

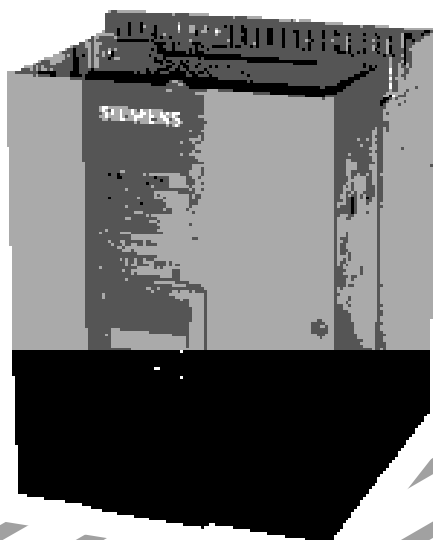


## SIMOREG CM

Operating Instructions

6RA70 Series

Control Module with microprocessor  
for Variable-Speed DC Drives



These Operating Instructions are available in the following languages:

| Language  | German        | French        | Spanish       | Italian       |
|-----------|---------------|---------------|---------------|---------------|
| Order No. | 6RX1700-0BD00 | 6RX1700-0BD77 | 6RX1700-0BD78 | 6RX1700-0BD72 |

## Control Module software version:

As these Operating Instructions went to print, SIMOREG CM were being delivered from the factory with software version **2.1** installed.

These Operating Instructions also apply to other software versions.

Earlier software versions: Some parameters described in this document might not be stored in the software (i.e. the corresponding functionality is not available on the converter) or some parameters will have a restricted setting range. If this is the case, however, appropriate reference to this status will be made in the Parameter List.

Later software versions: Additional parameters might be available on the SIMOREG CM (i.e. extra functions might be available which are not described in these Operating Instructions) or some parameters might have an extended setting range. In this case, leave the relevant parameters at their factory setting, or do not set any parameter values which are not described in these Instructions !

The software version of the SIMOREG CM device can be read in parameters r060 and r065.

The latest software version is available at the following Internet site:

<http://www4.ad.siemens.de/view/cs/en/8479576>

The reproduction, transmission or use of this document or contents is not permitted without express written authority. Offenders will be liable for damages. All rights, including rights created by patent grant or registration of a utility model or design, are reserved.

We have checked that the contents of this publication agree with the hardware and software described herein. Nonetheless, differences might exist and therefore we cannot guarantee that they are completely identical. The information given in this publication is reviewed at regular intervals and any corrections that might be necessary are made in the subsequent printings. Suggestions for improvement are welcome at all times.

SIMOREG ® is a registered trademark of Siemens

# 0 Contents

|                                                           | Page |
|-----------------------------------------------------------|------|
| <b>1 Safety information</b>                               |      |
| <b>2 Ordering Information</b>                             |      |
| 2.1 Converter order number                                | 2-1  |
| 2.2 Rating plate                                          | 2-1  |
| 2.3 Packaging label                                       | 2-1  |
| 2.4 Ordering information for options with order codes     | 2-2  |
| 2.5 Ordering information for cable sets                   | 2-4  |
| <b>3 Description</b>                                      |      |
| 3.1 Applications                                          | 3-1  |
| 3.2 Design                                                | 3-1  |
| 3.3 Mode of operation                                     | 3-2  |
| 3.4 Technical data                                        | 3-2  |
| 3.5 Applicable standards                                  | 3-3  |
| 3.6 Certification                                         | 3-3  |
| 3.7 Abbreviations                                         | 3-3  |
| <b>4 Shipment, unpacking</b>                              |      |
| <b>5 Installation</b>                                     |      |
| 5.1 Dimensions drawings                                   | 5-2  |
| 5.1.1 Converter components assembled (state as delivered) | 5-2  |
| 5.1.2 Converter components arranged side by side          | 5-3  |
| 5.2 Mounting/removal and division of modules              | 5-4  |
| 5.2.1 Removal of module C98043-A7043                      | 5-4  |
| 5.2.2 Dividing module C98043-A7043                        | 5-5  |
| 5.2.3 Dividing module C98043-A7044                        | 5-6  |
| 5.2.4 Mounting module C98043-A7043                        | 5-7  |
| 5.2.5 External assembly of module parts                   | 5-8  |
| 5.2.5.1 Terminal strip                                    | 5-8  |
| 5.2.5.2 Firing transfer plates                            | 5-8  |
| 5.2.5.3 Fuse monitoring                                   | 5-8  |
| 5.2.5.4 Voltage acquisition                               | 5-8  |
| 5.3 Mounting options                                      | 5-9  |
| 5.3.1 Terminal expansion module CUD2                      | 5-9  |



|          |                                                                                                                                              | Page |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------|------|
| 5.3.2    | Optional supplementary boards                                                                                                                | 5-10 |
| 5.3.2.1  | Local bus adapter (LBA) for mounting optional supplementary boards                                                                           | 5-10 |
| 5.3.2.2  | Mounting of optional supplementary boards                                                                                                    | 5-10 |
| <b>6</b> | <b>Connections</b>                                                                                                                           |      |
| 6.1      | Installation instructions for proper EMC installation of drives                                                                              | 6-2  |
| 6.1.1    | Fundamental principles of EMC                                                                                                                | 6-2  |
| 6.1.1.1  | What is EMC                                                                                                                                  | 6-2  |
| 6.1.1.2  | Noise radiation and noise immunity                                                                                                           | 6-2  |
| 6.1.1.3  | Limit values                                                                                                                                 | 6-2  |
| 6.1.1.4  | SIMOREG converters in industrial applications                                                                                                | 6-3  |
| 6.1.1.5  | Non-grounded supply systems                                                                                                                  | 6-3  |
| 6.1.1.6  | EMC planning                                                                                                                                 | 6-3  |
| 6.1.2    | Proper EMC installation of drives (installation instructions)                                                                                | 6-4  |
| 6.1.2.1  | General                                                                                                                                      | 6-4  |
| 6.1.2.2  | Rules for proper EMC installation                                                                                                            | 6-4  |
| 6.1.2.3  | Arrangement of components for converters                                                                                                     | 6-10 |
| 6.1.3    | Information on line-side harmonics generated by converters in a fully-controlled three-phase bridge circuit configuration B6C and (B6)A(B6)C | 6-11 |
| 6.2      | Block diagrams with recommended connection                                                                                                   | 6-13 |
| 6.3      | Connection of the external power section                                                                                                     | 6-15 |
| 6.4      | Dismantle capability                                                                                                                         | 6-20 |
| 6.5      | Measuring the armature current                                                                                                               | 6-30 |
| 6.5.1    | General information                                                                                                                          | 6-30 |
| 6.5.2    | Current measurement with two current transformers on the network side                                                                        | 6-31 |
| 6.5.3    | Current measurement via terminal block X3 with external measuring circuit                                                                    | 6-32 |
| 6.5.3.1  | External current transformer in V connection with +1V with rated armature direct current                                                     | 6-32 |
| 6.5.3.2  | External current transformer in V connection with +10V with rated armature direct current                                                    | 6-33 |
| 6.5.3.3  | Differential input for +10V at rated armature direct current                                                                                 | 6-33 |
| 6.5.4    | External current measurement via X21A                                                                                                        | 6-33 |
| 6.5.5    | Notes on the difference input, control range limits, and grounding                                                                           | 6-34 |
| 6.6      | Connecting the firing transformer                                                                                                            | 6-35 |
| 6.6.1    | General information                                                                                                                          | 6-35 |
| 6.6.1.1  | Normal use (individual)                                                                                                                      | 6-35 |
| 6.6.1.2  | Parallel connection of firing pulses                                                                                                         | 6-35 |
| 6.6.1.3  | External amplification of firing pulses                                                                                                      | 6-35 |
| 6.7      | Connecting the voltage measurement                                                                                                           | 6-36 |
| 6.8      | Connecting the fuse monitors                                                                                                                 | 6-37 |

|          |                                                                                                    | Page |
|----------|----------------------------------------------------------------------------------------------------|------|
| 6.9      | Parallel connection                                                                                | 6-38 |
| 6.9.1    | Parallel connection of devices                                                                     | 6-38 |
| 6.9.1.1  | Connection scheme for parallel connection of power sections, each with its own control electronics | 6-38 |
| 6.9.1.2  | Parameterization of SIMOREG converters for parallel connection                                     | 6-39 |
| 6.9.2    | Parallel connection of power sections                                                              | 6-42 |
| 6.9.2.1  | Current distribution / symmetry                                                                    | 6-42 |
| 6.9.2.2  | Comment about voltage measurement / synchronization                                                | 6-42 |
| 6.9.2.3  | Comment about fuse monitoring                                                                      | 6-42 |
| 6.10     | Field supply                                                                                       | 6-43 |
| 6.10.1   | Circuit diagram of the power section                                                               | 6-43 |
| 6.10.2   | Voltage measurement of the field power section                                                     | 6-43 |
| 6.10.3   | Conversion to field extra-low voltage                                                              | 6-44 |
| 6.11     | Fuses and commutating reactors                                                                     | 6-44 |
| 6.11.1   | Notes on commutating reactors                                                                      | 6-44 |
| 6.11.2   | Fuses for the field circuit                                                                        | 6-44 |
| 6.11.3   | Fuses in the power interface (board C98043-A7042)                                                  | 6-45 |
| 6.12     | Arrangement of printed circuit boards                                                              | 6-45 |
| 6.13     | Arrangement of customer connections (terminals, connectors, Faston tabs)                           | 6-46 |
| 6.14     | Terminal assignment (terminals, Faston tabs, ribbon cables)                                        | 6-51 |
| <b>7</b> | <b>Start-up</b>                                                                                    |      |
| 7.1      | General safety information                                                                         | 7-1  |
| 7.2      | Operator control panels                                                                            | 7-3  |
| 7.2.1    | Simple operator control panel (PMU)                                                                | 7-3  |
| 7.2.2    | User-friendly operator control panel (OP1S)                                                        | 7-4  |
| 7.3      | Parameterization procedure                                                                         | 7-6  |
| 7.3.1    | Parameter types                                                                                    | 7-6  |
| 7.3.2    | Parameterization on simple operator control panel                                                  | 7-6  |
| 7.4      | Reset to default value and adjust offset                                                           | 7-8  |
| 7.5      | Start-up procedure                                                                                 | 7-9  |
| 7.6      | Manual optimization (if necessary)                                                                 | 7-18 |
| 7.6.1    | Manual setting of armature resistance $R_A$ (P110) and armature inductance $L_A$ (P111)            | 7-18 |
| 7.6.2    | Manual setting of field resistance $R_F$ (P112)                                                    | 7-19 |
| 7.7      | Starting up optional supplementary boards                                                          | 7-20 |
| 7.7.1    | Procedure for starting up technology boards (T100, T300, T400)                                     | 7-20 |
| 7.7.2    | Sequence of operations for starting up PROFIBUS boards (CBP2)                                      | 7-22 |
| 7.7.2.1  | Mechanisms for processing parameters via the PROFIBUS                                              | 7-24 |
| 7.7.2.2  | Diagnostic tools                                                                                   | 7-25 |

|                                                                                        | Page |
|----------------------------------------------------------------------------------------|------|
| 7.7.3 Sequence of operations for starting up CAN bus boards (CBC)                      | 7-29 |
| 7.7.3.1 Description of CBC with CAN Layer 2                                            | 7-30 |
| 7.7.3.2 Description of CBC with CANopen                                                | 7-34 |
| 7.7.3.2.1 Introduction to CANopen                                                      | 7-34 |
| 7.7.3.2.2 Functionality of CBC with CANopen                                            | 7-35 |
| 7.7.3.2.3 Requirements for operating the CBC with CANopen                              | 7-36 |
| 7.7.3.3 Diagnostic tools                                                               | 7-36 |
| 7.7.4 Procedure for starting up the SIMOLINK board (SLB)                               | 7-40 |
| 7.7.5 Procedure for starting up expansion boards (EB1 and EB2)                         | 7-44 |
| 7.7.6 Procedure for starting up the pulse encoder board (SBP)                          | 7-45 |
| 7.7.7 Sequence of operations for starting up DeviceNet boards (CBD)                    | 7-46 |
| 7.7.7.1 Diagnostic tools                                                               | 7-52 |
| 7.7.8 Sequence of operations for starting up the serial I/O board (SCB1)               | 7-54 |
| 7.7.8.1 Diagnostic tools                                                               | 7-56 |
| 7.7.9 Structure of request/response telegrams                                          | 7-57 |
| 7.7.10 Transmission of double-word connectors for technology and communication modules | 7-60 |

## 8 Function diagrams

## 9 Function descriptions

|                                                                           |      |
|---------------------------------------------------------------------------|------|
| 9.1 General explanations of terms and functionality                       | 9-1  |
| 9.2 Computation cycles, time delay                                        | 9-6  |
| 9.3 Switch-on, shutdown, enabling                                         | 9-7  |
| 9.3.1 OFF2 (voltage disconnection) - control word 1, bit 1                | 9-7  |
| 9.3.2 OFF3 (Fast stop) - control word 1, bit 2                            | 9-7  |
| 9.3.3 Switch-on / shutdown (ON / OFF) terminal 37 - control word 1, bit 0 | 9-8  |
| 9.3.4 Operating enable (enable) terminal 38 - control word 1, bit 3       | 9-11 |
| 9.4 Ramp-function generator                                               | 9-11 |
| 9.4.1 Definitions                                                         | 9-12 |
| 9.4.2 Operating principle of ramp-function generator                      | 9-12 |
| 9.4.3 Control signals for ramp-function generator                         | 9-13 |
| 9.4.4 Ramp-function generator settings 1, 2 and 3                         | 9-13 |
| 9.4.5 Ramp-up integrator                                                  | 9-14 |
| 9.4.6 Ramp-function generator tracking                                    | 9-14 |
| 9.4.7 Limitation after ramp-function generator                            | 9-15 |
| 9.4.8 Velocity signal $dv/dt$ (K0191)                                     | 9-15 |
| 9.5 Inching                                                               | 9-15 |
| 9.6 Crawling                                                              | 9-16 |
| 9.7 Fixed setpoint                                                        | 9-16 |
| 9.8 Safety shutdown (E-Stop)                                              | 9-17 |

|           |                                                                                            |          |
|-----------|--------------------------------------------------------------------------------------------|----------|
| 01.04     |                                                                                            | Contents |
|           |                                                                                            | Page     |
| 9.9       | Activation command for holding or operating brake (low active)                             | 9-18     |
| 9.10      | Switch on auxiliaries                                                                      | 9-21     |
| 9.11      | Switch over parameter sets                                                                 | 9-21     |
| 9.12      | Speed controller                                                                           | 9-22     |
| 9.13      | Serial interfaces                                                                          | 9-23     |
| 9.13.1    | Serial interfaces with USS® protocol                                                       | 9-24     |
| 9.13.2    | Serial interfaces with peer-to-peer protocol                                               | 9-27     |
| 9.14      | Thermal overload protection of DC motor<br>(I <sup>2</sup> t monitoring of motor)          | 9-31     |
| 9.15      | Speed-dependent current limitation                                                         | 9-34     |
| 9.15.1    | Setting the speed-dependent current limitation for motors<br>with commutation transition   | 9-35     |
| 9.15.2    | Setting of speed-dependent current limitation for motors<br>without commutation transition | 9-36     |
| 9.16      | Automatic restart                                                                          | 9-37     |
| 9.17      | Field reversal                                                                             | 9-37     |
| 9.17.1    | Direction of rotation reversal using field reversal                                        | 9-38     |
| 9.17.2    | Braking with field reversal                                                                | 9-39     |
| 9.18      | Status description of some bits of status word ZSW1                                        | 9-41     |
| <b>10</b> | <b>Faults / Alarms</b>                                                                     |          |
| 10.1      | Fault messages                                                                             | 10-2     |
| 10.1.1    | General information about faults                                                           | 10-2     |
| 10.1.2    | List of fault messages                                                                     | 10-2     |
| 10.2      | Alarm messages                                                                             | 10-24    |
| <b>11</b> | <b>Parameter list</b>                                                                      |          |
| <b>12</b> | <b>List of connectors and binectors</b>                                                    |          |
| 12.1      | Connector list                                                                             | 12-1     |
| 12.2      | Binector list                                                                              | 12-27    |
| <b>13</b> | <b>Maintenance</b>                                                                         |          |
| 13.1      | Procedure for updating software                                                            | 13-2     |
| 13.2      | Replacement of components                                                                  | 13-3     |
| 13.2.1    | Replacement of PCBs                                                                        | 13-3     |
| 13.2.2    | Replacement of thyristor and diode modules (field)                                         | 13-3     |

|           | Page                                          |
|-----------|-----------------------------------------------|
| <b>14</b> | <b>Servicing</b>                              |
| 14.1      | Technical Support 14-1                        |
| 14.1.1    | Time zone Europe and Africa 14-1              |
| 14.1.2    | Time zone America 14-1                        |
| 14.1.3    | Time zone Asia / Australia 14-1               |
| 14.2      | Spare parts 14-2                              |
| 14.3      | Repairs 14-2                                  |
| 14.4      | On-site servicing 14-2                        |
| <b>15</b> | <b>DriveMonitor</b>                           |
| 15.1      | Scope of delivery 15-1                        |
| 15.2      | Installing the software 15-1                  |
| 15.3      | Connecting the SIMOREG to the PC 15-1         |
| 15.4      | Setting up an online link to the SIMOREG 15-2 |
| 15.5      | Further information 15-2                      |
| <b>16</b> | <b>Environmental compatibility</b>            |
| <b>17</b> | <b>Applications</b>                           |
| <b>18</b> | <b>Appendix</b>                               |
| 18.1      | Additional documentation 18-1                 |
|           | Sheet for customer feedback 18-3              |

# 1 Safety information



## WARNING

The manufacturer can only provide a warranty for correct functioning of the SIMOREG CM converter and accept liability for any damage if the device is installed and started up by qualified personnel and the instructions in this manual are correctly observed. The converters are operated at high voltages.



Hazardous voltages and rotating parts (fans) are present in this electrical equipment during operation. Non-observance of the safety instructions can result in death, severe personal injury or substantial property damage.

Only qualified personnel should work on or around the equipment after first becoming thoroughly familiar with all warning and safety notices and maintenance procedures contained herein. The successful and safe operation of this equipment is dependent on proper handling, installation, operation and maintenance.

### Definitions:

- **QUALIFIED PERSONNEL**

For the purpose of this Instruction Manual and product labels, a "Qualified person" is someone who is familiar with the installation, construction and operation of the equipment and the hazards involved. He or she must have the following qualifications:

1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
3. Trained in rendering first aid.

- **⚠ DANGER**

indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

- **⚠ WARNING**

indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

- **⚠ CAUTION**

used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

- **CAUTION**

used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

- **NOTICE**

NOTICE used without the safety alert symbol indicates a potentially situation which, if not avoided, may result in an undesirable result or state.

**NOTE**

These operating instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens Sales Office.

The contents of these operating instructions shall not become part or modify any prior or existing agreement, commitment or relationship. The Sales Contract contains the entire obligations of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

**DANGER**

Converters contain hazardous electrical voltages, Death, severe bodily injury or significant material damage can occur if the safety measures are not followed.

1. Only qualified personnel, who are knowledgeable about the converters and the provided information, can install, start up, operate, troubleshoot or repair the converters.
2. The converters must be installed in accordance with all relevant safety regulations (e.g. DIN VDE) as well as all other national or local regulations. Operational safety and reliability must be ensured by correct grounding, cable dimensioning and appropriate short-circuit protection.
3. All panels and doors must be kept closed during normal operation.
4. Before carrying out visual checks and maintenance work, ensure that the AC power supply is disconnected and locked out. Before the AC supply is disconnected, both converters and motors have hazardous voltage levels. Even when the converter contactor is open, hazardous voltages are still present.
5. When making measurements with the power supply switched on, electrical connections must not be touched under any circumstances. Remove all jewellery from wrists and fingers. Ensure that the test equipment is in good conditions and operationally safe.
6. When working on units which are switched on, stand on an insulating surface, i.e. ensure that you are not grounded.
7. Carefully follow the relevant instructions and observe all danger, warning and cautionary instructions.
8. This does not represent a full listing of all the measures necessary for safe operation of the equipment. If you require other information or if certain problems occur which are not handled in enough detail in the information provided in the Instruction Manual, please contact your local Siemens office.



**CAUTION****Electrostatically sensitive devices**

The converter contains electrostatically sensitive devices. These can easily be destroyed if they are not handled correctly. If, however, it is absolutely essential for you to work on electronic modules, please pay careful attention to the following instructions:

- Electronic modules (PCBs) should not be touched unless work has to be carried out on them.
- Before touching a PCB, the person carrying out the work must himself be electrostatically discharged. The simplest way of doing this is to touch an electrically conductive earthed object, e.g. socket outlet earth contact.
- PCBs must not be allowed to come into contact with electrically insulating materials – plastic foil, insulating table tops or clothing made of synthetic fibres –
- PCBs may only be set down or stored on electrically conducting surfaces.
- When carrying out soldering jobs on PCBs, make sure that the soldering tip has been earthed.
- PCBs and electronic components should generally be packed in electrically conducting containers (such as metallized-plastic boxes or metal cans) before being stored or shipped.
- If the use of non-conducting packing containers cannot be avoided, PCBs must be wrapped in a conducting material before being put in them. Examples of such materials include electrically conducting foam rubber or household aluminium foil.

For easy reference, the protective measures necessary when dealing with sensitive electronic components are illustrated in the sketches below.

a = Conductive flooring

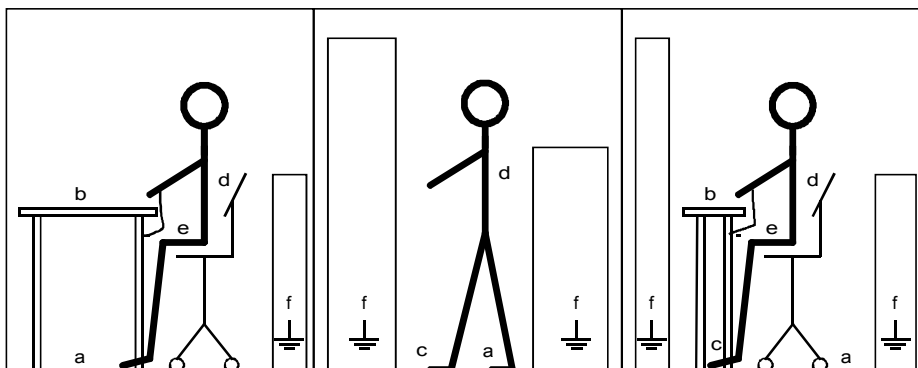
d = Anti-static overall

b = Anti-static table

e = Anti-static chain

c = Anti-static footwear

f = Earthing connections of cabinets



Seated workstation

Standing workstation

Standing/seated workstation

**WARNING**

Hazardous voltages and rotating parts (fans) are present in this electrical equipment during operation.



Non-observance of the safety instructions can result in death, severe personal injury or substantial property damage.

Only qualified personnel should work on or around the equipment after first becoming thoroughly familiar with all warning and safety notices and maintenance procedures contained herein.

The successful and safe operation of this equipment is dependent on proper handling, installation, operation and maintenance.





## 2 Ordering Information

### 2.1 Converter order number

Without option: 6RA7000 - 0MV62 - 0

With options: 6RA7000 - 0MV62 - 0 - Z

### 2.2 Rating plate

|                                                                                    |                               |                                                                                     |         |
|------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------|---------|
| <h1 style="margin: 0;">SIMOREG CM</h1>                                             |                               |                                                                                     |         |
| <b>SIEMENS</b>                                                                     |                               |                                                                                     |         |
| <b>CONTROL MODULE</b>                                                              |                               |                                                                                     |         |
|   |                               |                                                                                     |         |
| Order No. / Type                                                                   | 1P <b>6RA7000 – 0MV62 - 0</b> | 1)                                                                                  | 2)      |
|                                                                                    | 3)                            |                                                                                     |         |
|  |                               |                                                                                     |         |
| Serial No.                                                                         | s Q6 .....                    | 4)                                                                                  |         |
| <b>ARMATURE</b>                                                                    |                               |                                                                                     |         |
| Input                                                                              | 3AC 1000V                     | 50/60Hz                                                                             |         |
| <b>FIELD SUPPLY</b>                                                                |                               |                                                                                     |         |
| Input                                                                              | 2AC ... V                     | 40 A                                                                                | 50/60Hz |
| Output                                                                             | DC ... V                      | 40 A                                                                                |         |
| Prod. State                                                                        | 5) S                          |  |         |
| Cooling                                                                            |                               |                                                                                     |         |
| <b>Made in Austria</b>                                                             |                               |                                                                                     |         |

- 1) Bar code for order number (MLFB)
- 2) A -Z is affixed after the MLFB for options
- 3) Code for options (order-specific)
- 4) Bar code, serial number (order-specific)
- 5) Product version

### 2.3 Packaging label

|                                                                                     |  |                                                                                     |  |
|-------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------|--|
| <b>CONTROL MODULE</b>                                                               |  | <b>SIEMENS</b>                                                                      |  |
| <h2 style="margin: 0;">6RA7000 – 0MV62 - 0</h2>                                     |  |                                                                                     |  |
|  |  |                                                                                     |  |
| 1P <b>6RA7000 – 0MV62 - 0</b>                                                       |  | 1)                                                                                  |  |
|  |  |                                                                                     |  |
| s Q6 .....                                                                          |  |  |  |
| Q .....                                                                             |  | QTY 1                                                                               |  |
| SW – STAND<br>(Version)<br>---                                                      |  | E – STAND<br>(Version)<br>---                                                       |  |
| <b>Made in Austria</b>                                                              |  |                                                                                     |  |

- 1) A -Z is affixed to the MLFB for options, followed by the code for the relevant option (order-specific)

## 2.4 Ordering information for options with order codes

6RA7000 - 0MV62 - 0 - Z

Order number of SIMOREG CM converter  
with order code Z

Order codes (several added order codes)  
and/or

|  |
|--|
|  |
|--|

Plain text, where necessary

| Options                                                                                                                                                                                         | Codes                              | Order No..                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------------|
| Technology software in the basic converter ("Free function blocks")                                                                                                                             | S00                                | 6RX1700-0AS00                                                         |
| Module terminal expansion (CUD2)                                                                                                                                                                | K00                                | 6RX1700-0AK00                                                         |
| DriveMonitor PC - PMU (RS232) connecting cable, 3m                                                                                                                                              |                                    | 6SX7005-0AB00                                                         |
| User-friendly operator control panel (OP1S)<br>AOP1 adapter for mounting OP1A in cubicle door, including 5 m connecting cable<br>PMU-OP1S connecting cable, 3m<br>PMU-OP1S connecting cable, 5m |                                    | 6SE7090-0XX84-2FK0<br>6SX7010-0AA00<br>6SX7010-0AB03<br>6SX7010-0AB05 |
| LBA Local bus adapter for the electronics box<br>LBA is always needed to install supplementary boards (see Section 5.3.2)                                                                       | K11                                | 6SE7090-0XX84-4HA0                                                    |
| ADB Adapter board<br>ADB is always needed to install CBC, CBP, EB1, EB2, SBP and SLB boards                                                                                                     | K01, K02 <sup>5)</sup>             | 6SE7090-0XX84-0KA0                                                    |
| SBP Pulse encoder evaluation board <sup>1) 2) 3)</sup><br>(miniature-format board; ADB required)                                                                                                | C14, C15<br>C16, C17 <sup>5)</sup> | 6SX7010-0FA00                                                         |
| EB1 Terminal expansion board <sup>3)</sup><br>(miniature-format board; ADB required)                                                                                                            | G64, G65<br>G66, G67 <sup>5)</sup> | 6SE7090-0XX84-0KB0                                                    |
| EB2 Terminal expansion board <sup>3)</sup><br>(miniature-format board; ADB required)                                                                                                            | G74, G75<br>G76, G77 <sup>5)</sup> | 6SE7090-0XX84-0KC0                                                    |
| SLB SIMOLINK board <sup>1) 3)</sup><br>(miniature-format board; ADB required)                                                                                                                   | G44, G45<br>G46, G47 <sup>5)</sup> | 6SX7010-0FJ00                                                         |
| CBP2 Communications board with interface for SINEC- L2-DP, (PROFIBUS) <sup>1) 3)</sup><br>(miniature-format board; ADB required)                                                                | G94, G95<br>G96, G97 <sup>5)</sup> | 6SX7010-0FF05                                                         |
| CBC Communications board with interface for CAN protocol <sup>1) 3)</sup><br>(miniature-format board; ADB required)                                                                             | G24, G25<br>G26, G27 <sup>5)</sup> | 6SX7010-0FG00                                                         |
| CBD Communications board with interface for DeviceNet protocol <sup>1) 3)</sup><br>(miniature-format board; ADB required)                                                                       | G54, G55<br>G56, G57 <sup>5)</sup> | 6SX7010-0FK00                                                         |
| SCB1 Serial Communication Board 1 (Master for SCI1 and SCI2 with FO link) <sup>3) 4)</sup>                                                                                                      |                                    | 6SE7090-0XX84-0BC0                                                    |
| SCI1 Serial Communication Interface 1<br>(terminal expansion with FO link to SCB1) for attachment to DIN EN 50022 rail <sup>4)</sup>                                                            |                                    | 6SE7090-0XX84-3EA0                                                    |

| Options                                                                                                                                                                                                                                                                                                                                                          | Codes                           | Order No..                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SCI2 Serial Communication Interface 2<br>(terminal expansion with FO link to SCB1) for attachment<br>to DIN EN 50022 rail <sup>4)</sup>                                                                                                                                                                                                                          |                                 | 6SE7090-0XX84-3EF0                                                                                                                                                                       |
| T100 module incl. hardware operating instructions without<br>software module) <sup>3)</sup><br><br>Hardware operating instructions for T100<br><br>MS100 "Universal Drive" software module for T100 (EPROM)<br>without manual<br><br>Manual for MS100 "Universal Drive" software module<br><br>German<br><br>English<br><br>French<br><br>Spanish<br><br>Italian |                                 | 6SE7090-0XX87-0BB0<br><br>6SE7080-0CX87-0BB0<br><br>6SE7098-0XX84-0BB0<br><br>6SE7080-0CX84-0BB1<br>6SE7087-6CX84-0BB1<br>6SE7087-7CX84-0BB1<br>6SE7087-8CX84-0BB1<br>6SE7087-2CX84-0BB1 |
| T300 technology board with 2 connecting leads, SC58 and<br>SC60, terminal block SE300 and hardware operating<br>instructions <sup>3)</sup>                                                                                                                                                                                                                       |                                 | 6SE7090-0XX84-0AH0                                                                                                                                                                       |
| T400 technology board (incl. short description) <sup>3)</sup><br>T400 hardware and configuring manual                                                                                                                                                                                                                                                            |                                 | 6DD1606-0AD0<br>6DD1903-0EA0                                                                                                                                                             |
| Operating instructions for SIMOREG Control Module<br>Operating instructions German<br>Operating instructions Italian<br>Operating instructions English<br>Operating instructions French<br>Operating instructions Spanish<br>Operating Instructions and DriveMonitor in all the above<br>languages available on CD-ROM                                           | D72<br>D76<br>D77<br>D78<br>D64 | 6RX1700-0BD00<br>6RX1700-0BD72<br>6RX1700-0BD76<br>6RX1700-0BD77<br>6RX1700-0BD78<br>6RX1700-0AD64                                                                                       |

1) These boards can be ordered under two different numbers, i.e.

- under the order number of the board without accessories (such as connectors and Short Guide)
- as a retrofit kit: Board with connectors and Short Guide

| Board | Order number of board (w/o accessories) | Order number of retrofit kit |
|-------|-----------------------------------------|------------------------------|
| ADB   | 6SE7090-0XX84-0KA0                      | 6SE7010-0KA00                |
| SBP   | 6SE7090-0XX84-0FA0                      | 6SE7010-0FA00                |
| EB1   | 6SE7090-0XX84-0KB0                      | 6SE7010-0KB00                |
| EB2   | 6SE7090-0XX84-0KC0                      | 6SE7010-0KC00                |
| SLB   | 6SE7090-0XX84-0FJ0                      | 6SE7010-0FJ00                |
| CBP2  | 6SE7090-0XX84-0FF5                      | 6SE7010-0FF05                |
| CBC   | 6SE7090-0XX84-0FG0                      | 6SE7010-0FG00                |
| CBD   | 6SE7090-0XX84-0FK0                      | 6SE7010-0FK00                |

The retrofit kit must be ordered to install boards in the SMOREG converter so that the correct connectors for system cabling and the Short Guide are also available.

The LBA local bus adapter and ADB adapter board must be ordered as additional components for installing supplementary boards in the SIMOREG converter. These adapters are available under separate order numbers.

- 2) A pulse encoder evaluation circuit is a standard component of the basic SIMOREG converter. The SBP need therefore be ordered only in configurations requiring evaluation of a second pulse encoder.
- 3) An LBA local bus adapter is required to install this board in a SIMOREG converter. The adapter is available under a separate order number.
- 4) Supplied packed separately, including 10 m fiber-optic cable.
- 5) The last figure in the order code identifies the module location or slot of the electronic box (see Section 5.3.2):
  - 1 . . . Board location 2
  - 2 . . . Board location 3
  - 4 . . . Slot D
  - 5 . . . Slot E
  - 6 . . . Slot F
  - 7 . . . Slot G

## 2.5 Ordering information for cable sets

The SIMOREG control module is supplied with a front and back trough mounted one above the other. The ribbon cables required for this type of assembly are already fitted.

The following cable sets for connecting components (printed circuit boards or board components) for other installation methods (see Section 6) are available on request.

| Order No.     | Product Description                                                                                          | Contents                                                                                                                        | For Connecting ....                                                                                                                                            |
|---------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6RY1707-0CM00 | Assembly kit                                                                                                 | Screws, studs and snap-on parts for external assembly of board components                                                       |                                                                                                                                                                |
| 6RY1707-0CM01 | Pre-assembled jumpering kit, ribbon cables:<br>For connecting the two tanks when they are mounted separately | 2x 26-pin shielded ribbon cables (L=3m)<br>2x 10-pin shielded ribbon cables (L=3m)<br>1x 20-pin shielded ribbon cable (L=3m)    | X21A, X22A on PCB -A7042- to X21A, X22A on PCB -A7043-<br>XS20, XS21 on PCB -A7042- to XS20, XS21 on PCB -A7044-<br>X102 on PCB -A7042- to X102 on PCB -A7044- |
| 6RY1707-0CM02 | Pre-assembled jumpering kit, ribbon cables:<br>For connecting the two tanks when they are mounted separately | 2x 26-pin shielded ribbon cables (L=10m)<br>2x 10-pin shielded ribbon cables (L=10m)<br>1x 20-pin shielded ribbon cable (L=10m) | X21A, X22A on PCB -A7042- to X21A, X22A on PCB -A7043-<br>XS20, XS21 on PCB -A7042- to XS20, XS21 on PCB -A7044-<br>X102 on PCB -A7042- to X102 on PCB -A7044- |
| 6RY1707-0CM03 | Pre-assembled jumpering kit for current transformers                                                         | 2x 2-pin twisted cables (L=2m)                                                                                                  | X3 on PCB -A7042- to the current transformers                                                                                                                  |
| 6RY1707-0CM04 | Pre-assembled jumpering kit for current transformers                                                         | 2x 2-pin shielded cables (L=10m)                                                                                                | X3 on PCB -A7042- to the current transformers                                                                                                                  |
| 6RY1707-0CM05 | Pre-assembled jumpering kit for heat sink temperature sensing                                                | 1x 2-pin shielded cable (L=10m)                                                                                                 | X6 and X7 on PCB -A7042- to temperature sensor on heat sink                                                                                                    |
| 6RY1707-0CM06 | Pre-assembled jumpering kit for firing pulse cables                                                          | Jumpering kit for 12x 2-pin twisted cables (L=3m)                                                                               | XIMP11, XIMP12, XIMP13, XIMP14, XIMP15, XIMP16 XIMP21, XIMP22, XIMP23, XIMP24, XIMP25, XIMP26 to the thyristors                                                |

| Order No.     | Product Description                                                      | Contents                                                                     | For Connecting ....                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6RY1707-0CM07 | Pre-assembled jumpering kit for fuse monitoring                          | 6x 2-pin twisted cables (L=10m)                                              | XS1_4, XS2_4, XS3_4, XS4_4, XS5_4, XS6_4, XS7_4, XS8_4, XS9_4, XS10_4, XS11_4, XS12_4 or XS1_3, XS2_3, XS3_3, XS4_3, XS5_3, XS6_3, XS7_3, XS8_3, XS9_3, XS10_3, XS11_3, XS12_3 or XS1_2, XS2_2, XS3_2, XS4_2, XS5_2, XS6_2, XS7_2, XS8_2, XS9_2, XS10_2, XS11_2, XS12_2 or XS1_1, XS2_1, XS3_1, XS4_1, XS5_1, XS6_1, XS7_1, XS8_1, XS9_1, XS10_1, XS11_1, XS12_1 depending on voltage (85V, 250V, 575V or 1000V) to the fuses |
| 6RY1707-0CM08 | Pre-assembled jumpering kit for voltage sensing                          | 1x 3-pin twisted cable U-V-W (L=3m)<br>1x 2-pin twisted cable C-D (L=3m)     | XU4, XV4, XW4 or XU3, XV3, XW3 or XU2, XV2, XW2 or XU1, XV1, XW1 depending on voltage (85V, 250V, 575V or 1000V) to incoming supply<br><br>XC4, XD4 or XC3, XD3 or XC2, XD2 or XC1, XD1 depending on voltage (85V, 250V, 575V or 1000V) to incoming supply                                                                                                                                                                    |
| 6RY1707-0CM13 | Pre-assembled jumpering kit for firing-pulse transformer trigger circuit | 12x 2-pin twisted cable (L=1m)                                               | XIMP1, XIMP4 or XIMP2, XIMP5 or XIMP3, XIMP6 on PCB -A7043- (side panels) to firing-pulse transformer modules (single plates) with terminals X11, X12, X13, X14, X15, X16, X21, X22, X23, X24, X25, X26                                                                                                                                                                                                                       |
| 6RY1707-0CM10 | Pre-assembled jumpering kit for firing-pulse transformer trigger circuit | 2x 12-pin shielded cables (L=10m)                                            | XIMP1, XIMP4 and/or XIMP2, XIMP5 and/or XIMP3, XIMP6 on PCB -A7043- to external firing-pulse transformers                                                                                                                                                                                                                                                                                                                     |
| 6RY1707-0CM11 | Pre-assembled jumpering kit for adjacent tank mounting                   | 2x 26-pin ribbon cables<br>2x 10-pin ribbon cables<br>1x 20-pin ribbon cable | X21A, X22A on PCB -A7042- to X21A, X22A on PCB -A7043-<br><br>XS20, XS21 on PCB -A7042- to XS20, XS21 on PCB -A7044-<br><br>X102 on PCB -A7042- to X102 on PCB -A7044-                                                                                                                                                                                                                                                        |



## 3 Description

### 3.1 Applications

The main application of the SIMOREG CM converter is conversion and modernization of DC drives in existing installations.

In DC technology, many installations exist that are older than 5 - 10 years and still use analog technology.

When these installations are converted or upgraded, the motor, mechanical and power sections are left in the installation and the trigger and control section replaced by a 6RA70 control module. The result is a modern DC drive at an extremely low price, with the full functional scope of the tried and tested fully digital devices of the SIMOREG DC MASTER 6RA70 range.

The configuration of the existing components is adapted by simple parameterization.

The 6RA70 control module contains a power section for the field supply with a rated current of up to 40A.

### 3.2 Design

The 6RA70 control module is characterized by its compact, space-saving construction. Their compact design makes them particularly easy to service and maintain since individual components are readily accessible. The electronics box contains the basic electronic circuitry as well as any supplementary boards.

In order to make optimum use of the mounting possibilities of the installation, the 6RA70 control module can be divided along its depth. In addition, the PCBs for the firing pulse generation and distribution and for safety monitoring and voltage acquisition have been designed in such a way that they can be divided and either partially or completely mounted outside the converter directly on the power section and connected with the basic unit via cable.

All 6RA70 control modules are equipped with a PMU simple operator panel mounted in the converter door. The panel consists of a five-digit, seven-segment display, three LEDs as status indicators and three parameterization keys. The PMU also features connector X300 with a USS interface in accordance with the RS232 or RS485 standard.

The panel provides all the facilities for making adjustments or settings and displaying measured values required to start up the converter.

The OP1S optional converter operator panel can be mounted either in the converter door or externally, e.g. in the cubicle door. For this purpose, it can be connected up by means of a 5 m long cable. Cables of up to 200 m in length can be used if a separate 5 V supply is available. The OP1S is connected to the SIMOREG CM via connector X300.

The OP1S can be installed as an economic alternative to control cubicle measuring instruments which display physical measured quantities.

The OP1S features an LCD with 4 x 16 characters for displaying parameter names in plaintext.

German, English, French, Spanish and Italian can be selected as the display languages.

The OP1S can store parameter sets for easy downloading to other devices.

The converter can also be parameterized on a standard PC with appropriate software connected to the serial interface on the basic unit. This PC interface is used during start-up, for maintenance during shutdown and for diagnosis in operation. Furthermore, converter software upgrades can be loaded via this interface for storage in a Flash memory.

The field is supplied by a B2HZ single-phase single pair controllable two-pulse bridge connection. The power section for the field is constructed using isolated thyristor modules, the heat sink is therefore electrically isolated.



### 3.3 Mode of operation

All open-loop and closed-loop drive control and communication functions are performed by two powerful microprocessors. Drive control functions are implemented in the software as program modules which can be "wired up" by parameters.

### 3.4 Technical data

|                                               |    |                                                                                                                                                                                                                      |
|-----------------------------------------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measurable rated supply voltage armature      | V  | 85V / 250V / 575V / 1000V                                                                                                                                                                                            |
| Rated supply voltage electronics power supply | V  | 2AC 380 (– 25%) to 460 (+15%); $I_n=1A$ or<br>1AC 190 (– 25%) to 230 (+15%); $I_n=2A$<br>(– 35% for 1min)                                                                                                            |
| Rated supply voltage field <sup>1)</sup>      | V  | 2AC 400 (+15% / – 20%)<br>2AC 460 (+10%)                                                                                                                                                                             |
| Rated frequency                               | Hz | Converters self-adapt to the frequency of the available supply voltage in the range from 45 to 65 Hz <sup>3)</sup>                                                                                                   |
| Rated DC voltage field <sup>1)</sup>          | V  | max. 325 / 373                                                                                                                                                                                                       |
| Rated DC current field                        | A  | 40                                                                                                                                                                                                                   |
| Operational ambient temperature               | °C | 0 - +60                                                                                                                                                                                                              |
| Storage and transport temperature             | °C | – 25 to +70                                                                                                                                                                                                          |
| Control stability                             |    | $\Delta n = 0.006\%$ of the rated motor speed, valid for pulse encoder operation <u>and</u> digital setpoint<br>$\Delta n = 0.1\%$ of the rated motor speed, valid for analog tacho or analog setpoint <sup>2)</sup> |
| Environmental class DIN IEC 60721-3-3         |    | 3K3                                                                                                                                                                                                                  |
| Degree of protection DIN EN 60529             |    | IP00                                                                                                                                                                                                                 |
| Dimensions                                    |    | Refer to dimensional drawings in Section 5                                                                                                                                                                           |
| Weight (approx.)                              | kg | 15                                                                                                                                                                                                                   |

- 1) The field supply voltage can be lower than the rated field voltage (setting in parameter P078, input voltages of up to 85V are permissible). The output voltage is reduced accordingly.

The specified output DC voltage can be guaranteed up to an undervoltage corresponding to 95% of line voltage (rated supply voltage field).

- 2) Requirements:

The control stability (closed-loop PI control) is referred to the rated motor speed and applies when the SIMOREG converter is warm. The following conditions are applicable:

- Temperature changes of  $\pm 10$  K
- Line voltage changes corresponding to +10% / – 5% of the rated input voltage
- Temperature coefficient of temperature-compensated tacho-generators 0.15‰ per 10 K (applies only to analog tacho-generator)
- Constant setpoint (14-bit resolution)

- 3) Operation in the extended frequency range between 23 Hz and 110 Hz is available on request.

### 3.5 Applicable standards

VDE 0106 Part 100

Arrangement of operator control elements in the vicinity of components/parts at hazardous voltage levels.

VDE 0110 Part 1

Insulation coordination for electrical equipment in low-voltage installations.

Degree of pollution 2 for boards and power section.

Only non-conductive contamination is permissible.

"Moisture condensation is excluded, as the components are only permitted for humidity class F."

EN 60146 T1-1 / VDE 0558 T11

Semiconductor converter

General requirements and line-commutated converters

DIN EN 50178 / VDE 0160

Regulations for equipping electrical power systems with electronic equipment.

EN 61800-3

Variable-speed drives, part 3, EMC Product Standard including special testing procedures

DIN IEC 60068-2-6 acc. to severity grade 12 (SN 29010 Part1)

Mechanical stressing

### 3.6 Certification

The products referred to in this document are manufactured and operated in accordance with DIN ISO 9001 (Certificate Register No.: 257-0).

### 3.7 Abbreviations

|           |                                                                                                                            |
|-----------|----------------------------------------------------------------------------------------------------------------------------|
| ADB       | <b>A</b> dapter <b>B</b> oard, carrier for miniature-format supplementary boards                                           |
| CAN       | Field bus specification of user organization CiA (CAN in Automation)<br>( <b>C</b> ontroller <b>A</b> rea <b>N</b> etwork) |
| CB        | Supplementary <b>C</b> ommunication <b>B</b> oard                                                                          |
| CBC       | Supplementary board for CAN Bus link<br>( <b>C</b> ommunication <b>B</b> oard <b>CAN</b> Bus)                              |
| CBD       | Supplementary board for DeviceNet link<br>( <b>C</b> ommunication <b>B</b> oard <b>D</b> eviceNet)                         |
| CBP2      | Supplementary board for PROFIBUS link<br>( <b>C</b> ommunication <b>B</b> oard <b>P</b> ROFIBUS)                           |
| COB       | <b>C</b> ommunication <b>O</b> bject for CAN Bus communication                                                             |
| CUD1      | Electronics board C98043-A7001 of SIMOREG DC Master<br>( <b>C</b> ontrol <b>U</b> nit / <b>D</b> irect Current)            |
| CUD2      | Terminal expansion board C98043-A7006 for CUD1                                                                             |
| DeviceNet | Field bus specification of ODVA (Open DeviceNet Vendor Association)                                                        |
| DP        | <b>D</b> istributed <b>P</b> eripherals                                                                                    |
| EB1       | Supplementary board with additional inputs/outputs ( <b>E</b> xpansion <b>B</b> oard <b>1</b> )                            |
| EB2       | Supplementary board with additional inputs/outputs ( <b>E</b> xpansion <b>B</b> oard <b>2</b> )                            |
| GSD file  | Device master data file defining the communication features of the PROFIBUS communication board                            |
| ID        | <b>I</b> dentifier for CAN Bus communication                                                                               |

|          |                                                                                                                                                          |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| IND      | Parameter <b>I</b> ndex                                                                                                                                  |
| LBA      | Connection module for mounting supplementary modules ( <b>L</b> ocal <b>B</b> us <b>A</b> dapter)                                                        |
| LWL      | Fiber-optic cable                                                                                                                                        |
| MSAC_C1  | Designation of a transmission channel for PROFIBUS (Master Slave Acyclic / Class 1)                                                                      |
| MSCY_C1  | Designation of a transmission channel for PROFIBUS (Master Slave Cyclic / Class 1)                                                                       |
| OP1S     | Optional device operating panel with plaintext display and internal memory for parameter sets ( <b>O</b> perator <b>P</b> anel <b>1</b> / <b>S</b> tore) |
| PKE      | Parameter identifier                                                                                                                                     |
| PKW      | Reference to parameter (parameter identifier value)                                                                                                      |
| PMU      | Simple operator panel of SIMOREG DC Master ( <b>P</b> arameterization <b>U</b> nit)                                                                      |
| PNU      | <b>P</b> arameter <b>n</b> umber                                                                                                                         |
| PPO      | Definition of number of parameter and process data words for PROFIBUS communication ( <b>P</b> arameter <b>P</b> rocess <b>D</b> ata <b>O</b> bject)     |
| PROFIBUS | Field bus specification of PROFIBUS user organization ( <b>P</b> rocess <b>F</b> ield <b>B</b> us)                                                       |
| PWE      | Parameter value                                                                                                                                          |
| PZD      | Process data                                                                                                                                             |
| SBP      | Supplementary board for linking tachometer ( <b>S</b> ensor <b>B</b> oard <b>P</b> ulse)                                                                 |
| SCB1     | Supplementary board for linking SCI1 or SCI2 via fiber optic cable ( <b>S</b> erial <b>C</b> ommunication <b>B</b> oard <b>1</b> )                       |
| SCI1     | Supplementary board with additional inputs/outputs; I/O slave module on SCB1 ( <b>S</b> erial <b>C</b> ommunication <b>I</b> nterface <b>1</b> )         |
| SCI2     | Supplementary board with additional inputs/outputs; I/O slave module on SCB1 ( <b>S</b> erial <b>C</b> ommunication <b>I</b> nterface <b>2</b> )         |
| SIMOLINK | Field bus specification for fiber optic ring bus ( <b>S</b> iemens <b>M</b> otion <b>L</b> ink)                                                          |
| SLB      | Supplementary board for SIMOLINK link ( <b>S</b> IMOLINK <b>B</b> oard)                                                                                  |
| STW      | Control word                                                                                                                                             |
| T100     | Supplementary board with technology functions ( <b>T</b> echnology <b>B</b> oard <b>100</b> )                                                            |
| T300     | Supplementary board with technology functions ( <b>T</b> echnology <b>B</b> oard <b>300</b> )                                                            |
| T400     | Supplementary board with technology functions ( <b>T</b> echnology <b>B</b> oard <b>400</b> )                                                            |
| TB       | <b>T</b> echnology board T100, T300 or T400                                                                                                              |
| USS      | <b>U</b> niversal serial interface                                                                                                                       |
| ZSW      | <b>S</b> tatus <b>w</b> ord                                                                                                                              |

## 4 Shipment, unpacking

SIMOREG CM converters are packed in the production works according to the relevant ordering data. A product packing label is attached to the box.

Protect the package against severe jolts and shocks during shipment, e.g. when setting it down.

Carefully observe the information on the packaging relating to transportation, storage and proper handling.

The SIMOREG device can be installed after it has been unpacked and the shipment checked for completeness and/or damage.

The packaging materials consist of cardboard and corrugated paper and can be disposed of according to locally applicable waste disposal regulations.

If you discover that the converter has been damaged during shipment, please inform your shipping agent immediately.



## 5 Installation



### CAUTION

Failure to lift the converter in the correct manner can result in bodily injury and/or property damage.

The device must always be lifted by properly trained personnel using the appropriate equipment (i.e. protective gloves, etc.).

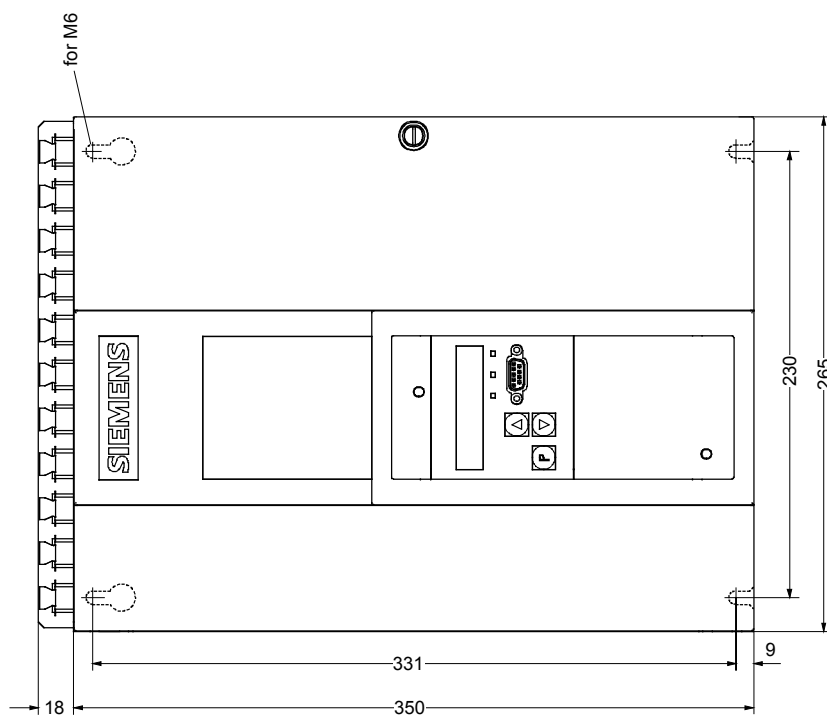
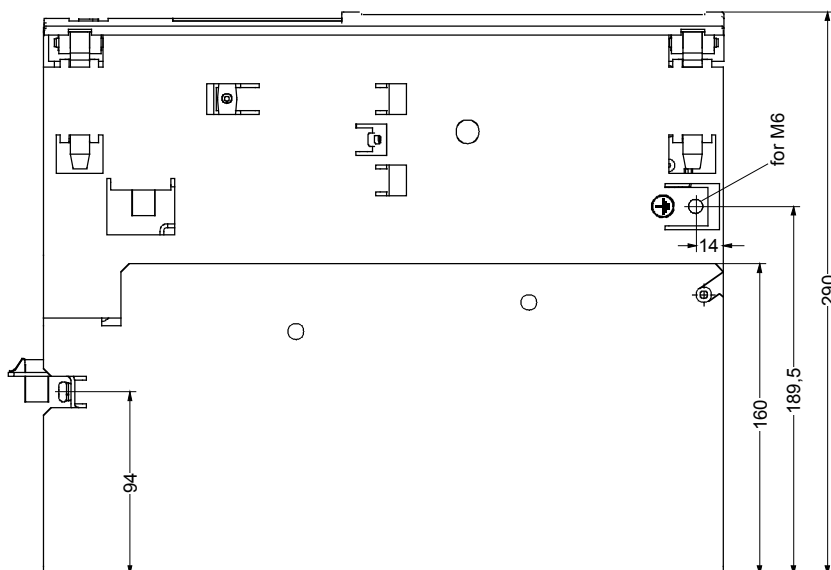


The user is responsible for installing the SIMOREG CM converter, the power section, the motor, transformer, as well as other equipment according to safety regulations (e.g. EN, DIN, VDE), as well as all other relevant national or local regulations regarding cable dimensioning and protection, grounding, isolating switch, overcurrent protection, etc.

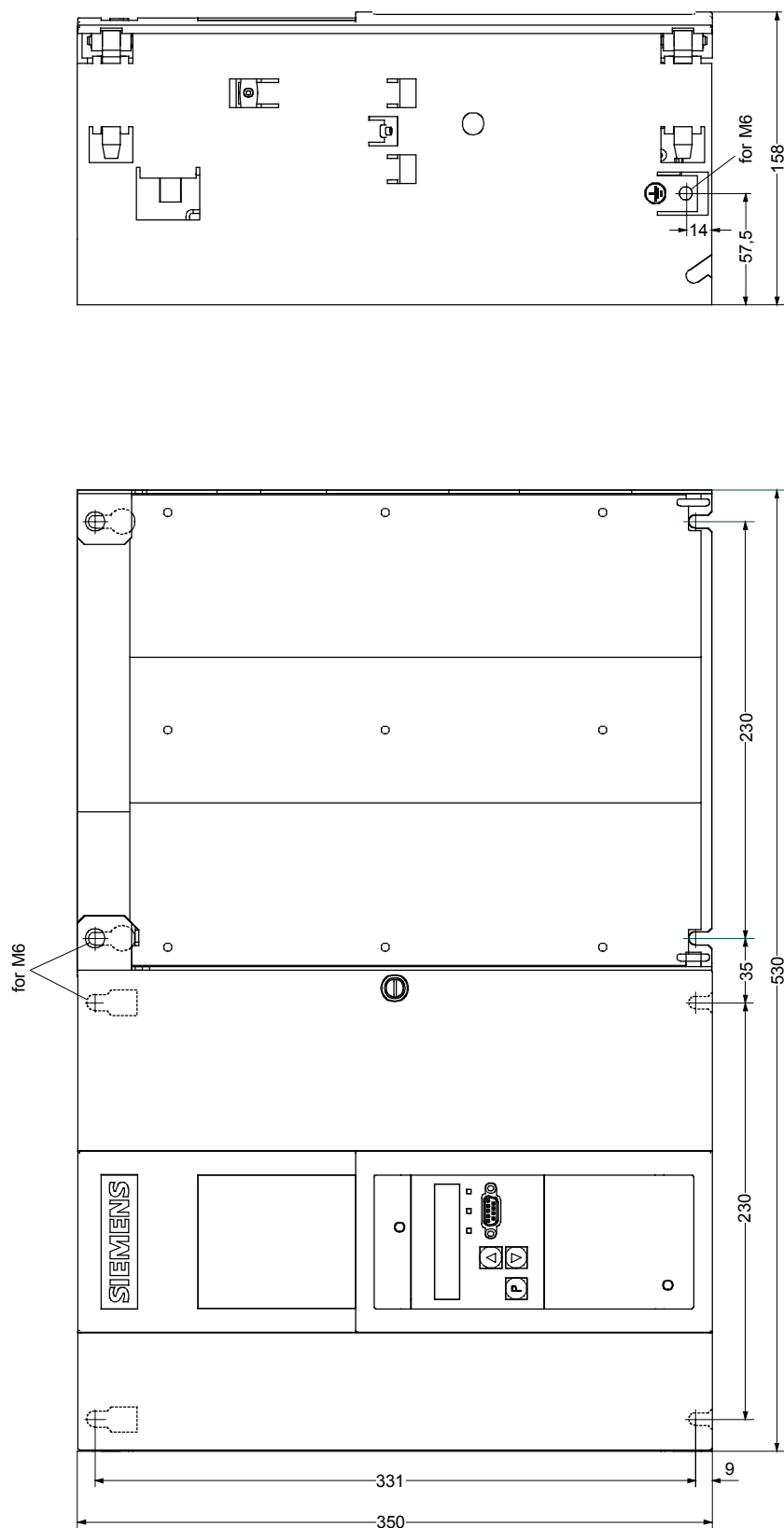
The converter must be installed in accordance with the relevant safety regulations (e.g. EN, DIN, VDE), as well as all other relevant national and local regulations. It must be ensured that the grounding, cable dimensioning and appropriate short-circuit protection have been implemented to guarantee operational safety and reliability..

## 5.1 Dimensions drawings

### 5.1.1 Converter components assembled (state as delivered)



### 5.1.2 Converter components arranged side by side

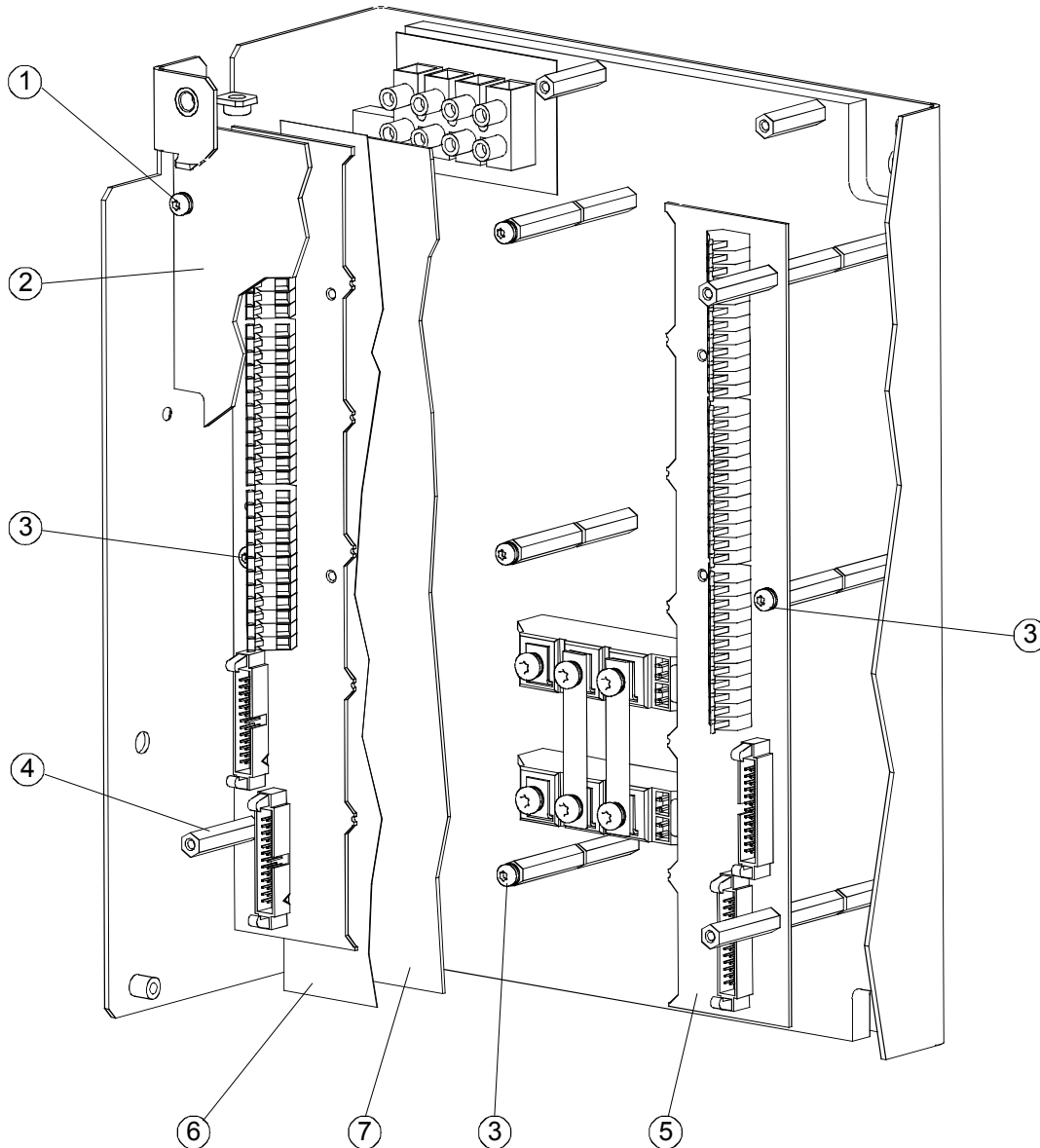




## 5.2 Mounting/removal and division of modules

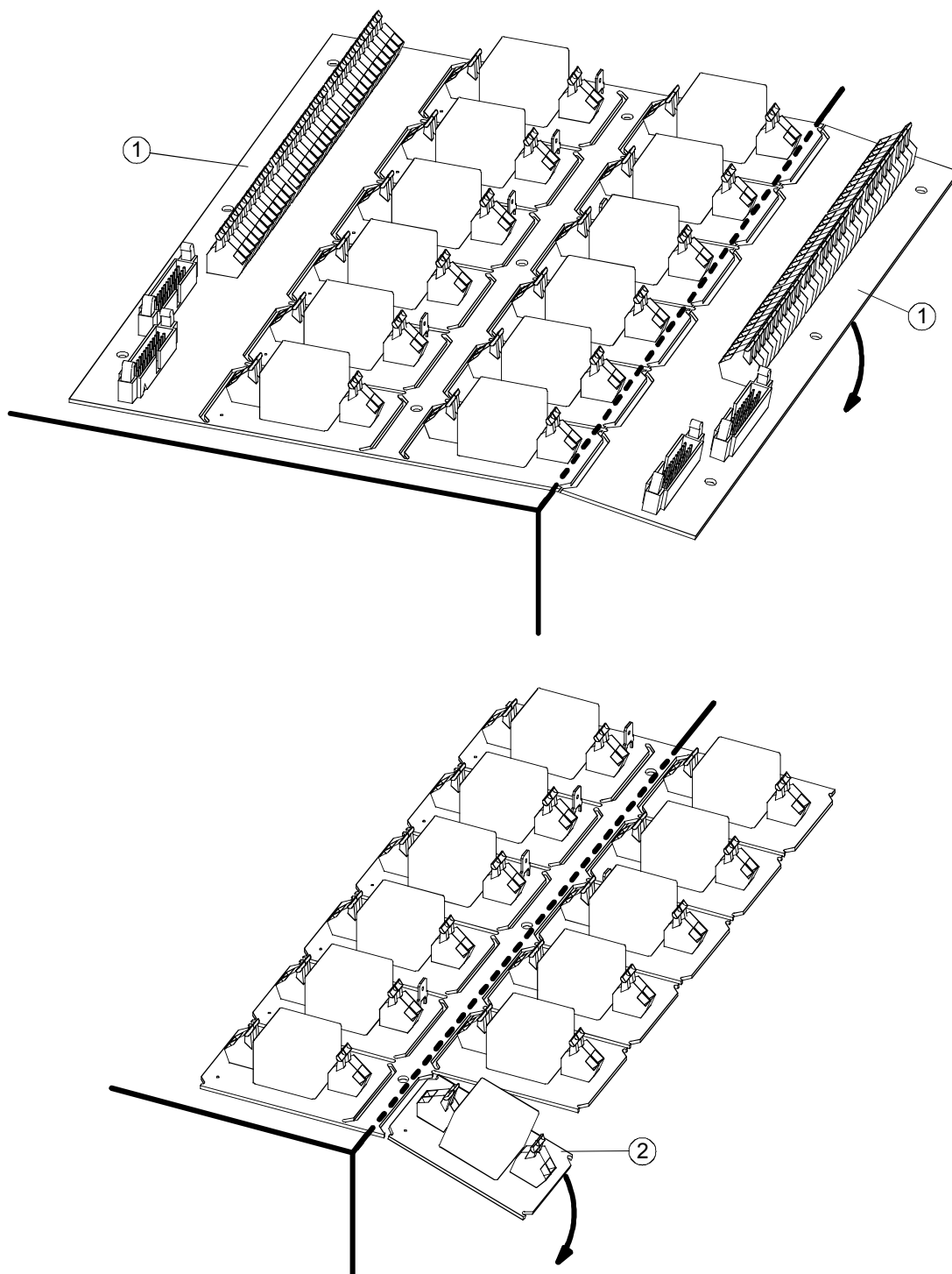
(see also Chapters 6.4 and 6.9)

### 5.2.1 Removal of module C98043-A7043



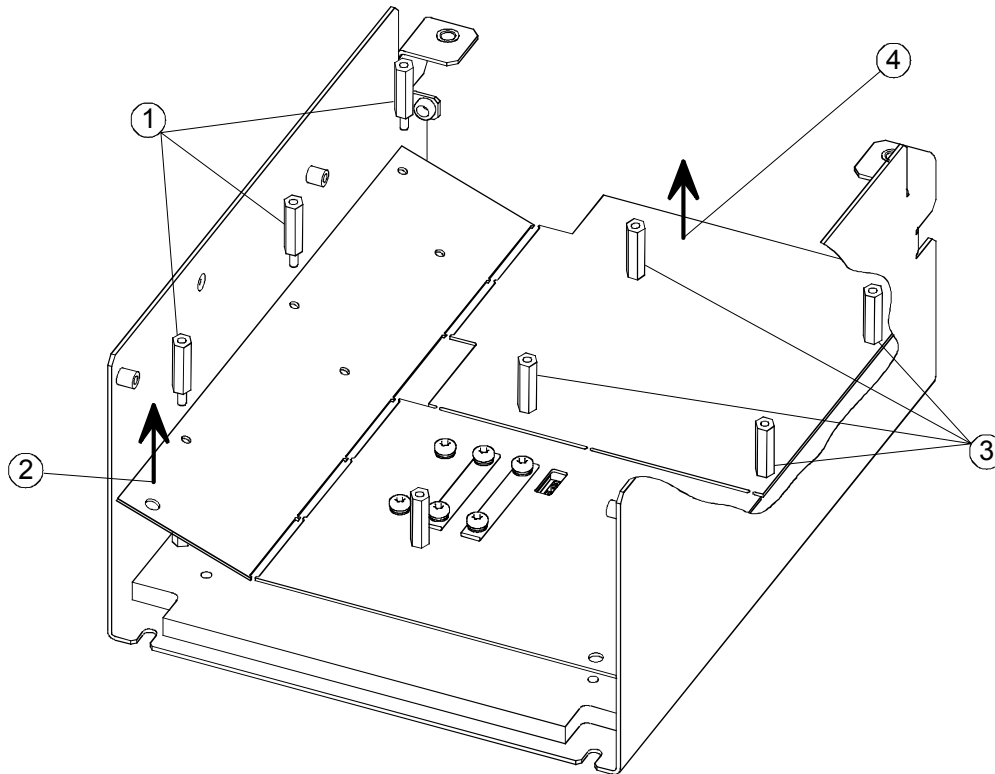
- Remove 4 Torx TX20 screws ① and take off cover ②.
- Remove 5 Torx TX20 screws ③ and 4 hexagon-head studs ④.
- Remove module C98043-A7043 ⑤ and divide (see Chapter 5.2.2).
- Remove the loosely attached insulation plate ⑥.
- Divide module C98043-A7044 ⑦ (see Chapter 5.2.3).
- See Chapter 5.2.4 for how to mount module C98043-A7043.

### 5.2.2 Dividing module C98043-A7043



- Remove cover and module C98043-A7043 (see Chapter 5.2.1).
- Break the two terminal parts ① across the table edge.
- Break control plates ② across the table edge.
- Mount the cover and the two terminal parts ① (see Chapter 5.2.4).

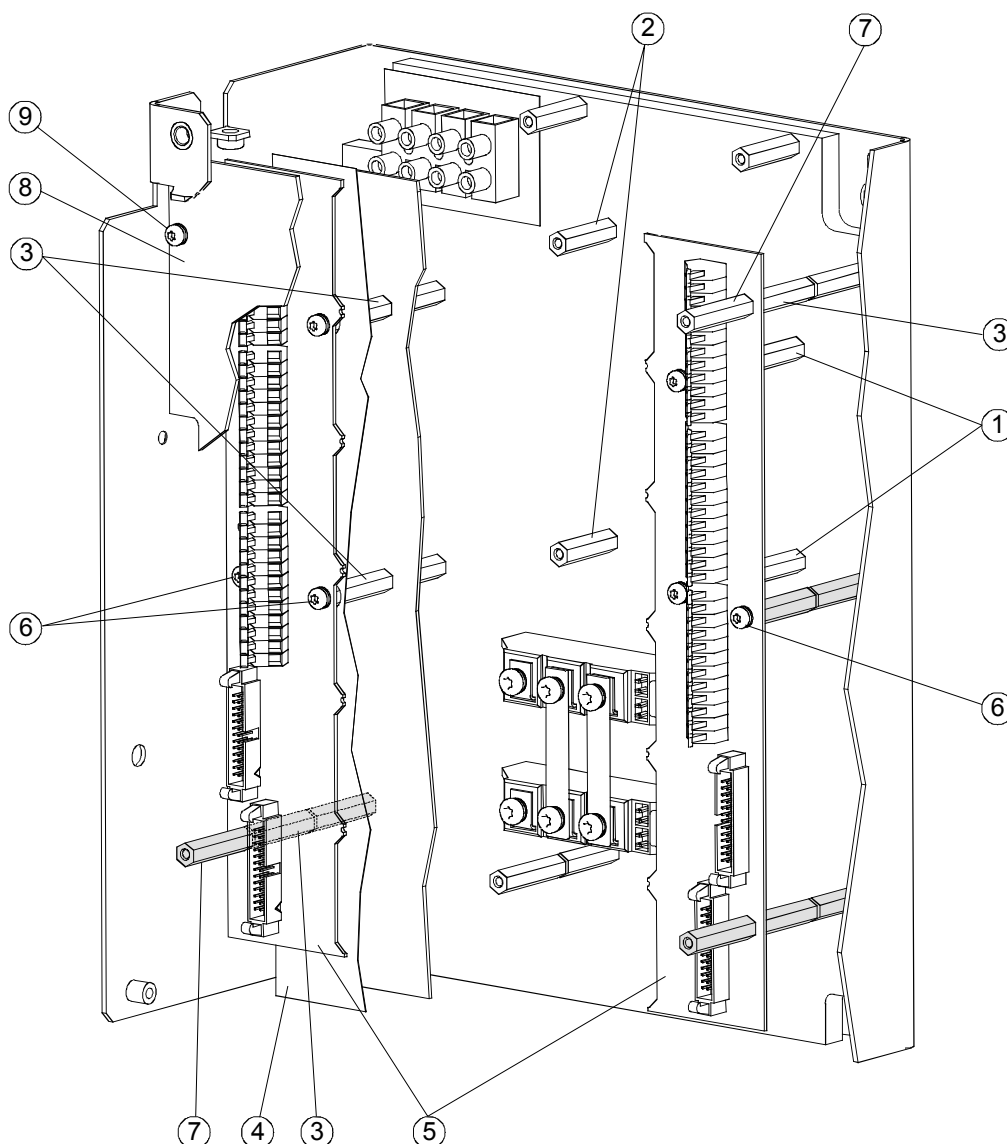
### 5.2.3 Dividing module C98043-A7044



- Remove cover and module C98043-A7043 (see Chapter 5.2.1)
- Remove the 3 hexagon-head studs ①.
- Break module part ② in the direction of the arrow.
- Remove the 4 hexagon-head studs ③.
- Break module part ④ in the direction of the arrow.

### 5.2.4 Mounting module C98043-A7043

The parts required are not part of the scope of supply, they are available as a “set of loose parts” under order No.: 6RY1707-0CM00.



#### WARNING



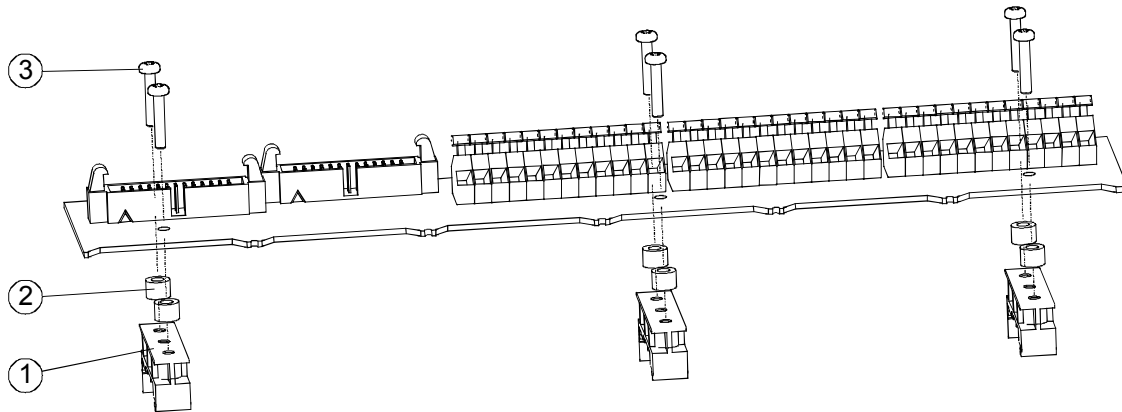
The hexagon-head studs shown in gray must be metal bolts, all other bolts must be non-conductive (danger of short circuit).

- Fit 4 hexagon-head studs (L=30mm) ①.
- The two hexagon-head studs ② are not required and can be removed.
- Screw 9 hexagon-head studs (L=35mm) ③ onto the fitted hexagon-head studs.
- Clip on insulation plate ④.
- Fix the two terminal parts ⑤ of module C98043-A7043 with 6 Torx TX20 screws ⑥ and 4 hexagon-head studs ⑦.
- Connect terminals and ribbon cable and fix cover ⑧ with 4 Torx TX20 screws ⑨.

### 5.2.5 External assembly of module parts

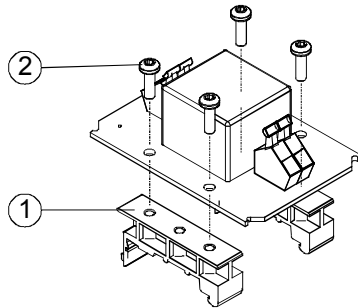
The parts required are not part of the scope of supply, they are available as a "set of loose parts" under order No.: 6RY1707-0CM00.

#### 5.2.5.1 Terminal strip



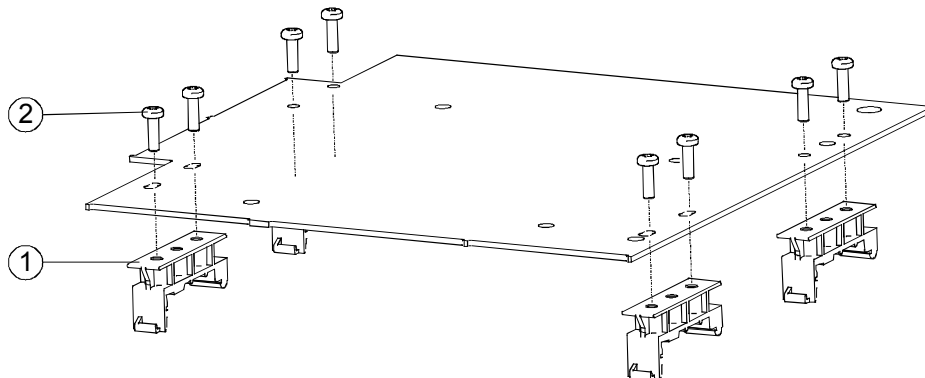
The 3 snap-on parts ① for DIN rail acc. to DIN EN 50022-35x7.5 are mounted using distance rolls ② and M3x16 screws ③ on the terminal strip.

#### 5.2.5.2 Firing transfer plates



The 2 snap-on parts ① for DIN rail acc. to DIN EN 50022-35x7.5 are mounted with M3x8 screws ② on the control plates.

#### 5.2.5.3 Fuse monitoring



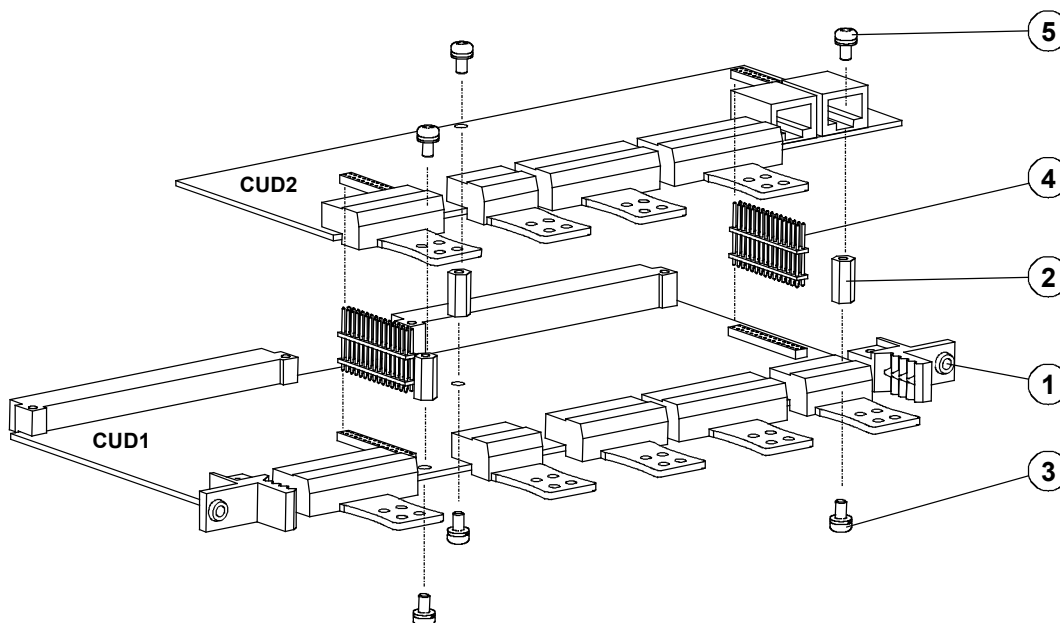
The 4 snap-on parts ① for DIN rail acc. to DIN EN 50022-35x7.5 are mounted on the fuse monitoring with screws M3x8 ②.

#### 5.2.5.4 Voltage acquisition

The voltage acquisition can be mounted externally using mounting housing UM 72 supplied by Phönix. This mounting housing must be ordered directly from Phönix.

## 5.3 Mounting options

### 5.3.1 Terminal expansion module CUD2



- Remove electronics board CUD1 from the electronics box by undoing the two fixing screws ①.
- Attach the 3 hexagon-head bolts supplied at position ② on the CUD1 electronics board with the screws and fixing elements ③ supplied and insert the two plug connectors ④.  
The two plug connectors must be positioned such that the short pin ends are inserted in the socket connectors of the CUD1 and the long pin ends in the socket connectors of the CUD2.
- Position board CUD2 in such a way that the two plug connectors ④ are properly contacted.
- Secure board CUD2 in position using the supplied screws and retaining elements ⑤.
- Insert electronics board CUD1 into electronics box and tighten up the two fixing screws ① again as instructed.

### 5.3.2 Optional supplementary boards



#### WARNING

Safe operation is dependent upon proper installation and start-up by qualified personnel under observance of all warnings contained in these operating instructions.



Boards must always be replaced by properly qualified personnel.

Boards must not be inserted or removed when the power supply is connected.

Failure to observe this warning can result in death, severe physical injury or substantial property damage.



#### CAUTION

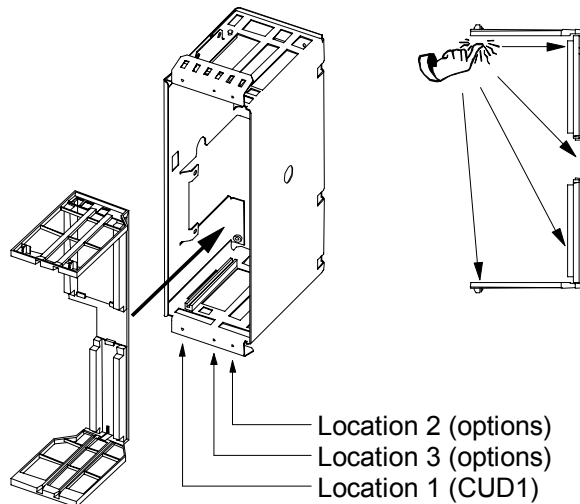
The boards contain ElectroStatic Discharge Sensitive Devices (ESDS). Before touching a board, make sure that your own body has been electrostatically discharged. The easiest way to do this is to touch a conductive, grounded object (e.g. bare metal part of cubicle) immediately beforehand).

#### 5.3.2.1 Local bus adapter (LBA) for mounting optional supplementary boards

Optional supplementary boards can be installed only in conjunction with the LBA option. If an LBA is not already fitted in the SIMOREG converter, one must be installed in the electronics box to accommodate the optional board.

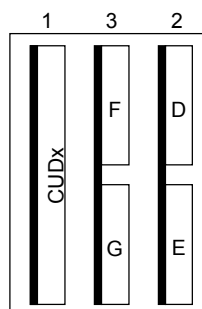
##### How to install an LBA local bus adapter in the electronics box:

- ◆ Undo the two fixing screws on the CUD1 board and pull board out by special handles.
- ◆ Push LBA bus extension into electronics box (see picture on right for position) until it engages.
- ◆ Insert CUD1 board in left-hand board location again and tighten fixing screws in handles.



#### 5.3.2.2 Mounting of optional supplementary boards

Supplementary boards are inserted in the slots of the electronics box. Option **LBA** (local bus adapter) is required to fit supplementary boards. The designations of the board locations or slots are shown in the adjacent diagram.



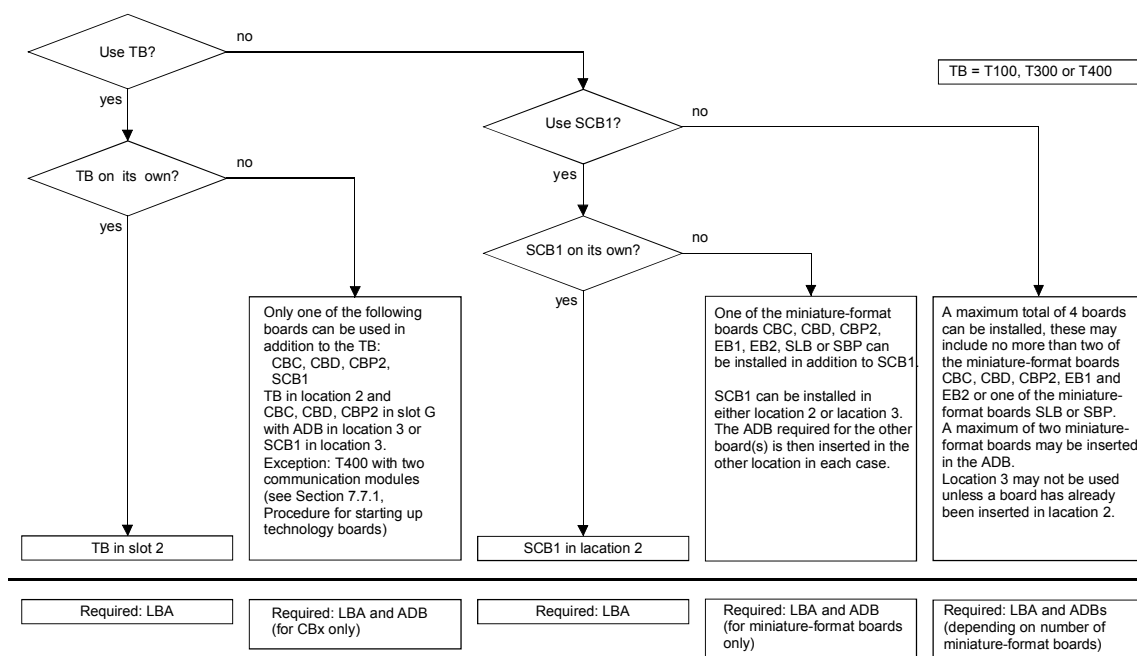
Arrangement of board locations 1 to 3 and slots D to G in electronics box

Supplementary boards may be inserted in any slot subject to the following restrictions:

## NOTICE

- ◆ Slot 3 must not be used until slot 2 is already occupied.
- ◆ A technology board must always be installed in board location 2 of the electronics box.
- ◆ If a technology board is used in conjunction with **one** communication board, then the communication board must be fitted in slot G (miniature-format boards, for example CBP2 and CBC) or slot 3 (large-format board SCB1).  
A type **T400** technology module can also be used with **two** communication boards of type CBC, CBD or CBP2 (see Section 7.7.1, Procedure for starting up technology boards).
- ◆ It is not possible to operate boards EB1, EB2, SLB and SBP in conjunction with a technology board.
- ◆ The data of large-format boards are always output under slot E or slot G, i.e. the software version of a technology board, for example, is displayed in r060.003.
- ◆ In addition to the LBA, miniature-format boards (for example CBP2 and CBC) also require an **ADB** (adapter board, support board). Due to their very compact physical dimensions, these boards must be inserted in an ADB before they can be installed in the electronics box.
- ◆ A total of two supplementary boards of the same type can be used (e.g. 2 EB1s), but only 1 SBP and 1 SLB may be installed.

The diagram below shows which locations or slots can be used for the supplementary boards you wish to install and which board combinations are possible:



For information about starting up supplementary boards, please refer to Section 7.7 "Starting up optional supplementary boards".





## 6 Connections



### WARNING

The manufacturer shall give warranty for the serviceability of the SIMOREG CM device and assume liability for any damage which may arise only on the condition that the device has been installed and commissioned by properly qualified personnel and the instructions and warnings in this Operator's Guide duly followed.

The converters are operated at high voltages.

Disconnect the power supply before making any connections!

Only qualified personnel who are thoroughly familiar with all safety notices contained in the operating instructions as well as erection, installation, operating and maintenance instructions must be allowed to work on these devices.

Non-observance of the safety instructions can result in death, severe personal injury or substantial damage to property .



The converter might sustain serious or irreparable damage if connected incorrectly.

Voltage may be present at the power and control terminals even when the motor is stopped.

A hazardous voltage might still be present in the snubber capacitors even after isolation. For this reason, wait for an appropriate time before opening the converter.

When working on the open converter, remember that live parts are exposed. The unit must always be operated with the standard front covers in place.

The user is responsible for ensuring that the motor, SIMOREG converter and other devices are installed and connected up in accordance with the approved codes of practice of the country concerned and any other regional or local codes that may apply. Special attention must be paid to proper conductor sizing, fusing, grounding, isolation, and disconnection measures and to overcurrent protection.

These converters contain hazardous rotating machinery (fans) and control rotating mechanical components (drives). Death, serious bodily injury or substantial damage to property may occur if the instructions in the relevant operating manuals are not observed.

Successful and safe operation of this equipment is dependent on careful transportation, proper storage and installation as well as correct operation and maintenance.

## 6.1 Installation instructions for proper EMC installation of drives

### NOTE

These installation instructions do not purport to handle or take into account all of the equipment details or versions or to cover every conceivable operating situation or application.

If you require more detailed information, or if special problems occur, which are not handled in enough detail in this document, please contact your local Siemens office.

The contents of these installation instructions are not part of an earlier or existing agreement or legal contract and neither do they change it. The actual purchase contract represents the complete liability of the ASI 1 Variable-Speed Drives Group of Siemens AG. The warranty agreed in the contract between the parties is the sole warranty to which the Automation and Drives Division A&D is bound. The warranty conditions specified in the contract are neither expanded nor changed by the information provided in the installation instructions.

### 6.1.1 Fundamental principles of EMC

#### 6.1.1.1 What is EMC

EMC stands for "electromagnetic compatibility" and defines the capability of an item of equipment to operate satisfactorily in an electromagnetic environment without itself causing electromagnetic disturbances that would adversely affect other items of equipment in its vicinity.

Different items of equipment must therefore not adversely affect one another.

#### 6.1.1.2 Noise radiation and noise immunity

EMC is dependent on two characteristics of the equipment/units involved, i.e. radiated noise and noise immunity. Items of electrical equipment can either be fault sources (transmitters) and/or noise receivers.

Electromagnetic compatibility exists if the fault sources do not adversely affect the function of the noise receivers.

An item of equipment can be both a fault source and a fault receiver. For example, the power section of a converter must be regarded as a fault source and the control section as a noise receiver.

#### 6.1.1.3 Limit values

Electrical drives are governed by Product Standard EN 61800-3. According to this standard, it is not necessary to implement all EMC measures for industrial supply networks. Instead, a solution adapted specifically to the relevant environment can be applied. It might therefore be more economical to increase the interference immunity of a sensitive device rather than implementing noise suppression measures for the converter. In this way, solutions selected will depend on their cost-effectiveness.

SIMOREG converters are designed for industrial applications (industrial low-voltage supply system, i.e. a system that does not supply domestic households).

Noise immunity defines the behavior of a piece of equipment when subjected to electromagnetic disturbance. The Product Standard regulates the requirements and assessment criteria for the behavior of equipment in industrial environments. The converters in this description comply with this Standard (Section 6.1.2.3).

#### 6.1.1.4 SIMOREG CM in industrial applications

In an industrial environment, equipment must have a high level of noise immunity whereas lower demands are placed on noise radiation.

SIMOREG CM converters are components of an electrical drive system in the same way as contactors, switches, and the power section. Properly qualified personnel must integrate them into a drive system consisting, at least, of the converter, power section, motor cables, and motor. Commutating reactors and fuses are also required in most cases. Limit values can only be maintained if these components are installed and mounted in the correct way. In order to limit the radiated noise according to limit value "A1", the appropriate radio interference suppression filter and a commutating reactor are required in addition to the converter itself. Without an RI suppression filter, the noise radiated by a SIMOREG CM converter exceeds limit value "A1" as defined by EN55011.

If the drive forms part of a complete installation, it does not initially have to fulfill any requirements regarding radiated noise. However, EMC legislation requires the installation as a whole to be electromagnetically compatible with its environment.

If all control components in the installation (e.g. PLCs) have noise immunity for industrial environments, it is not necessary for each drive to meet limit value "A1" in its own right.

#### 6.1.1.5 Non-grounded supply systems

Non-grounded supply systems (IT systems) are used in a number of industrial sectors to increase plant availability. In the event of a ground fault, no fault current flows so that the plant can continue to produce. However, with radio interference suppression filters, in the event of a ground fault a fault current will flow that can cause irreparable damage to the radio interference suppression filter. The product standard therefore does not define limit values for such networks. From the economic viewpoint, RI suppression should, if required, be implemented on the grounded primary side of the supply transformer.

Radio interference suppression filters for IT networks up to 690V have recently become available (Epcos B84143-Bxxx-S24).

#### 6.1.1.6 EMC planning

If two units are not electromagnetically compatible, you can either reduce the noise radiated by the noise source, or increase the noise immunity of the noise receiver. Noise sources are generally power electronics units with a high power consumption. To reduce the radiated noise from these units, complex and costly filters are required. Noise receivers are predominantly control equipment and sensors including evaluation circuitry. Increasing the noise immunity of less powerful equipment is generally easier and cheaper. In an industrial environment, therefore, it is often more cost-effective to increase noise immunity rather than reduce radiated noise. For example, in order to adhere to limit value class A1 of EN 55011, the noise suppression voltage at the mains connection may be max. 79 dB( $\mu$ V) between 150 kHz and 500 kHz and max. 73 dB ( $\mu$ V) (9 mV or 4.5 mV) between 500 kHz and 30 MHz.

In industrial environments, the EMC of the equipment used must be based on a well balanced mixture of noise radiation and noise immunity.

The most cost-effective RI suppression measure is the physical separation of noise sources and noise receivers, assuming that it has already been taken into account when designing the machine/plant. The first step is to define whether each unit is a potential noise source (noise radiator or noise receiver). Noise sources are, for example, converter units, contactors. Interference sinks include, for example, programmable controllers, encoders, and sensors.

The components in the switching cabinet (sources of interference, interference sinks) must be kept separate, if necessary using partition plates or by placing them in a metal housing. Proper EMC installation of drives (installation instructions)

## 6.1.2 Proper EMC installation of drives (installation instructions)

### 6.1.2.1 General information

Since drives can be operated in a wide range of differing environments and the electrical components used (controls, switched-mode power supplies, etc.) can widely differ with respect to noise immunity and radiation, any mounting/installation guideline can only represent a practical compromise. For that reason, EMC regulations do not need to be implemented to the letter, provided that measures are checked out on a case by case basis.

In order to guarantee electromagnetic compatibility in your cabinets in rugged electrical environments and fulfill the standards specified by the relevant regulatory bodies, the following EMC regulations must be observed when designing and installing cabinets.

Rules 1 to 10 generally apply. Rules 11 to 15 must be followed to fulfill standards governing radiated noise.

### 6.1.2.2 Rules for proper EMC installation

#### Rule 1

All the metal components in the cabinet must be conductively connected with one another over a large contact area. (Not paint to paint!)

Serrated or contact washers must be used where necessary. The cabinet door should be connected to the cabinet through the shortest possible grounding straps (top, center, bottom).

#### Rule 2

Contactors, relays, solenoid valves, electromechanical hours counters, etc. in the cabinet, and, if applicable, in adjacent cabinets, must be provided with quenching elements, for example, RC elements, varistors, diodes. These devices must be connected directly at the coil.

(RC elements are better than varistors)

#### Rule 3

Signal cables <sup>1)</sup> should enter the cabinet at only one level wherever possible.

#### Rule 4

Unshielded cables in the same circuit (incoming and outgoing conductors) must be twisted where possible, or the area between them kept as small as possible in order to prevent unnecessary coupling effects.

#### Rule 5

Connect spare strands at both ends with cabinet frame (ground <sup>2)</sup>). This provides an additional shielding effect.

#### Rule 6

Avoid unnecessary cable lengths. This keeps coupling capacitances and inductances to a minimum.

#### Rule 7

Crosstalk is kept low if cables are routed close to the cabinet ground. For this reason, wiring should not be routed freely in the cabinet, but as close as possible to the cabinet frame and mounting panels. This applies equally to spare cables.

#### Rule 8

Signal and power cables must be routed separately from one another (to prevent noise from being coupled in). Minimum distance: A clearance of 20 cm should be maintained.

If the encoder cables and motor cables cannot be routed separately, then the encoder cable must be decoupled by means of a metal partition or installation in a metal conduit. The partition or metal conduit must be grounded at several points.

**Rule 9**

The shields of digital signal cables must be connected to ground at both ends (source and destination). If there is poor equipotential bonding between the shield connections, an additional equipotential bonding cable of at least 10 mm<sup>2</sup> must be connected in parallel to the shield to reduce the shield current. Generally speaking, the shields can be connected to the cabinet housing (ground<sup>2)</sup>) at several points. The shields may also be connected at several locations outside the cabinet. Foil-type shields should be avoided. Their shielding effect is five times poorer than that of braided shields.

**Rule 10**

The shields of analog signal cables may be connected to ground at both ends (conductively over a large area) if equipotential bonding is good. Equipotential bonding can be assumed to be good if all metal parts are well connected and all the electronic components involved are supplied from the same source.

The single-ended shield connection prevents low-frequency, capacitive noise from being coupled in (e.g. 50 Hz hum). The shield connection should then be made in the cabinet. In that case, the shield can be connected by means of a sheath wire.

The cable to the temperature sensor on the motor (X174:22 and X174:23) must be shielded and connected to ground at both ends.

**Rule 11**

The RI suppression filter must always be mounted close to the suspected noise source. The filter must be connected to the cabinet housing, mounting plates, etc., over a large area. Input and output cables must be kept separate.

**Rule 12**

To ensure adherence to limit value class A1, the use of RI suppression filters is obligatory. Additional loads must be connected on the line side of the filter.

The control system used and the other wiring in the cubicle determines whether an additional line filter needs to be installed.

**Rule 13**

A commutating reactor must be installed in the field circuit for controlled field supplies.

**Rule 14**

A commutating reactor must be installed in the converter armature circuit.

**Rule 15**

Unshielded motor cables may be used in SIMOREG drive systems.

In such cases, the line supply cable must be routed at a distance of at least 20 cm from the motor cables (field, armature). Use a metal partition if necessary.

**Footnotes:**

1) Signal cables are defined as:

Digital signal cable:

Binary inputs and outputs

Pulse encoder cables

Serial interfaces, e.g. PROFIBUS-DP

Analog signal cable.:

e.g.  $\pm 10$  V setpoint cable

2) The term "ground" generally refers to all metallic, conductive components which can be connected to a protective conductor, e.g. cabinet housing, motor housing, foundation ground, etc.

## Cabinet design and shielding:

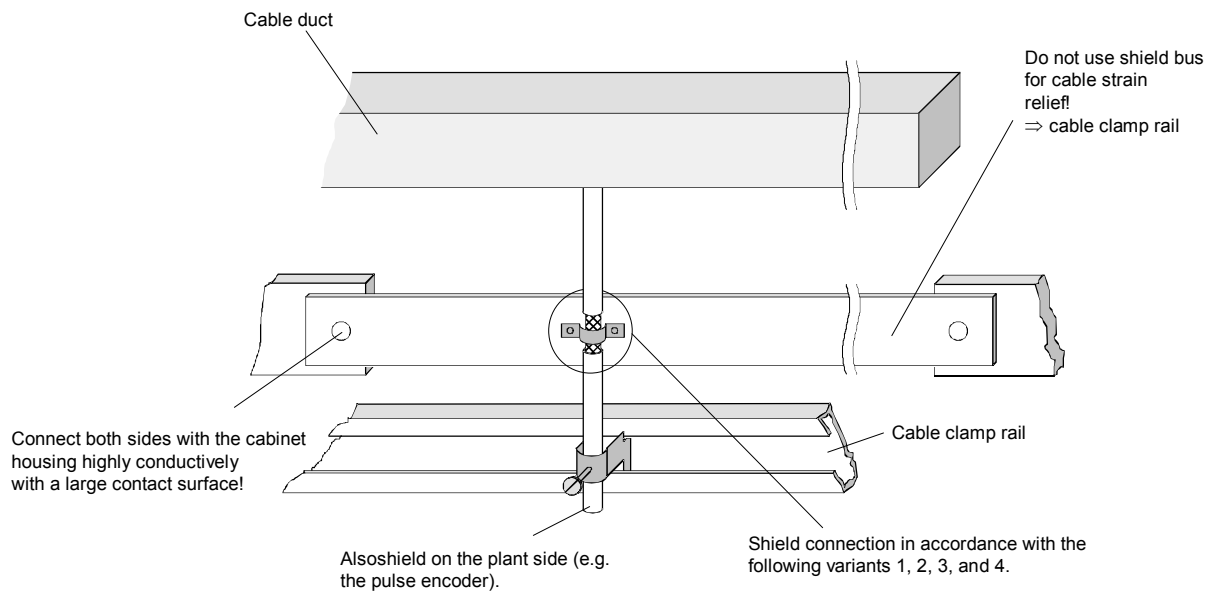


Fig. 1a: Shield at cable entry point to cabinet

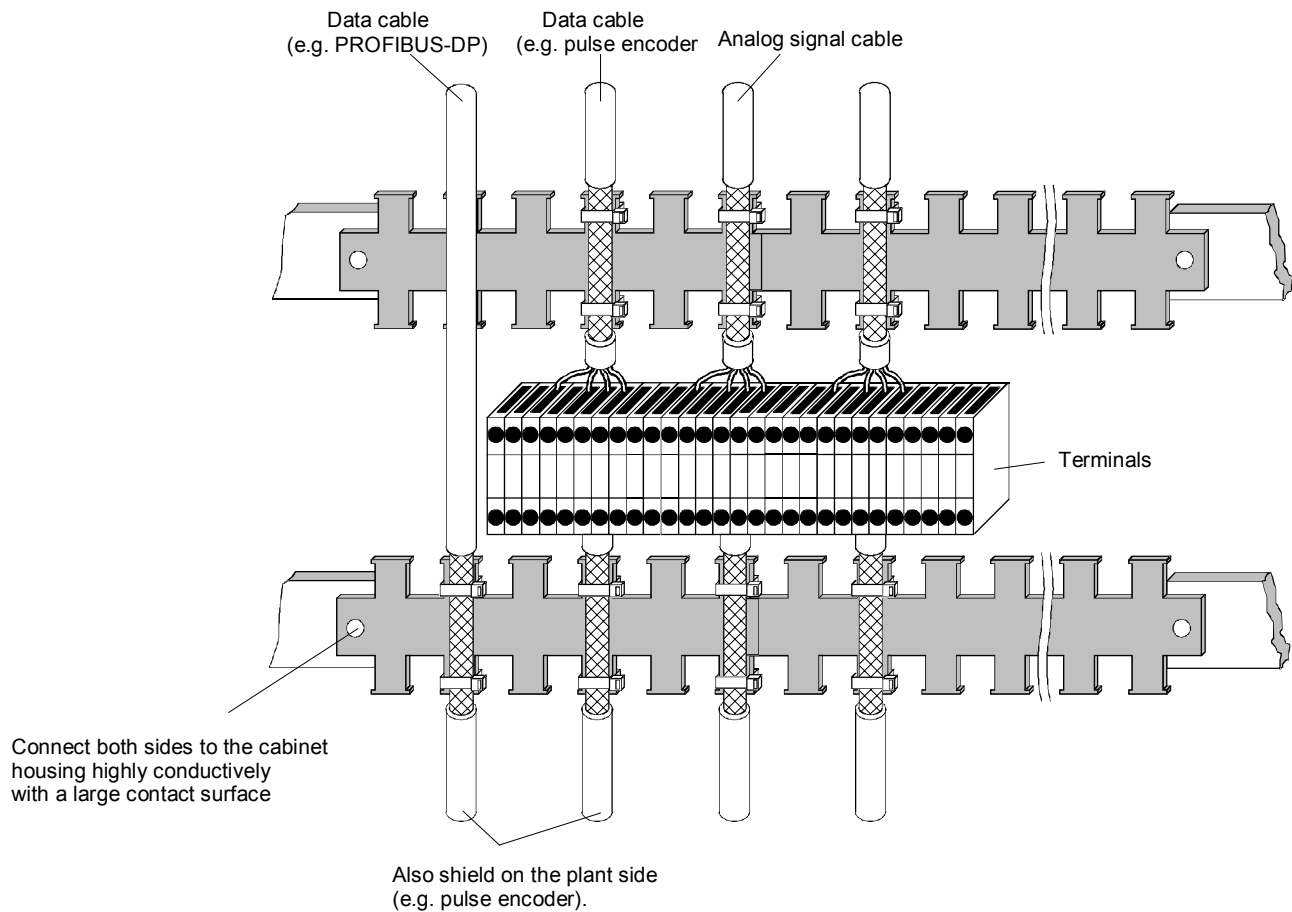
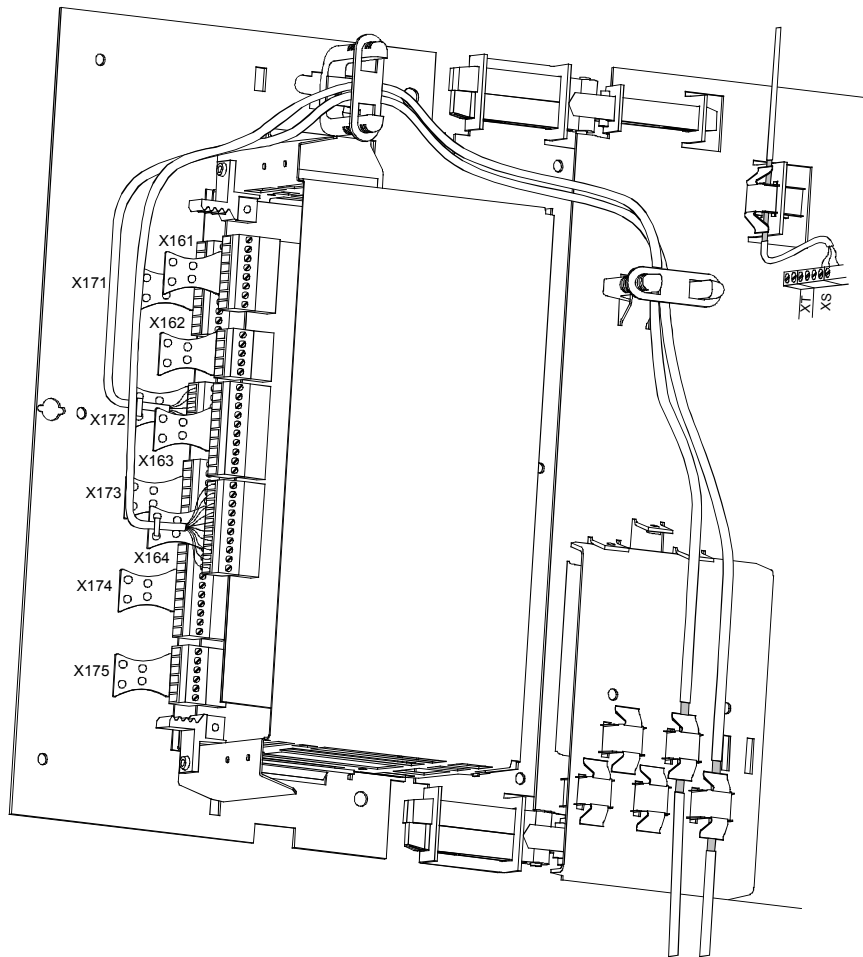


Fig. 1b: Shielding in the cabinet



The customer connections must be routed above the electronics box.

Fig. 1c: Shield contacting on SIMOREG CM

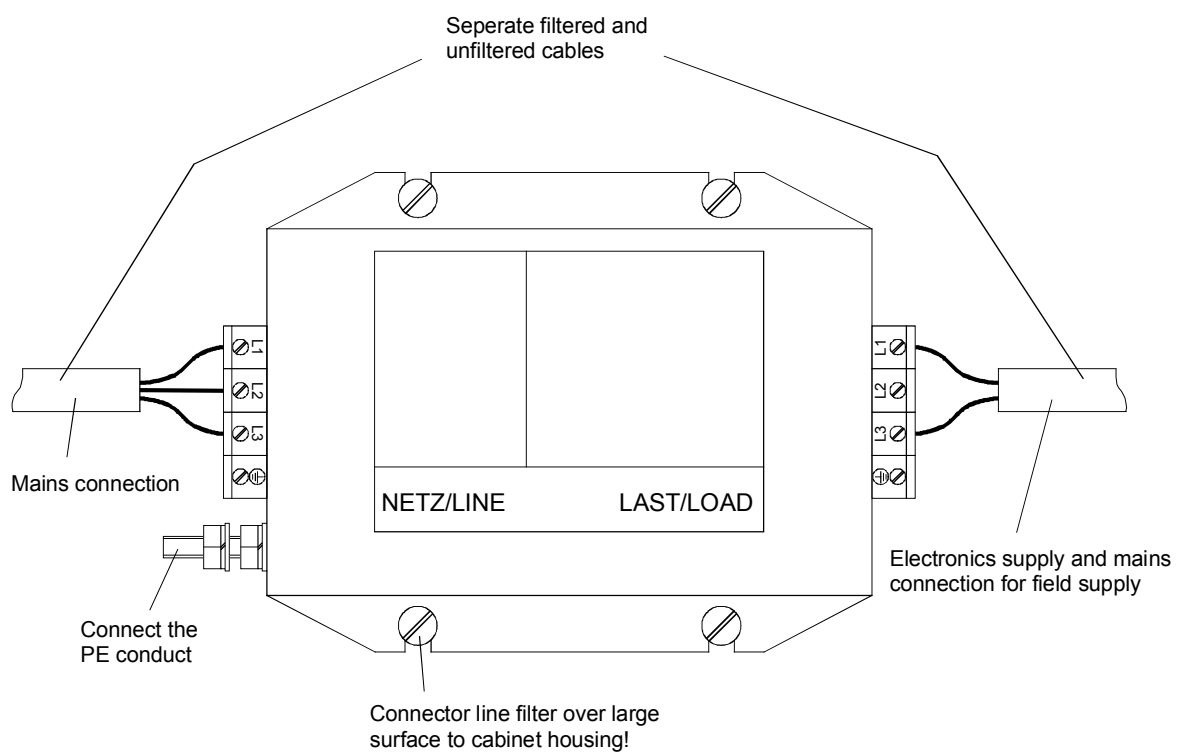


Fig. 1d: Line filter for SIMOREG CM electronics power supply



**Shield connections:**

Variant 1:

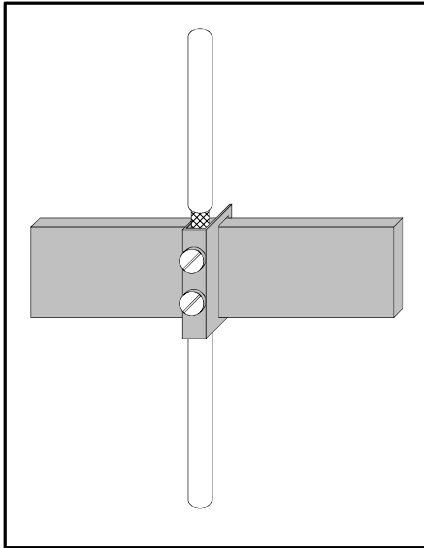


Fig. 2a: Terminal on a copper busbar, max. cable diameter 15 mm

Variant 2:

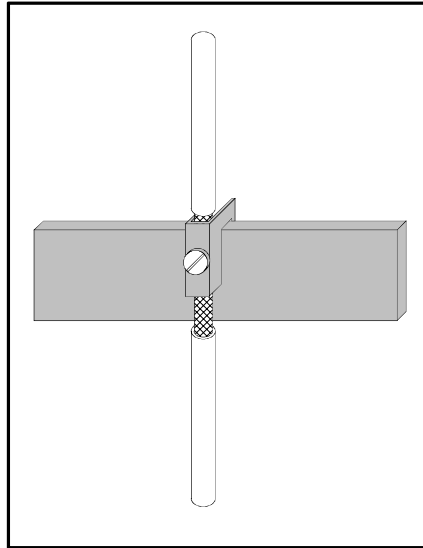


Fig. 2b: Terminal on copper busbar, max. cable diameter 10 mm

**Caution!**

The conductor could be damaged if the terminal screw is over-tightened.

**Note:**

Terminals:  
5 mm busbar thickness  
Order No. 8US1921-2AC00  
10 mm busbar thickness  
Order No. 8US1921-2BC00

**Note:**

Terminals:  
Order No. 8HS7104,  
8HS7104, 8HS7174, 8HS7164

Variant 3:

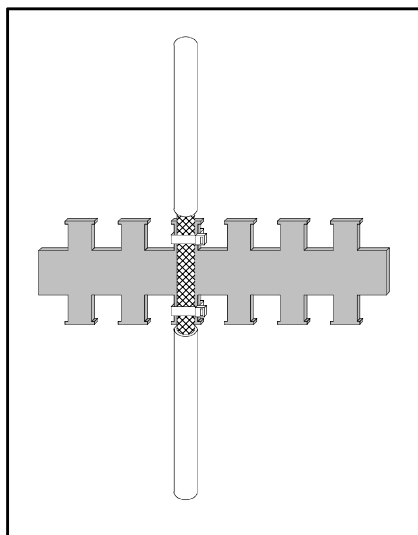


Fig. 2c: Metallized tubing or cable ties on a bare metal comb-type/serrated rail

**Note:**

Comb-type rail:  
Item No. J48028

Variant 4:

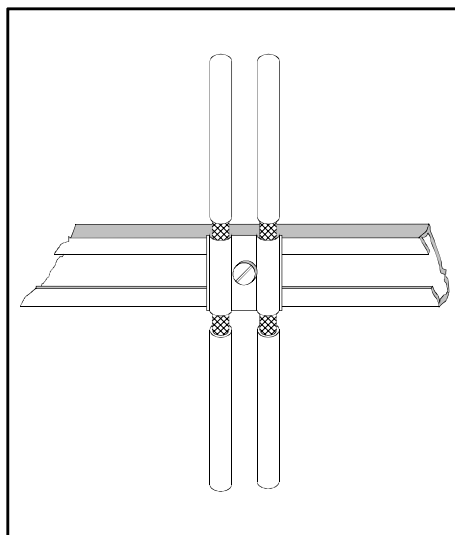


Fig. 2d: Clamp and metallic mating piece on a cable clamping rail

**Note:**

Siemens 5VC55... cable clamps;  
Clamping rails in various sizes:  
Item No. K48001 to 48005

### 6.1.2.3 Arrangement of components for converters

#### Arrangement of reactors and radio interference suppression filters

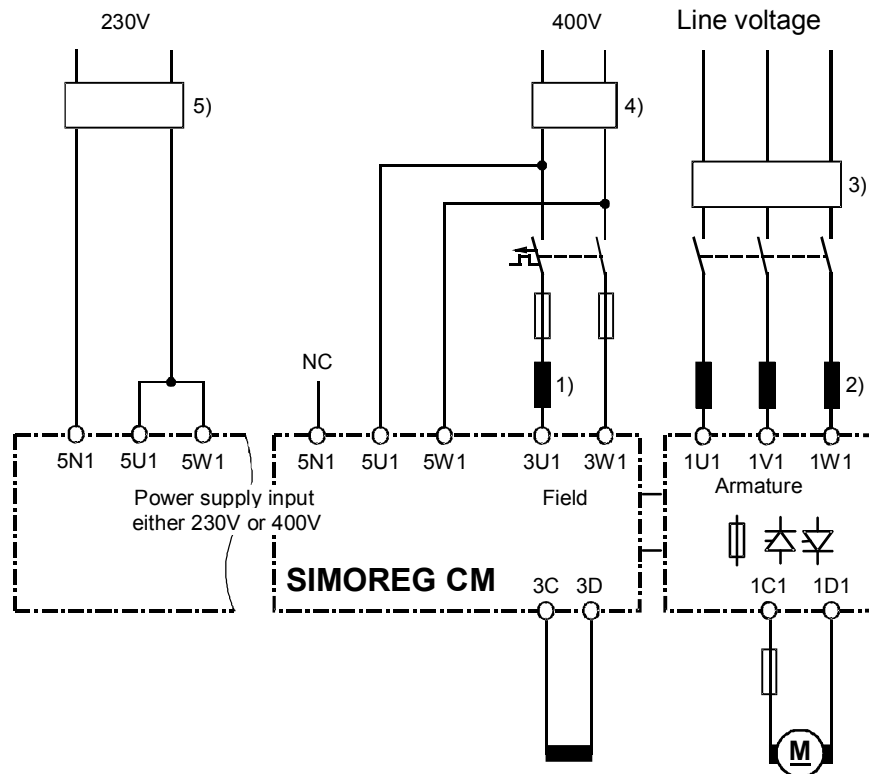


Fig. 6.1.2.3.1

- 1) The commutating reactor in the field circuit is dimensioned for the rated motor field current.
- 2) The commutating reactor in the armature circuit is dimensioned for the rated motor current in the armature. The line current equals DC current x 0.82.
- 3) The radio interference suppression filter for the armature circuit is dimensioned for the rated motor current in the armature. The line current equals DC current x 0.82.
- 4) The radio interference suppression filter for the field circuit and the electronics power supply (if 380 to 460 V) is designed for the rated current of the motor of plus 1 A (see description terminal XP).
- 5) The radio interference suppression filter for the electronics power supply (if 190 to 230 V) is designed for 2 A (see description for terminal XP).

## CAUTION

When radio interference suppression filters are used, commutating reactors are always required at the converter input to decouple the snubber circuitry.  
Commutating reactors are selected according to the information in Catalog DA93.1.

### 6.1.3 Information on line-side harmonics generated by converters in a fully-controlled three-phase bridge circuit configuration B6C and (B6)A(B6)C

Converters for the medium power range usually consist of fully-controlled three-phase bridge circuit configurations. An example of the harmonics generated by a typical system configuration for two firing angles ( $\alpha = 20^\circ$  and  $\alpha = 60^\circ$ ) is given below.

The values have been taken from an earlier publication entitled "Harmonics in the Line-Side Current of Six-Pulse Line-Commutated Converters" written by H. Arremann and G. Möltgen, Siemens Research and Development Dept., Volume 7 (1978) No. 2, © Springer-Verlag 1978.

Formulas have been specified with which the short circuit power  $S_K$  and armature inductance  $L_a$  of the motor to which the specified harmonics spectrum applies can be calculated depending on the applicable operating data [line voltage (no-load voltage  $U_{V0}$ ), line frequency  $f_N$ , and DC current  $I_d$ ]. A dedicated calculation must be performed if the actual system short circuit power and/or actual armature reactance deviate from the values determined by this method.

The spectrum of harmonics listed below is obtained if the values for short circuit power  $S_K$  at the converter supply connection point and the armature inductance  $L_a$  of the motor calculated by the following formulas correspond to the actual plant data. If the calculated values differ, the harmonics must be calculated separately.

a.)  $\alpha = 20^\circ$

b.)  $\alpha = 60^\circ$

Fundamental factor  $g = 0.962$

Fundamental factor  $g = 0.953$

| $v$ | $I_v/I_1$ | $v$ | $I_v/I_1$ |
|-----|-----------|-----|-----------|
| 5   | 0.235     | 29  | 0.018     |
| 7   | 0.100     | 31  | 0.016     |
| 11  | 0.083     | 35  | 0.011     |
| 13  | 0.056     | 37  | 0.010     |
| 17  | 0.046     | 41  | 0.006     |
| 19  | 0.035     | 43  | 0.006     |
| 23  | 0.028     | 47  | 0.003     |
| 25  | 0.024     | 49  | 0.003     |

| $v$ | $I_v/I_1$ | $v$ | $I_v/I_1$ |
|-----|-----------|-----|-----------|
| 5   | 0.283     | 29  | 0.026     |
| 7   | 0.050     | 31  | 0.019     |
| 11  | 0.089     | 35  | 0.020     |
| 13  | 0.038     | 37  | 0.016     |
| 17  | 0.050     | 41  | 0.016     |
| 19  | 0.029     | 43  | 0.013     |
| 23  | 0.034     | 47  | 0.013     |
| 25  | 0.023     | 49  | 0.011     |

The fundamental-frequency current  $I_1$  as a reference quantity is calculated with the following equation:

$$I_1 = g \times 0.817 \times I_d$$

where  $I_d$  DC current of operating point under investigation

where  $g$  Fundamental factor (see above)

The harmonic currents calculated from the above tables are valid **only** for

#### I.) Short-circuit power $S_K$ at converter supply connection point

$$S_K = \frac{U_{v0}^2}{X_N} \quad (\text{VA})$$

where

$$X_N = X_K - X_D = 0.3536 \times \frac{U_{v0}}{I_d} - 2\pi f_N \times L_D \quad (\Omega)$$

and

$U_{v0}$  No-load voltage in V at the converter supply connection point

$I_d$  DC current in A of operating point under investigation

$f_N$  Line frequency in Hz

$L_D$  Inductance in H of commutating reactor used

$X_D$  Impedance of the commutating reactor

$X_N$  Impedance of the network

$X_K$  Impedance at the device terminals

## II.) Armature inductance $L_a$

$$L_a = 0.0488 \times \frac{U_{v0}}{f_N \times I_d} \text{ (H)}$$

A separate calculation must be performed if the actual values for short-circuit power  $S_K$  and/or armature inductance  $L_a$  deviate from the values calculated on the basis of the above equations.

### Example

Let us assume that a drive has the following data:

$$U_{v0} = 400 \text{ V}$$

$$I_d = 150 \text{ A}$$

$$f_N = 50 \text{ Hz}$$

$$L_D = 0.169 \text{ mH (4EU2421-7AA10 where } I_{L_N} = 125 \text{ A)}$$

When

$$X_N = 0.3536 \times \frac{400}{150} - 2\pi \times 50 \times 0.169 \times 10^{-3} = 0.0412 \Omega$$

the required system short-circuit power at the converter supply connection point is as follows:

$$S_K = \frac{400^2}{0.0412} = 3.88 \text{ MVA}$$

and the required motor armature inductance as follows:

$$L_a = 0.0488 \times \frac{400}{50 \times 150} = 2.60 \text{ mH}$$

The harmonic currents  $I_v$  listed in the tables above (where  $I_1 = g \times 0.817 \times I_d$  for firing angles  $\alpha = 20^\circ$  and  $\alpha = 60^\circ$ ) apply only to the values  $S_K$  and  $L_a$  calculated by the above method. If the calculated and actual values are not the same, the harmonics must be calculated separately.

For the purpose of dimensioning filters and compensation circuits with reactors, the harmonic values calculated by these equations can be applied only if the values calculated for  $S_K$  and  $L_a$  tally with the actual values of the system. If they do not, they must be calculated separately (this is especially true when using compensated motors as these have a very low armature inductance).

## 6.2 Block diagram with recommended connection

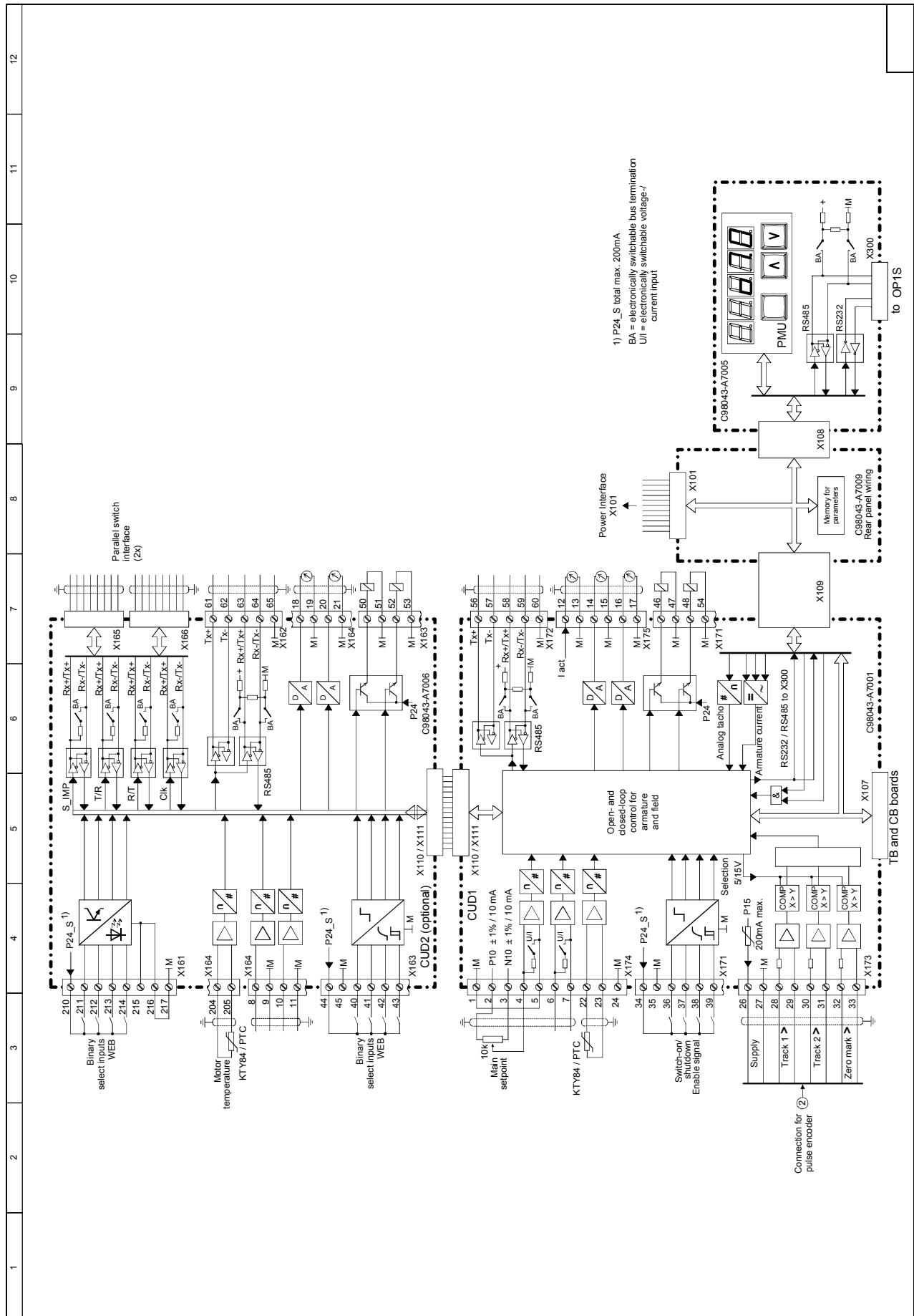


Fig. 6.2.1 a

6-14

## 6.3 Connection of the external power section

All the necessary connections to the power section are shown in the following figs. 6.3.1 to 6.3.4.

Fig. 6.3.1

- Four-quadrant drive (parameterized as a four-quadrant drive – U825=4 when supplied from the factory)
- Measurement of the line voltage and armature voltage via the Faston connections on the firing pulse transfer module (when supplied from the factory)

Fig. 6.3.2

- Four-quadrant drive (parameterized as a four-quadrant drive – U825=4 when supplied from the factory)
- Measurement of the system voltage and armature voltage directly from the power section via cables that must be additionally laid

Fig. 6.3.3:

- Single-quadrant drive (parameterization via parameter U825 = 1)
- Measurement of the system voltage and armature voltage via the Faston connections on the firing pulse transfer module (state as delivered) In order to measure the armature voltage it is necessary to make a connection to 1D1 on the power section.

Fig. 6.3.4:

- Single-quadrant drive (parameterization via parameter U825 = 1)
- Measurement of the system voltage and armature voltage directly from the power section via cables that must be additionally laid

See Chapter 6.4 for possible ways of positioning the two troughs and dismantling the device.



### WARNING

The following electrical cables between the power section (system voltage) and the electronics must be protected against short-circuits:  
Secondary sides of the firing transmission, voltage measurement, fuse monitoring.



All these cables (that lead to the supply voltage) must be laid in a such a way as to preclude short circuits or with short-circuit protection.  
The effective currents in the specified cables are smaller than 0.5 A.

Method 1: Short-circuit protected cables that burn internally but whose insulation does not split.

Method 2: Protect the cables as close as possible to the power section with fuses.  
The fuses must have the necessary cutout capability.



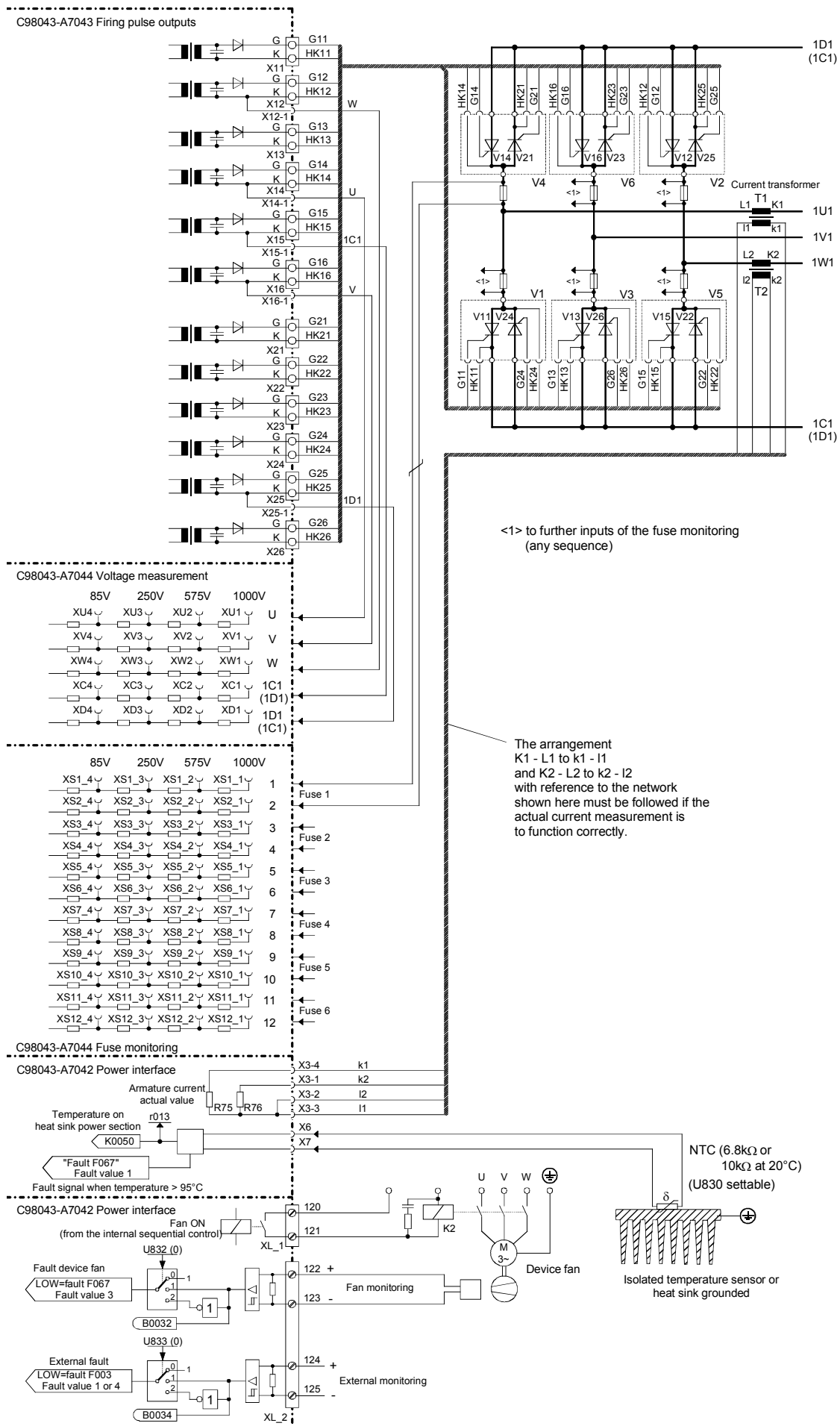


Fig. 6.3.1

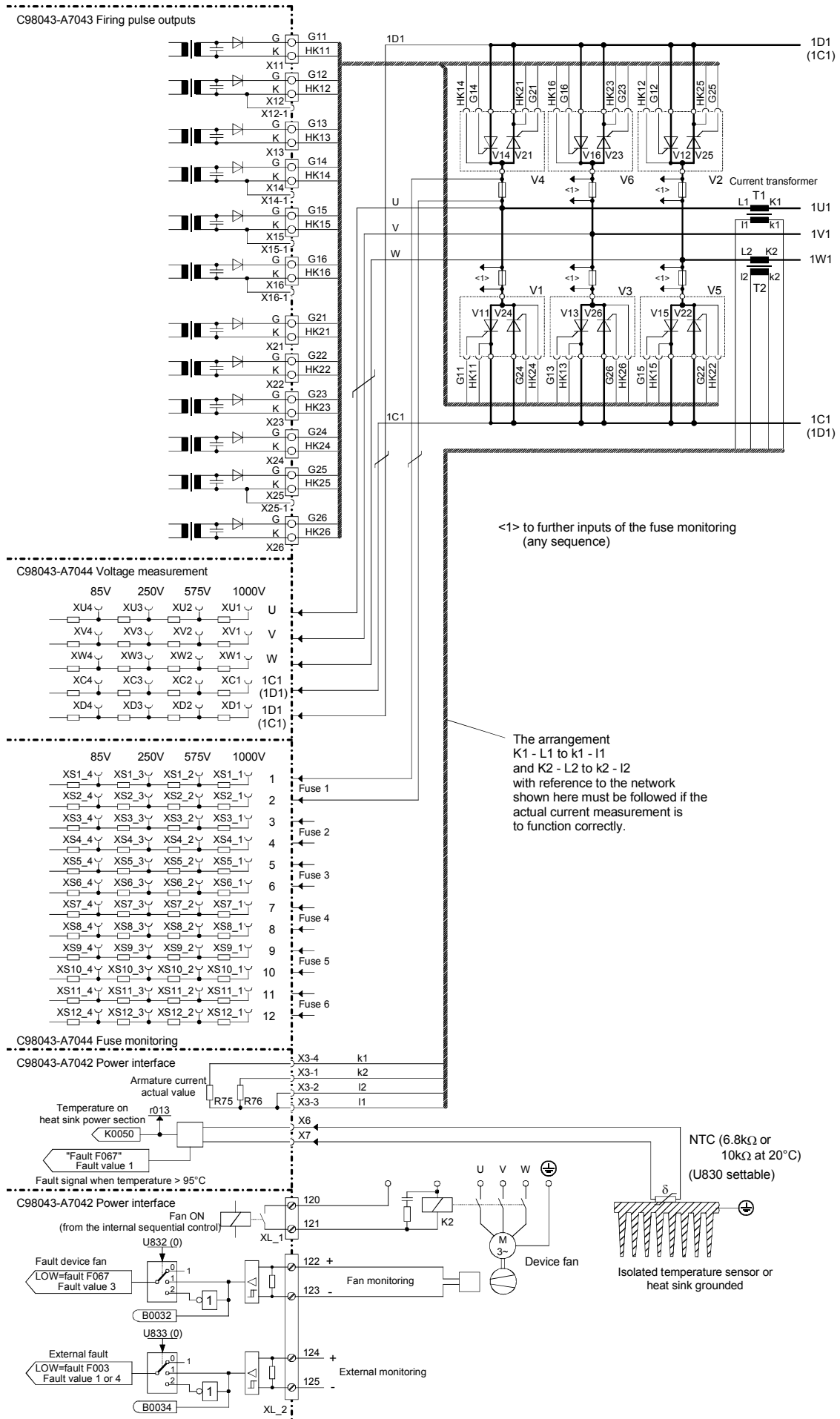


Fig. 6.3.2

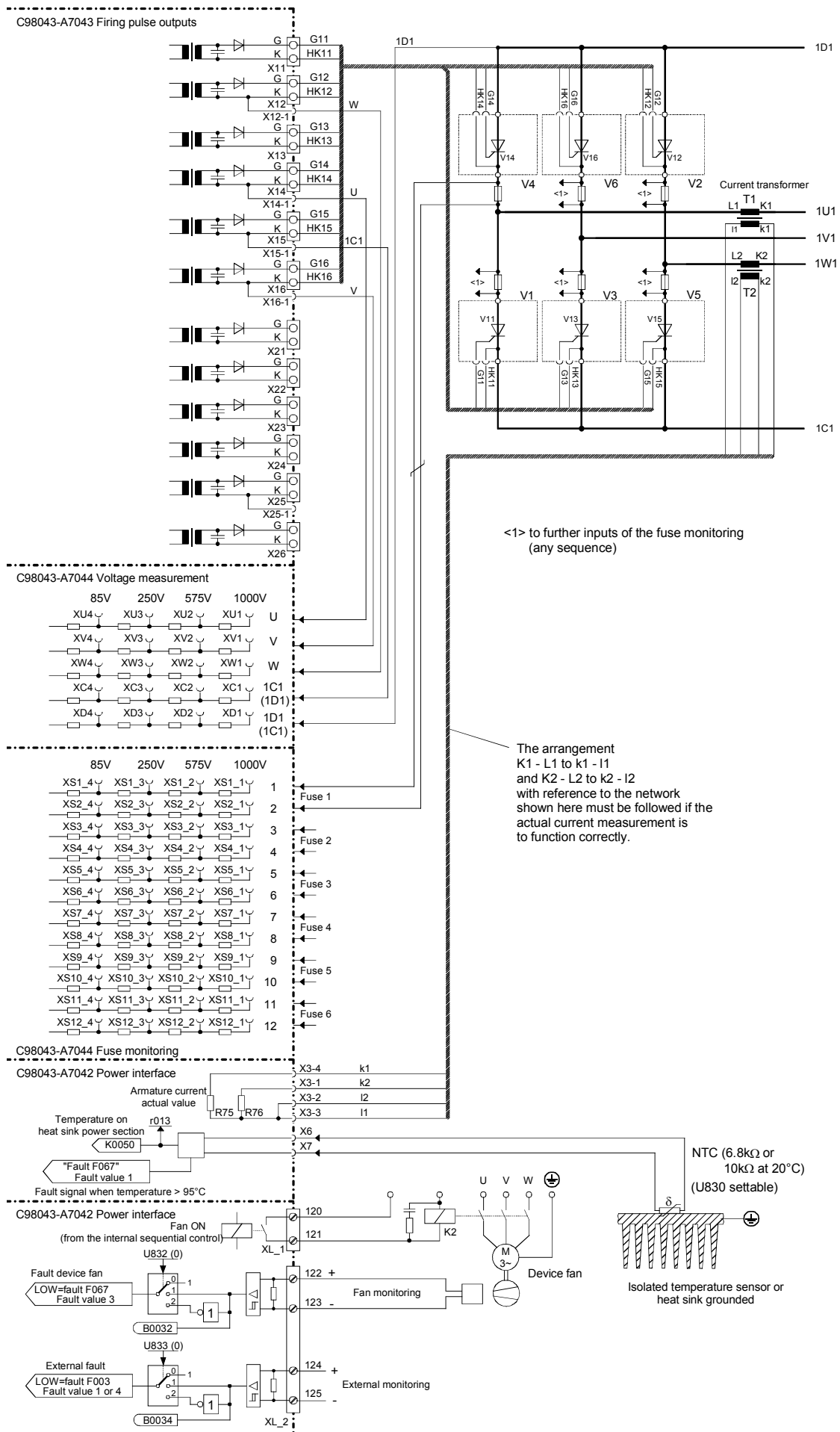


Fig. 6.3.3

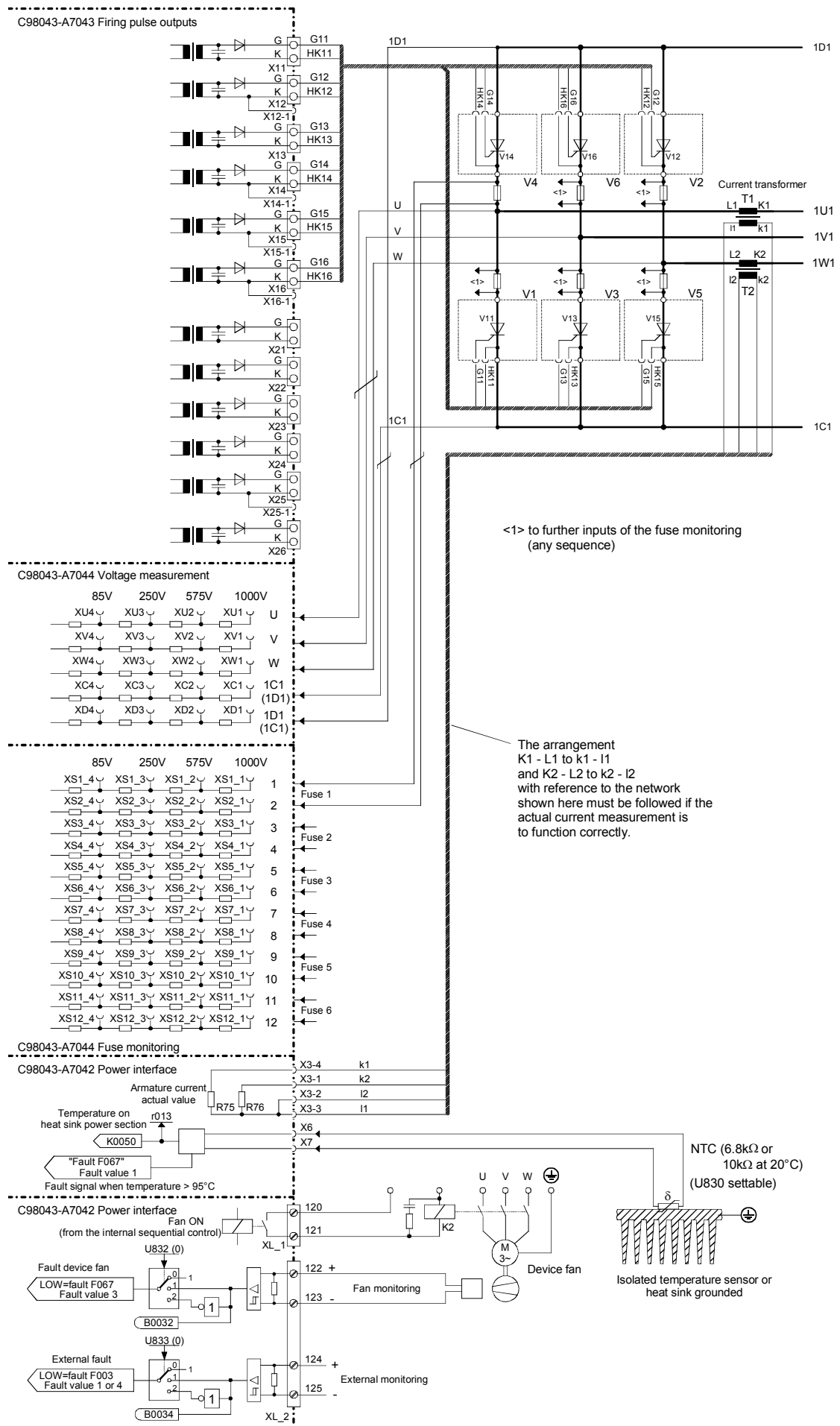


Fig. 6.3.4

## 6.4 Dismantle capability

See also Chapter 5.2

The SIMOREG control module is mounted in two troughs.

The front trough contains the power interface module and the electronics box with the electronics module CUD1 (C98043-A7001) and the terminal expansion CUD2 (ordering option K01) (C98043-A7006) as an option, and further supplementary modules such as technology modules or interface modules.

The rear trough contains the firing pulse transmission module (C98043-A7043) and the module with the voltage measurement, fuse monitoring, and field supply (C98043-A7044). The two modules can be separated mechanically so that parts of it can be mounted in the proximity of the power section.

The two troughs can be mounted one on top of the other or separately.

Here are a few examples:

**1. Rear and front troughs mounted one on top of the other or separately, modules C98043-A7043 and C98043-A7044 not separated (Fig. 6.4.1)**

| Connection (connectors / terminals)            | Cable                                                                             | Length      | Comments                                                 |
|------------------------------------------------|-----------------------------------------------------------------------------------|-------------|----------------------------------------------------------|
| X21A (torque direction 1)                      | Ribbon cable 26-way                                                               | max. 10m *) | Shield if >1m                                            |
| X22A (torque direction 2)                      | Ribbon cable 26-way                                                               | max. 10m *) | Shield if >1m                                            |
| XS20 (fuse monitoring)                         | Ribbon cable 10-way                                                               | max. 10m *) | Shield if >1m                                            |
| XS21 (voltage measurement)                     | Ribbon cable 10-way                                                               | max. 10m *) | Shield if >1m                                            |
| X102 (field)                                   | Ribbon cable 20-way                                                               | max. 10m *) | Shield if >1m                                            |
| Current transformer (X3)                       | Single wires (stranded) twisted pairs                                             | max. 10m *) | Shield if >2m                                            |
| Heat sink temperature (X6, X7)                 | Single wires (stranded) twisted                                                   | max. 10m *) | Shield if >1m                                            |
| Firing pulse (X11...X16, X21...X26)            | Single wires (short-circuit-proof cables) twisted pairs                           | max. 3m *)  | Do not shield !                                          |
| Fuse monitoring (XS1_1...XS1_12 etc.)          | Single wires (short-circuit-proof cables) laid in pairs (for each monitored fuse) | max. 10m *) |                                                          |
| Voltage measurement (XU1,XV1,XW1,XC1,CD1 etc.) | Single wires (short-circuit-proof cables) U,V,W twisted C,D twisted               | max. 3m *)  | Connection of voltage measurement see also Chapter . 6.3 |

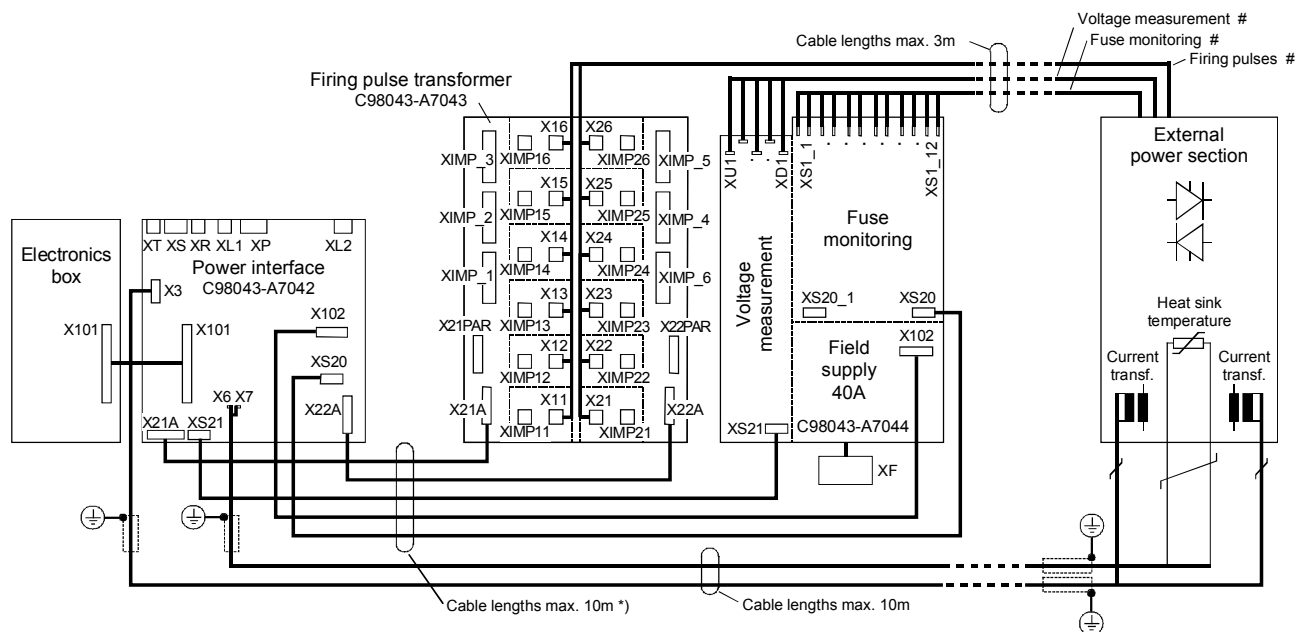


Fig. 6.4.1

#...short-circuit-proof cable laying

\*) The SIMOREG control module is supplied with the front and rear trough mounted one on top of the other. Ribbon cables are already installed for this assembly type.

See Chapter 2.3 for other cable lengths

**2. Rear and front trough mounted one on top of the other or separately, module C98043-A7043 and separated (firing pulse transformer mounted with power section), module C98043-A7044 not separated (Fig. 6.4.2)**

Mechanical conversion see Chapter 5

| Connection (connectors / terminals)                                            | Cable                                                                             | Length      | Comments                                               |
|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------|--------------------------------------------------------|
| X21A (torque direction 1)                                                      | Ribbon cable 26-way                                                               | max. 10m *) | Shield if >1m                                          |
| X22A (torque direction 2)                                                      | Ribbon cable 26-way                                                               | max. 10m *) | Shield if >1m                                          |
| XS20 (fuse monitoring)                                                         | Ribbon cable 10-way                                                               | max. 10m *) | Shield if >1m                                          |
| XS21 (voltage measurement)                                                     | Ribbon cable 10-way                                                               | max. 10m *) | Shield if >1m                                          |
| X102 (field)                                                                   | Ribbon cable 20-way                                                               | max. 10m *) | Shield if >1m                                          |
| Current transformer (X3)                                                       | Single wires (stranded) twisted pairs                                             | max. 10m *) | Shield if >2m                                          |
| Heat sink temperature (X6, X7)                                                 | Single wires (stranded) twisted                                                   | max. 10m *) | Shield if >1m                                          |
| Control firing pulse transformer (XIMP_1 - XIMP11...16) (XIMP_6 - XIMP21...26) | 2x LiyCY 8x2x0.5(or 1)mm <sup>2</sup> or                                          | max. 10m *) | Apply shield on both sides                             |
|                                                                                | Single wires (stranded) twisted pairs                                             | max. 3m *)  | Shield if >1m                                          |
| Firing pulse (X11...X16, X21...X26)                                            | Single wires (short-circuit-proof cables) twisted pairs                           | max. 3m *)  | Do not shield !                                        |
| Fuse monitoring (XS1_1...XS1_12 etc.)                                          | Single wires (short-circuit-proof cables) laid in pairs (for each monitored fuse) | max. 10m *) |                                                        |
| Voltage measurement (XU1,XV1,XW1,XC1,CD1 etc.)                                 | Single wires (short-circuit-proof cables) U-V-W twisted, C-D twisted              | max. 3m *)  | Connection of voltage measurement see also Chapter 6.3 |

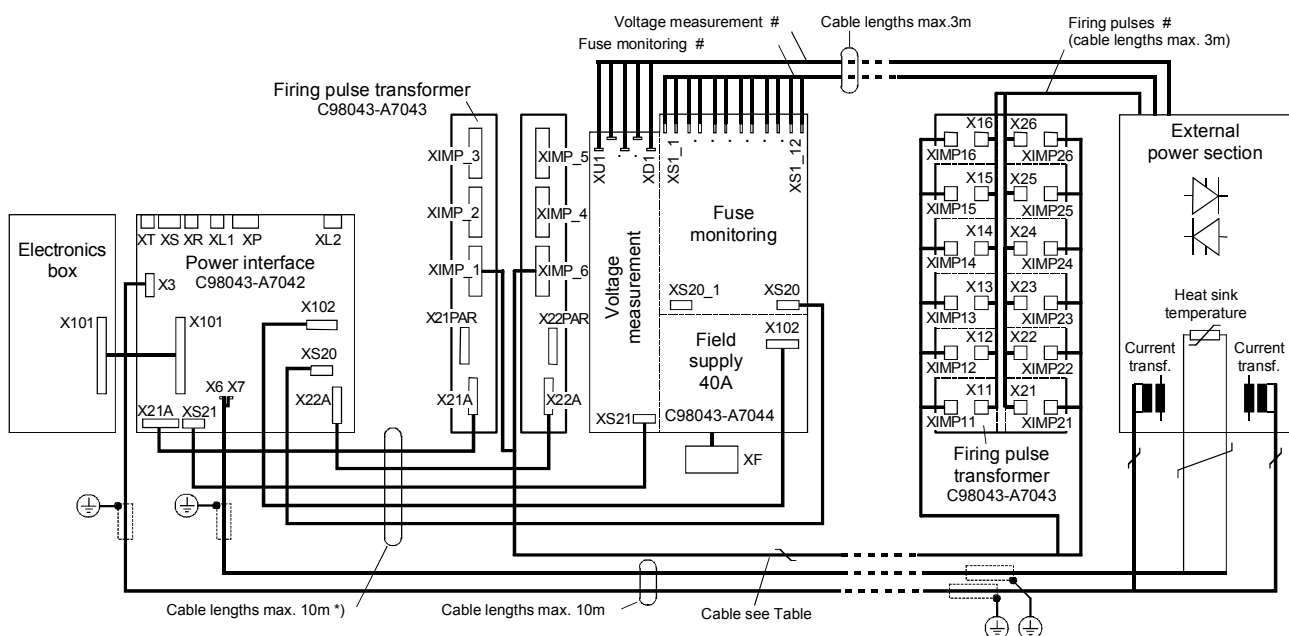


Fig. 6.4.2

#...short-circuit-proof cable laying

\*) The SIMOREG control module is supplied with the front and rear trough mounted one on top of the other. Ribbon cables are already installed for this assembly type.

See Chapter 2.3 for other cable lengths

3. Rear and front trough mounted one on top of the other or separately, modules C98043-A7043 C98043-A7044 separated (firing pulse transformer, voltage measurement, and fuse monitoring mounted with power section), field supply remains in trough (Fig. 6.4.3)

Mechanical conversion see Chapter 5

| Connection (connectors / terminals)                                            | Cable                                                                             | Length      | Comments                                               |
|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------|--------------------------------------------------------|
| X21A (torque direction 1)                                                      | Ribbon cable 26-way                                                               | max. 10m *) | Shield if >1m                                          |
| X22A (torque direction 2)                                                      | Ribbon cable 26-way                                                               | max. 10m *) | Shield if >1m                                          |
| XS20 (fuse monitoring)                                                         | Ribbon cable 10-way                                                               | max. 10m *) | Shield if >1m                                          |
| XS21 (voltage measurement)                                                     | Ribbon cable 10-way                                                               | max. 10m *) | Shield if >1m                                          |
| X102 (field)                                                                   | Ribbon cable 20-way                                                               | max. 10m *) | Shield if >1m                                          |
| Current transformer (X3)                                                       | Single wires (stranded) twisted pairs                                             | max. 10m *) | Shield if >2m                                          |
| Heat sink temperature (X6, X7)                                                 | Single wires (stranded) twisted                                                   | max. 10m *) | Shield if >1m                                          |
| Control firing pulse transformer (XIMP_1 - XIMP11...16) (XIMP_6 - XIMP21...26) | 2x LiyCY8x2x0.5 (or1) mm <sup>2</sup>                                             | max. 10m *) | Apply shield on both sides                             |
|                                                                                | Single wires (stranded) twisted pairs                                             | max. 3m *)  | Shield if >1m                                          |
| Firing pulse (X11...X16, X21...X26)                                            | Single wires (short-circuit-proof cables) twisted pairs                           | max. 3m *)  | Do not shield !                                        |
| Fuse monitoring (XS1_1...XS1_12 etc.)                                          | Single wires (short-circuit-proof cables) laid in pairs (for each monitored fuse) | max. 10m *) |                                                        |
| Voltage measurement (XU1,XV1,XW1,XC1,CD1 etc.)                                 | Single wires (short-circuit-proof cables) U-V-W twisted, C-D twisted              | max. 3m *)  | Connection of voltage measurement see also Chapter 6.3 |

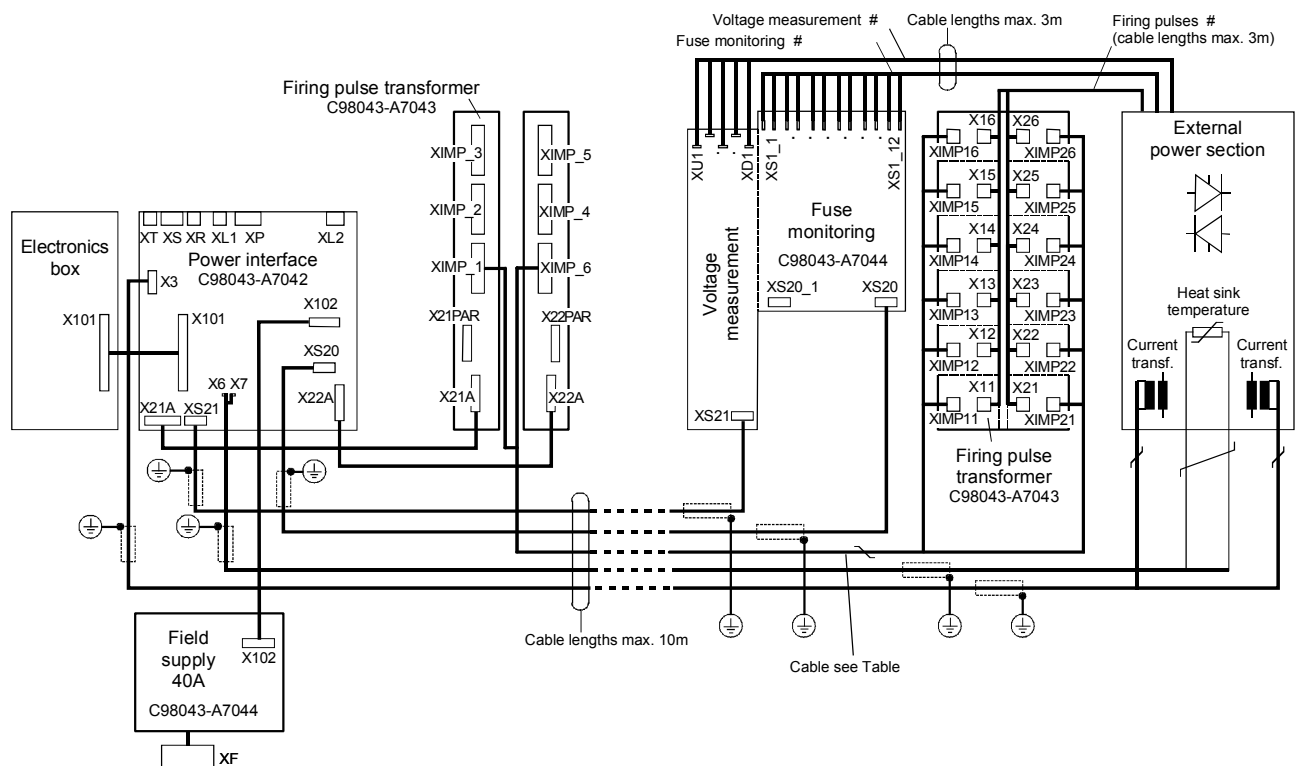


Fig. 6.4.3

#...short-circuit-proof cable laying

- \*) The SIMOREG control module is supplied with the front and rear trough mounted one on top of the other. Ribbon cables are already installed for this assembly type. See Chapter 2.3 for other cable lengths



#### 4. Parallel connection of power sections with shared control electronics

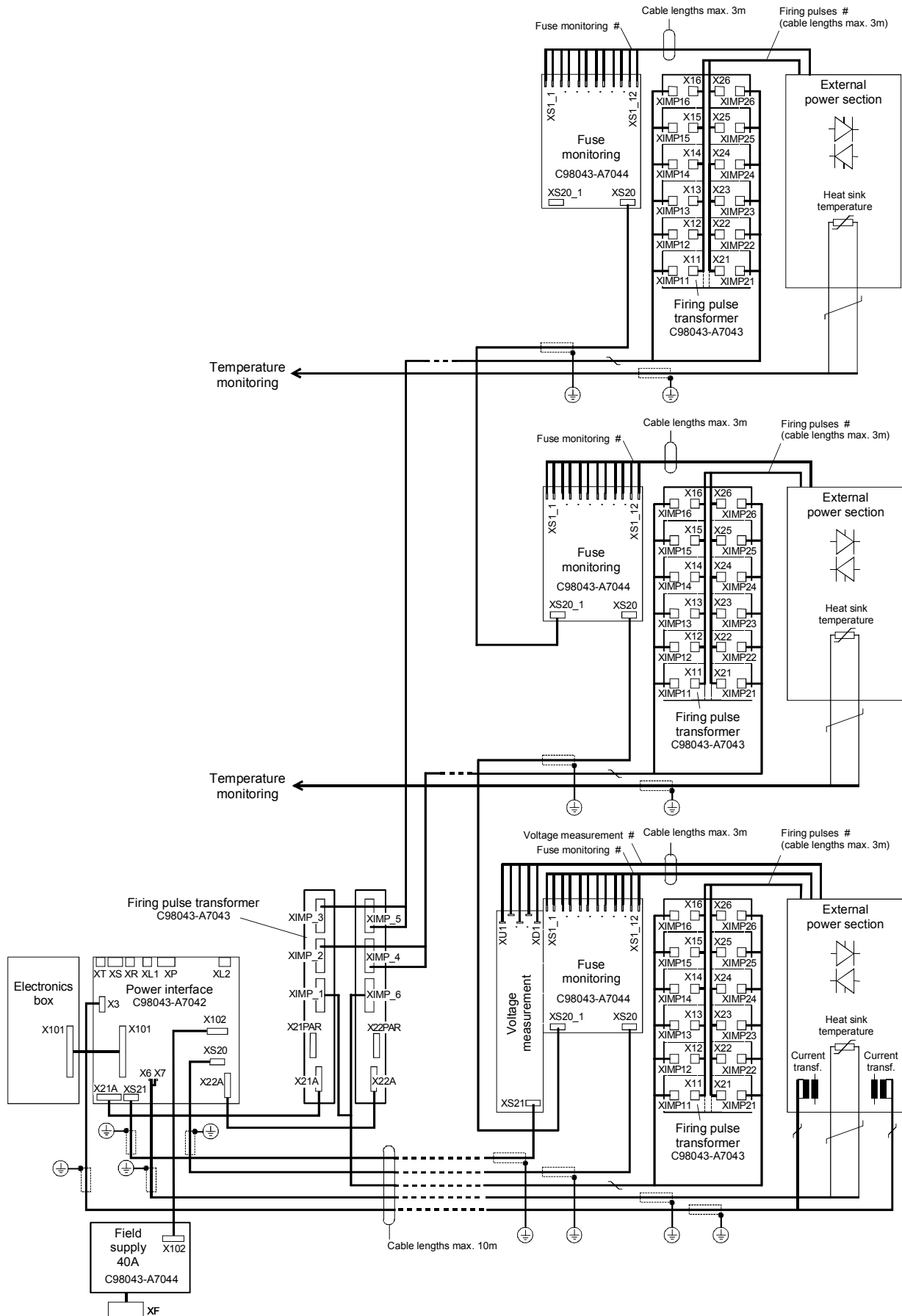


Bild 6.4.4

#... short-circuit-proof cable laying

## Notes:

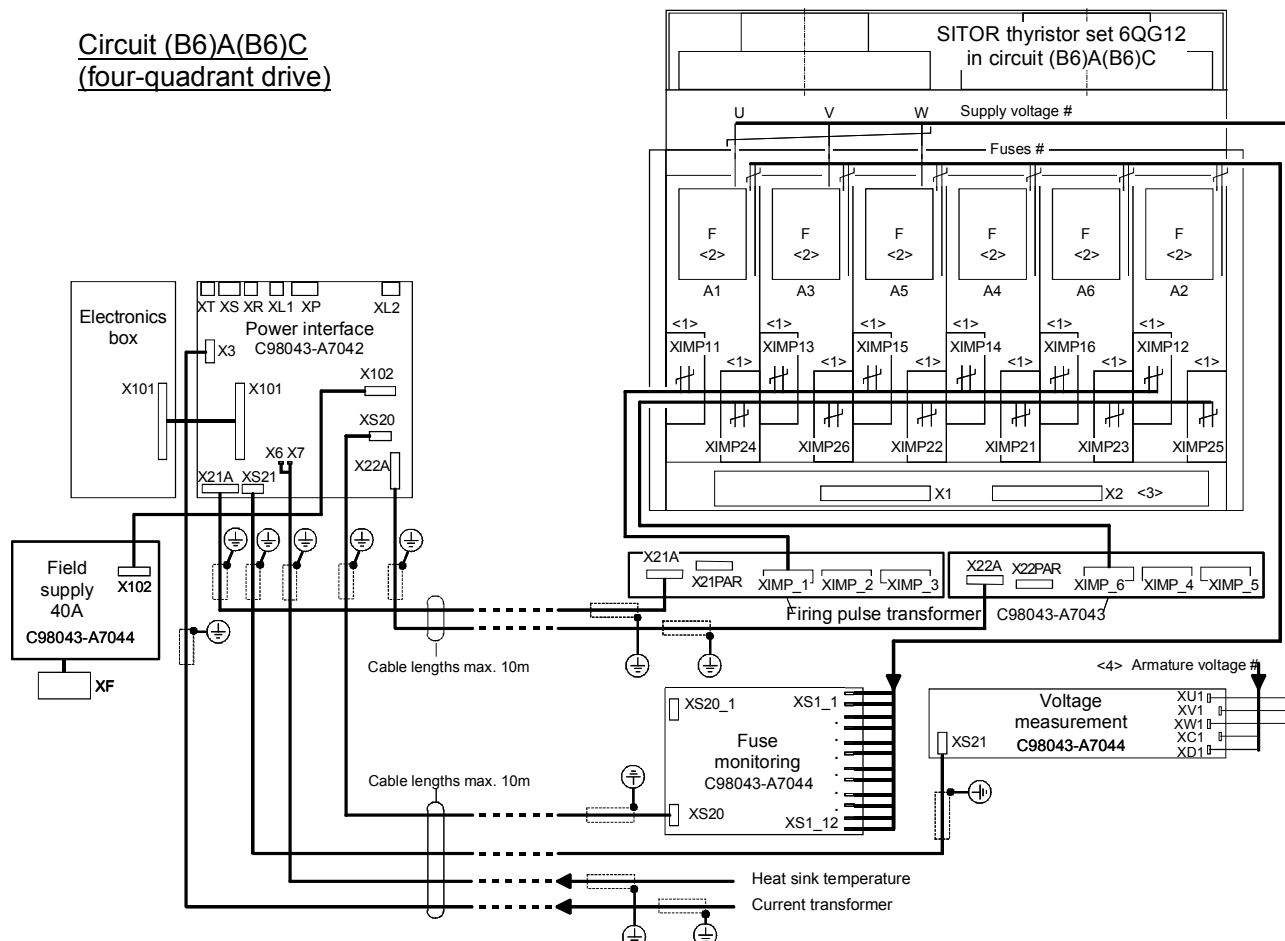
- Temperature monitoring:  
The SIMOREG CM closed-loop control electronics can monitor the temperature of only one power section via terminals X6 / X7. The temperature of the other power sections must be monitored by supplementary circuits.
- Cables:  
With respect to cable types and permissible cable lengths, the specifications in subsections 1 to 3 of this section apply analogously.
- See Section 6.6 for firing pulse transformers
- See Section 6.8 for fuse monitoring
- See also the Note in Section 6.9.2

## 5. Control of SITOR thyristor set 6QG12 (Figs. 6.4.5 to 6.4.9)

With respect to cables, cable lengths, and separation of modules, largely corresponds to example 3.

The firing pulse transmission module (C98043-A7043) is completely separated. The individual plates with the firing pulse transformers can be slotted into the plastic supports on the power section instead of the old firing pulse transformer plates. The safety monitoring and voltage measurement are mounted directly next to the SITOR set.

### Circuit (B6)A(B6)C (four-quadrant drive)



<1>

Firing pulse transformer C98043-A7043 into existing plastic mounts  
(sequence according to the terminal designations as shown in the figure)

Cables to the firing pulse transformers from the terminal strips XIMP\_1 and XIMP\_6 to XIMP11 (IMP11, P24) to XIMP26 (IMP26, P24)

Firing cables X11 (K, G) to X26 (K, G) to the thyristors not shown  
(X11 to X16 each to thyristor V01 in thyristor double module, X21 to X26 to thyristor V02)

<2>

Connection of fuse monitors to the Faston tabs on the fuse-carriers.

The supply voltage measurement can be connected to Faston tabs in thyristor modules A1 (=AK1 =U), A3 (=AK3 =V) and A5 (=AK5 =W) (see circuit diagram on next page).

<3> Do not connect X1, X2

<4> Measurement of armature voltage: Connections KW (AW) to C and AW (KW) to D

Fig. 6.4.5

#...short-circuit-proof cable laying

See also Fig. 6.4.7 for information and to simplify conversion (circuit diagram of SITOR set before conversion).

Rear view

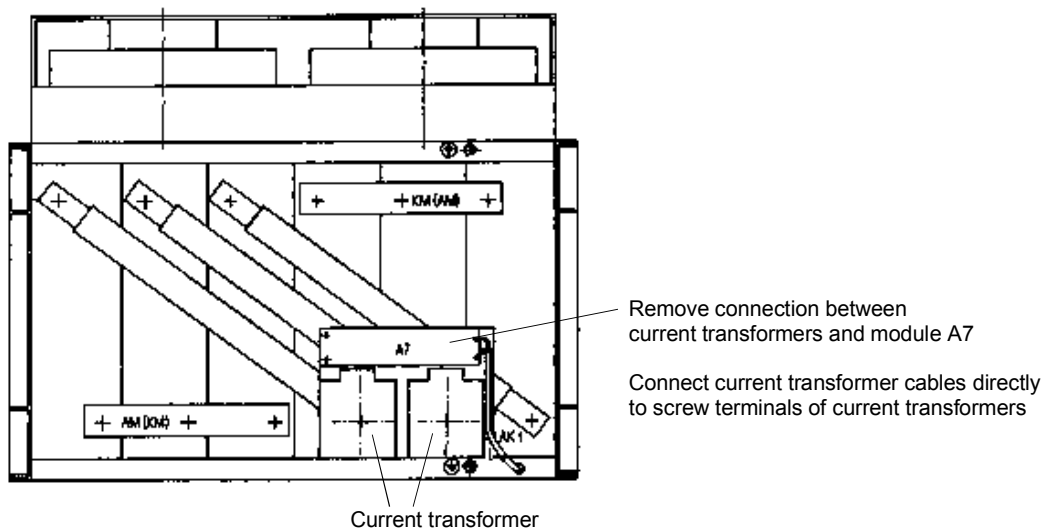
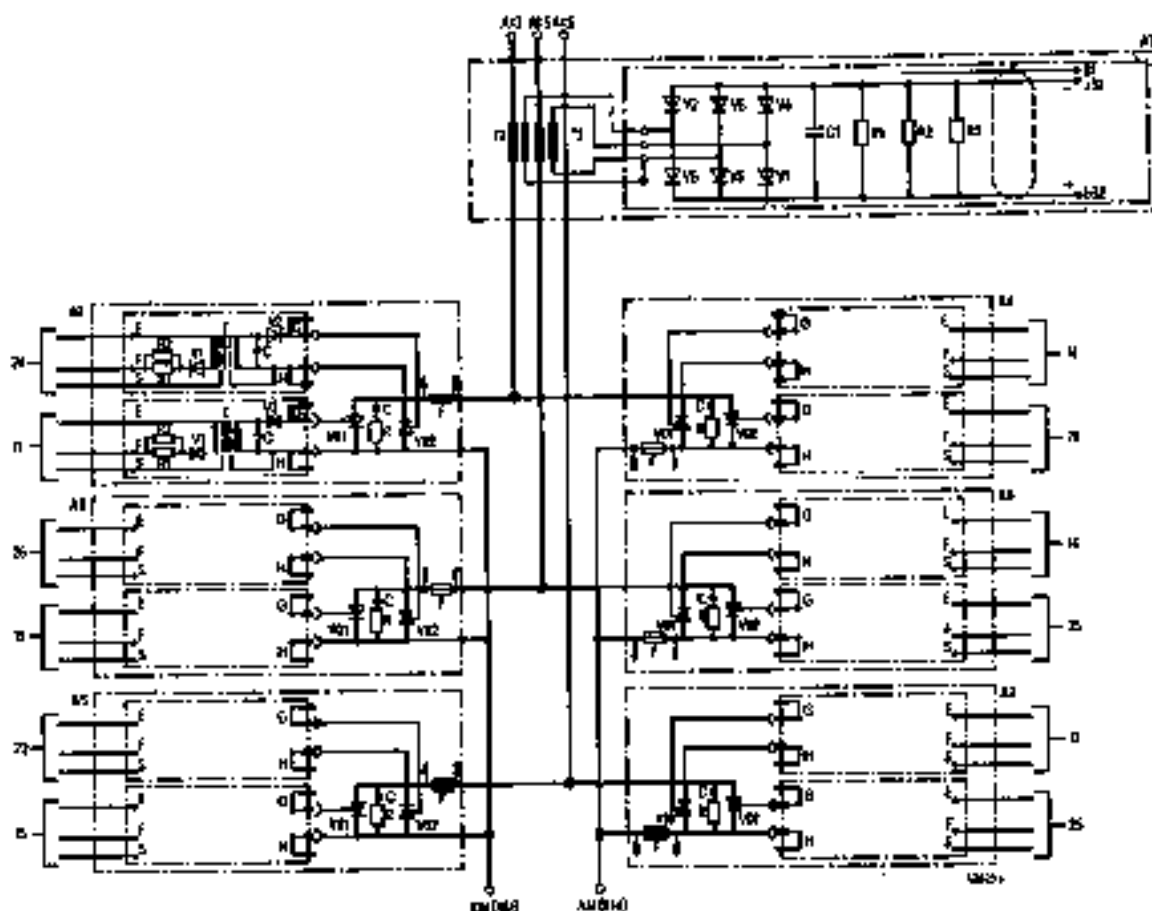


Fig. 6.4.6

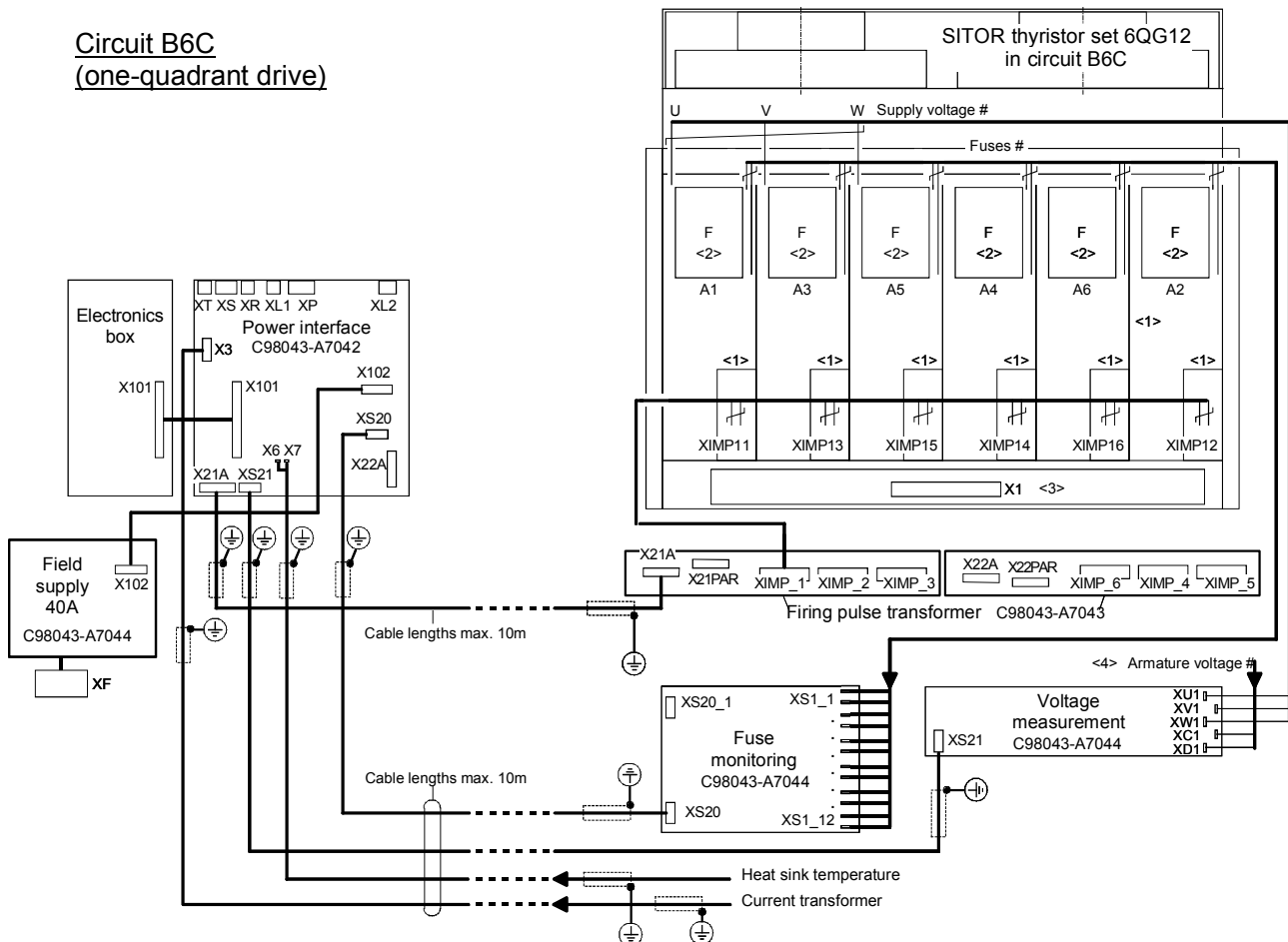
**Circuit diagram SITOR set (4Q) before being equipped with SIMOREG CM (for information):**



SITOR sets 6QG12 in inverse parallel connection of two three-phase connections [(B6)A(B6)C] with transformer module for actual current measurement (module A7 not used for SITOR sets 6QG12 without transformer module for actual current measurement)

Fig. 6.4.7

### Circuit B6C (one-quadrant drive)



<1>

Firing pulse transformer C98043-A7043 into existing plastic mounts (sequence according to the terminal designations as shown in the figure)

Cables to the firing pulse transformers from the terminal strips XIMP\_1 to XIMP11 (IMP11, P24) to XIMP16 (IMP16, P24)

Firing cables X11 (K, G) to X16 (K, G) to the thyristors not shown

<2>

Connection of fuse monitors to the Faston tabs on the fuse-carriers.

The supply voltage measurement can be connected to Faston tabs in thyristor modules A1 (=AK1 =U), A3 (=AK3 =V) and A5 (=AK5 =W) (see circuit diagram on next page).

<3>

Do not connect X1

<4>

Measurement of armature voltage: Connection KW - C und AW - D

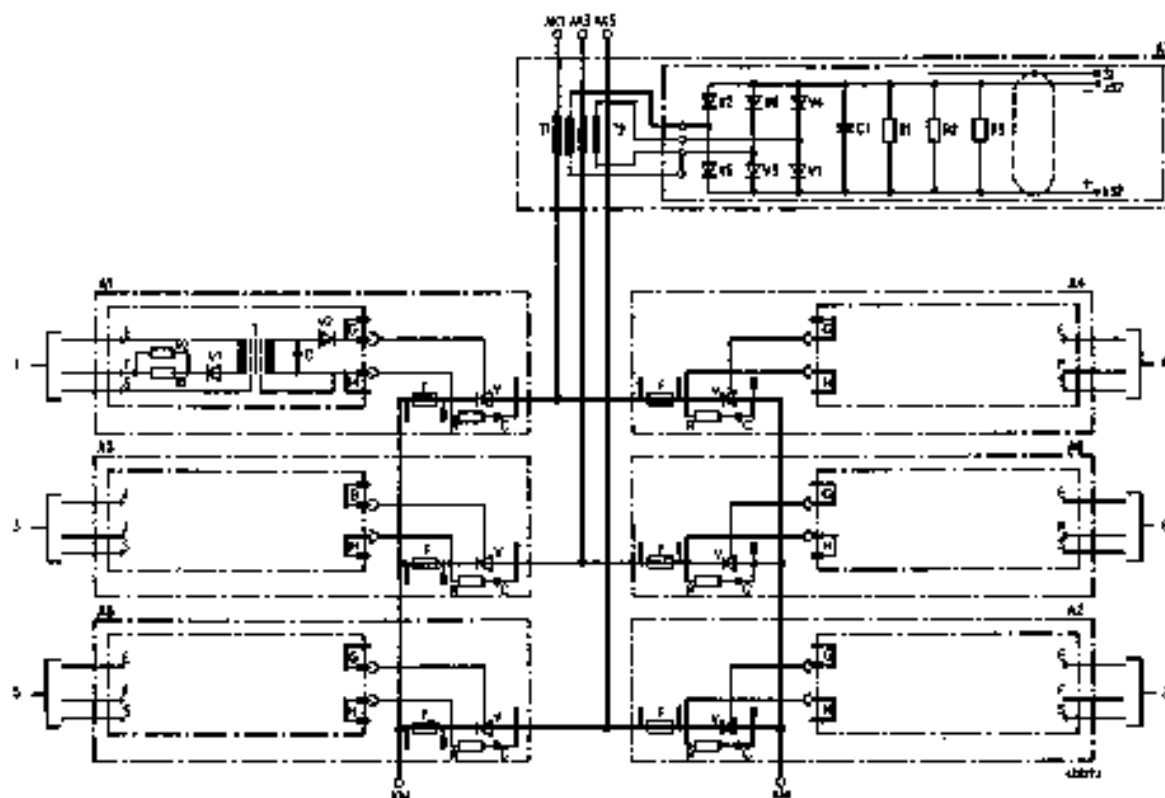
(for how to connect Faston tabs on thyristor modules see circuit diagram on next page).

Fig. 6.4.8

#...short-circuit-proof cable laying

See also Fig. 6.4.9 for information and to simplify conversion (circuit diagram of SITOR set before conversion).

Circuit diagram SITOR set (1Q) before being equipped with SIMOREG CM (for information):



SITOR sets 6QG12 in three-phase bridge connection [B6C] with transformer module for actual current measurement (module A7 not used for SITOR sets 6QG12 without transformer module for actual current measurement)

Fig. 6.4.9

## 6.5 Measuring the armature current

### 6.5.1 General information

Measuring circuit at the power interface C98043-A7042:

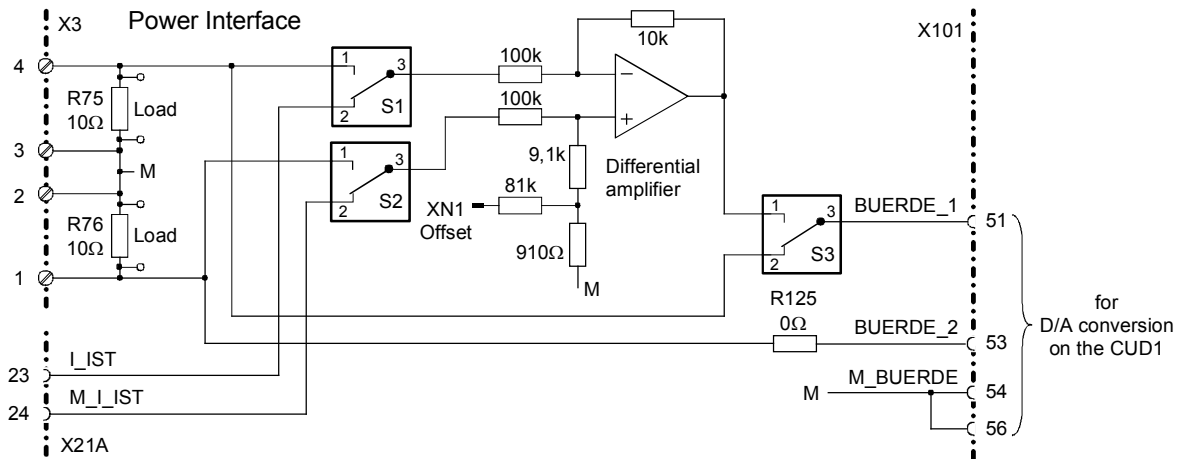
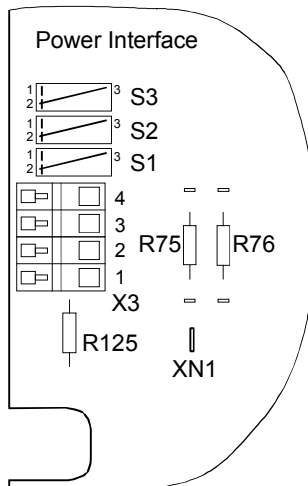


Fig. 6.5.1

Mechanical arrangement at the power interface C98043-A7042:



Note:

To ensure a secure connection, the jumpers of switches S1, S2, and S3 must be soldered into the hooks

Fig. 6.5.2

#### Dimensioning of the current transformers, load resistances

The D/A converter circuit on the CUD1 can process voltages up to  $\pm 2.5V$  (peak value). When dimensioning the current transformers and load resistances, it is important to ensure that the voltage to X101-51 (BUERDE\_1) or X101-53 (BUERDE\_2) (see Fig. 6.5.1) never exceeds this value even with the highest overcurrent to be expected in the power section. In the state as delivered, the current actual value measurement of the CM is set such that a 1 V current actual value signal is set at device rated current. The differential amplifier with an amplification of 0.1 shown in Fig. 6.5.1 can be used to adapt the input voltage of existing measurements with other scalings.

We recommend that the current transformers and load resistors are dimensioned such that an average load voltage of maximum 1V is present at rated direct current of the armature.

If an external load resistor is used, the wires from it to terminal X3 should be kept as short as possible and twisted. The external load resistor itself should be contacted at four points (potential pick-off) and have as little inductance as possible to prevent measuring errors.

Four-point contacting means: The current to be measured is routed through the resistor. The resulting voltage (load voltage) is picked off at the connections at the distances specified by the manufacturer. This method ensures the most precise possible measurement. The load resistance must never be connected via two separate cables – this only increases the effective value of the load resistance and the converter provides too little current.

Only load resistances with a maximum power loss of 0.5 watts can be soldered to the soldering terminals parallel to the installed load resistances of 10 ohms. If 5A current converters already exist, 5A / 0.1 A coupling transformers should be used. In that case, standard R75 and R76 load resistances of 10 ohms each can be used.

If two current transformers in V-connection already exist, they can be connected directly to terminal X3 to reduce the time to the next current reversal (higher dynamic response on change of torque). For calculation of the load resistances see above.

Interposing transformers must not be connected directly behind a current transformer – and not behind a V-connection !

## 6.5.2 Current measurement with two current transformers on the network side

(state as delivered)

Configuration as shown in Chapter 6.3

### Current transformer

|      |    |                               |               |
|------|----|-------------------------------|---------------|
| X3-1 | k2 | Current transformer T2 signal | K line side   |
| X3-2 | I2 | Reference ground              | L device side |
| X3-3 | I1 | Reference ground              |               |
| X3-4 | k1 | Current transformer T1 signal |               |

The current transformers must not be connected to ground externally. The connection must be made via terminals X3-2 and X3-3 only.

Recommended current transformers:

| Up to armature current | Transformation ratio | Item number       | MLFB number   | Primary side                                            |
|------------------------|----------------------|-------------------|---------------|---------------------------------------------------------|
| 600 A                  | 6000 : 1             | C98130-A1023-C771 | 6RY1702-0AA03 | Hole 31 x 5.5 mm                                        |
| 850 A                  | 8500 : 1             | C98130-A1023-C850 | 6RY1702-0AA06 | Hole Ø 22 mm                                            |
| 1200 A                 | 12000 : 1            | C98130-A1023-C772 | 6RY1702-0AA04 | Hole 61 x 10.5 mm                                       |
| 2400 A                 | 24000 : 1            | C98130-A1023-C773 | 6RY1702-0AA05 | Cylindrical el. Cu<br>height 45 mm<br>hole dia. 12.2 mm |

### Switch positions

S1 in position 2 - 3

S2 in position 2 - 3

S3 in position 2 - 3

The position of switches S1 to S3 makes the differential amplifier on power interface C98043-A7042 (Fig. 6.5.1) inactive. The load voltages of X3 are connected directly to the control electronics.

### Load resistances

$$R_B = \frac{u_B}{\ddot{u} * I_d}$$

$R_B$  = Load resistance

$u_B$  = Load resistance (= average value across 1 current maximum value, not rms value or average value across whole period); Recommended value = 1 V

$\ddot{u}$  = Transmission ratio of current transformer ( $I_2 / I_1$ )  
(in general  $\ddot{u} = 1 / \text{number of turns per unit length}$ )

$I_d$  = Rated armature direct current



In the state as delivered, load resistors (R75, R76) of 10Ω are installed.

The values calculated for the load resistances can be set by soldering additional resistors on the soldering tags parallel to R75 and R76, possibly also removing R75 and R76.

To calculate load resistances precisely, the influence of the magnetizing current can be taken into account. If the magnetization current is not taken into account, "magnetizing current x number of turns" more current flows in the cables than is indicated.

Determining the magnetizing current:

The secondary current of the current transformer must flow through the series connection of its ohmic resistance (at maximum working temperature) and the load resistor, and any rectifier diodes. This produces a calculated voltage drop at rated current (sinusoidal). This voltage (50 Hz sine) is now applied on the secondary side and the magnetizing current measured. This is used in the calculations for  $R_B$ .

It is also important to ensure that the current transformers do not easily become saturated on overcurrent because otherwise the magnetization current would rise too quickly. A temperature rise caused by continuous load must also be monitored.

Load resistance taking the magnetizing current into account:

$$R_B = \frac{U_B}{\dot{U} * (I_d + \frac{I_m}{\dot{U}})}$$

$I_m$  = Magnetizing current

#### Parameter settings

U822 = Rated armature direct current

U823 = Load voltage at armature rated current (state as delivered = 1000.0 mV)

U824 = 1: Current transformer in phases U and V

2: Current transformer in phases U and W (state as delivered)

3: Current transformer in phases V and W

### 6.5.3 Current measurement via terminal block X3 with external measuring circuit

#### 6.5.3.1 External current transformer in V connection with +1V with rated armature direct current

##### Connection

The output signal of the V connection is connected to terminals X3-4 (I\_IST) and X3-3 (M) (terminals X3-1 and X3-2 are not used).

##### Switch positions

S1 in position 2 - 3 (parking position)

S2 in position 2 - 3 (parking position)

S3 in position 2 - 3

Remove resistor R125. The differential amplifier is not used.

##### Parameter settings

U822 = Rated armature direct current

U823 = Input voltage for armature rated current

U824 = 4

##### Load

The load resistor of the V connection must be connected externally and must not be grounded. It is grounded via terminals X3-2 or X3-3. Remove R75 and R76.

### 6.5.3.2 External current transformer in V connection with +10V with rated armature direct current

#### Connection

The output signals of the V connection is connected to terminals X3-1 (I\_IST) and X3-2 (M). Connect terminals X3-3 and X3-4.

#### Switch positions

S1 in position 1 - 3  
S2 in position 1 - 3  
S3 in position 1 - 3

Remove resistor R125.

The differential amplifier on the power interface is active. The input signal is attenuated by a factor of 10 (10 V to 1 V at rated direct current).

#### Parameter settings

U822 = Rated armature direct current  
U823 = Input voltage for armature rated current / 10  
U824 = 4

#### Load

The load resistor of the V connection must be connected externally and must not be grounded. It is grounded via terminals X3-2 or X3-3. Remove R75 and R76.

### 6.5.3.3 Differential input for +10V at rated armature direct current

#### Connection

X3-1 positive (not inverting), X3-4 negative (inverting). External grounding of the measuring circuit is recommended.

The effect of the differential amplifier is as a 10 / 1 attenuator.

#### Parameters, load and switches

Set as for V connection with +10V at rated armature direct current.  
Remove R75 and R76.

### 6.5.4 External current measurement via X21A

X21A-23 I\_IST Negative current actual value via ribbon cable (e.g. of SIMADYN-D)  
X21A-24 M\_I\_IST Reference potential

#### Switch positions

S1 in position 2 - 3  
S2 in position 2 - 3  
S3 in position 1 - 3

The differential amplifier is active. The input signal is attenuated by a factor of 10 (10 V to 1 V at rated direct current).

#### Parameter settings

U822 = Rated armature direct current  
U823 = Input voltage for armature rated current / 10  
U824 = 5

#### Optional offset correction via XN1

For 6QGXX Sitor sets with shunt current measurement and U/f and f/U conversion, the potentiometer (R202 on module 6QM400 for SITOR thyristor set 6QG22) must be adjusted to exactly voltage zero of the output voltage on the secondary side when the device is at zero current. See Chapter 6 of 6QG22 "Improvement of the noise immunity and drift problems of the analog current actual value in SITOR electronics". If this potentiometer is incorrectly set, not only an offset error, but also a scaling error in current measurement will occur. To allow extra adjustment of the offset for an exact current zero signal, connector XN1 on power interface A7042 must be connected to an analog output ( $\pm 10$  volts) on control electronics A7001. The offset can be minimized by parameterizing the output voltage manually. However, this method does not eliminate the scaling error mentioned above. We therefore urge you first to set the potentiometer as precisely as possible.

### 6.5.5 Notes on the difference input, control range limits, and grounding

The differential amplifier reduces the signal level to a tenth of the input voltage and specification of the output level is only guaranteed up to  $\pm 10$  volts.

If the output signal of the external armature current measurement is normalized to  $\pm 10$  volts at rated current, no overcurrent can be measured. If the output signal of the armature current measurement is normalized to  $\pm 5$  volts at rated current, a current of  $2 \times I_{\text{NOM}}$  can be measured. The user of the 6RA70 CM is urged to check whether the current measurement used provides a true image of the required overcurrent and the expected peak values within the necessary tolerance. Please ensure that image of the current in the current measurement circuit runs linearly up to the required overcurrent capability. Otherwise clipping of the actual value with current overshoots and finally a tripped fuse is to be expected.

The most common risk is that the last operational amplifier of the measuring circuit will be overdriven. The problem can usually be avoided by normalizing the external current measurement to  $\pm 5$  volts. For example, R 462 must be short-circuited in the 6QG22. For example, R 71 must be jumpered with an additional 100k in the 6QG35. This ensures a control range up to  $2 \times$  rated current ( $\pm 10$  volts).

Simoreg 6RA70 can process load signals up to  $\pm 2.5$  volts peak value ( $= 2.5 \times$  rated current). Using the differential input, it is therefore possible to process a level of  $\pm 25$  volts peak value.

If a V connection with a load resistor without a downstream amplifier is used, it is advisable to dimension the load resistor for 1 volt at rated current. The internal resistor R76 with 10 ohms should be removed to minimize the effect of the resistance of the instrument lead and the terminal. Take care with the calculation if the resistor is left inside! Existing load resistors for 10 volts at rated current can be reduced to a tenth of their previous value and power loss. The connection is made at terminals X3-1 and X3-2, where X3-2 is the ground connection. There must be no other connections between the V connection and ground or zero potential.

If the connection of the V connection for 10 volts at rated current remains unchanged, one end of the load resistor should be grounded for EMC reasons. This can be done by directly placing a jumper between X3-1 and X3-2. If the V connection has already been grounded somewhere else, this connection must not be made. If an external measuring circuit is connected, its electronics reference potential must be grounded for EMC reasons. This can be done by directly placing a jumper between X3-1 and X3-2. If the measuring circuit has already be grounded somewhere else, the specified connection must not be made.

To avoid humming loops, the external measuring circuit or V connection must only be grounded at one point.

## 6.6 Connecting the firing transformer

### 6.6.1 General information

The 12 firing pulse drivers for the firing transformers are located on module A7042. The firing pulses for the first torque direction can be accessed by connector X21A and for the second torque direction, via connector X22A. Each firing pulse driver has its own open collector output with a parallel diode to electronics reference potential. A further diode is used to divert the opening overvoltages to P44 (plus 44 volts) internally. The 12 firing transformers (with internal 33 ohm series resistors) are located on module A7043 and are each connected between P24 and the firing circuit cable. The 12 firing pulse drivers can control a maximum of three firing transformers each (with internal 33 ohm series resistors). No short-circuit protection is provided! The user must ensure that the outputs are not overloaded. The maximum pulse current at each of these outputs is 1.5 amperes each. The whole circuit is dimensioned for long pulses.

#### 6.6.1.1 Normal use (individual)

Connectors X21A and X22A are connected to connectors with the same designation on modules A7043 via two 26-way ribbon cables. The firing transformers on the module of the same name are then connected. If operation is in one current direction only, only the ribbon cable for X21A need be connected. If module A7043 is divided (broken), each firing transformer must be connected to the terminal row via two twisted cables.

#### 6.6.1.2 Parallel connection of firing pulses

Up to three firing transformers (with 33 ohm series resistors installed) can be connected in parallel. They are supplemented by additional A7043 modules (firing transformers) (spare part order number 6RY1703-OCM01) connected via ribbon cable, or individual firing transformers are connected in parallel via two twisted cables each to the terminals of the same name.

- a) Two or three firing transformers can be connected in parallel to increase the firing current. In addition, the secondary sides of the firing transformers are connected in parallel for each firing pulse. The resulting firing current should be tested with a current probe and an oscilloscope.
- b) For operation in one current direction only (torque direction), the second half of module A7043 can be used for parallel connection of a power section or to increase the firing current. In this case, module A7043 of connector X21PAR is connected to connector X22PAR via a 26-way ribbon cable. Designations X21 and X26 on the firing pulse transformers are then no longer correct.



### WARNING



Never connect more than three firing transformers to a firing pulse output !  
There is a risk that the firing drivers on module A7042 (power interface) could be damaged by overloading.

Fuse on power interface (C98043-A7042) with F3 (1A medium time-lag fuse)

#### 6.6.1.3 External amplification of firing pulses

If more than three power sections are to be connected in parallel, external firing pulse amplifiers (with PNP transistors) must be connected with a separate 24V supply. The maximum possible load on the internal firing pulse drivers (open collectors) is 1.5 A per pulse.

Their electronics ground cables are also brought out at connectors X21A and X22A. The P24 cables on connectors X21A and X22A must not be loaded with more than 1 A (not usually connected). The external firing pulse amplifiers must be supplied with 24V (22V to 30 V) by a separate power supply unit. The supply conductors of the external firing pulse amplifiers must be sufficiently interference-free to avoid misfiring of the thyristors under the applicable conditions.

**Note 1:**

Normally, pull-up resistors are installed in the external firing pulse amplifiers. If they are missing, extra pull-up resistors can be connected to increase noise immunity. However, the pulse current must not exceed 1 A per output.

**Note 2:**

If several firing pulse amplifiers are connected in parallel on the input side to separate power supply units (e.g. Sitor sets), the inputs must be decoupled with isolation diodes. This measure is already included in the Sitor sets.

## 6.7 Connecting the voltage measurement

The following potentials on the power section must be connected to the voltage measurement (part of module A7044).

Power supply voltage 1U1, 1V1, and 1W1

Output voltage 1C1 and 1D1

The tabs are arranged in groups for the different power supply ranges.

| Rated system voltage    | Connect at | Parameters  | Discharge resistor against ground |
|-------------------------|------------|-------------|-----------------------------------|
| 24 volts to 85 volts    | 85 V       | U821 = 85   | 134 k $\Omega$                    |
| 86 volts to 250 volts   | 250 V      | U821 = 250  | 394 k $\Omega$                    |
| 251 volts to 575 volts  | 575V       | U821 = 575  | 910 k $\Omega$                    |
| 575 volts to 1000 volts | 1000 V     | U821 = 1000 | 1576 k $\Omega$                   |

Note: Parameter P078 index.001 must be set to the actual rated armature input voltage.

The voltage stage selected on the printed-circuit board must correspond to that in the software, otherwise the voltages measured will be grossly incorrect. External voltage transformers must be used for operation with supply voltages greater than 1000 V.

The leakage resistances against ground specified in the table are used to calculate the discharge current during hipot tests.



### WARNING



The firing transformers no longer fulfill the safety requirements for supply voltages above 1000 volts.  
The use of firing transformers with line isolation for higher voltages is then strongly recommended.



### WARNING



Disconnect the power supply before making any connections!  
The measurements might sustain serious or irreparable damage if connected incorrectly.  
Non-observance of the safety instructions can result in death, severe personal injury, or substantial damage to property.

## 6.8 Connecting the fuse monitors

The fuses of one or more power sections can be monitored with one or more fuse monitors on the A7044. These cables must be connected in the same way as those of the voltage monitors. Each pair of adjacent tabs form a single monitor. The fuse monitors do not generate a ground leakage current.

Up to six groups of 6 fuse monitors each can be connected in parallel. This is achieved by looping through the signal of connector XS20\_1 to connector XS20 on the next module. In this way, a maximum of 36 individual fuses can be monitored isolated from each other, or 72 fuses, if each pair is linked to a single phase.

Additional modules C98043-A7044 are available under spare part order number 6RY1703-0CM02.



### WARNING



Disconnect the power supply before making any connections!

The monitors might sustain serious or irreparable damage if connected incorrectly.

Non-observance of the safety instructions can result in death, severe personal injury or substantial damage to property.

## 6.9 Parallel connection

### 6.9.1 Parallel connection of devices

#### 6.9.1.1 Connection scheme for parallel connection of power sections, each with its own control electronics

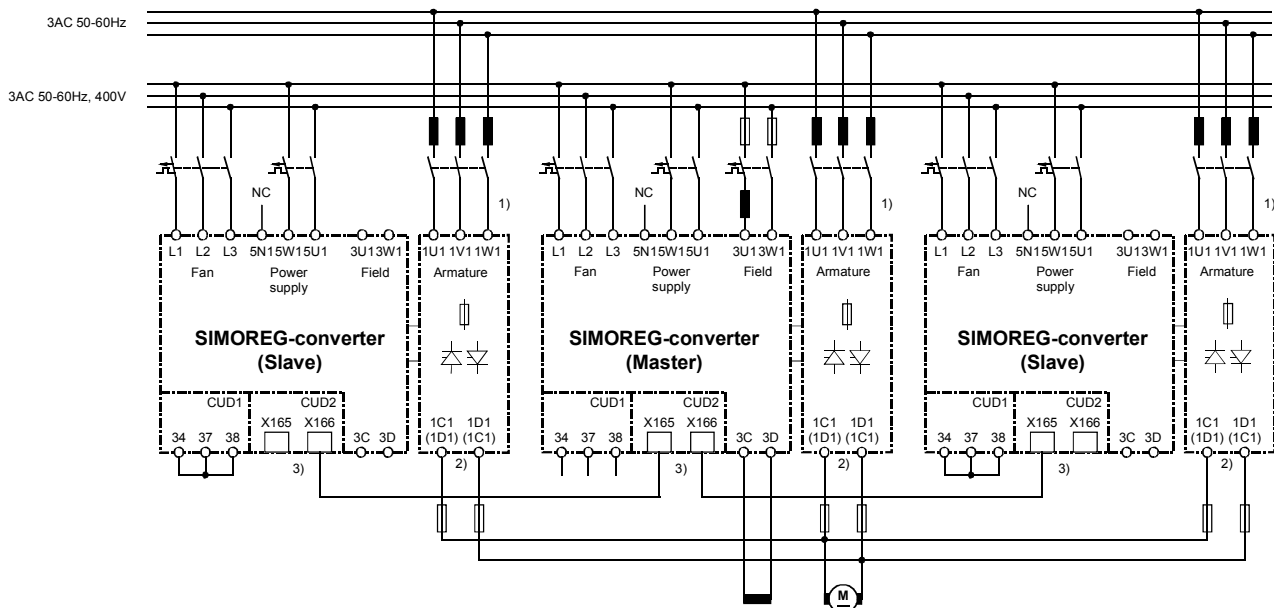


Fig. 6.9.1

- 1) The same phase sequence is required between 1U1 /1V1 /1W1.
- 2) The same phase sequence is required between 1C1 / 1D1.
- 3) The converters are connected by means of an (8-pin) shielded Patch cable of type UTP CAT5 according to ANSI/EIA/TIA 568, such as those used in PC networking.  
A standard 5 m cable can be ordered directly from Siemens (order number: 6RY1707-0AA08).  
(n-1) cables are needed to connect n converters in parallel.  
The bus terminator must be activated (U805=1) on the converter at each end of the bus.

The terminal expansion option (CUD2) is required for each converter in a parallel connection.

A maximum of 6 converters can be connected in parallel.

When several converters are connected in parallel, the master unit should be positioned in the center to allow for signal transit times. Maximum length of paralleling interface cable between master and slave converters at each end of bus: 15m.

For the purpose of current distribution, separate commutating reactors of the same type are required for each power section. Current distribution is determined by the differential reactor tolerance. A tolerance of 5% or better is recommended for operation without derating (reduced current).

### CAUTION

Parallel connections may only be made between converters with the same DC current rating!

#### 6.9.1.2 Parameterization of SIMOREG converters for parallel connection

### 1) Standard operating mode

| <b>Master</b>                                                                                                                                                                                                                                           | <b>Slaves</b>                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U800 = 1      Paralleling interface active                                                                                                                                                                                                              | U800 = 2      Paralleling interface active<br>Use master firing pulses                                                                                                                                                                                                                            |
| U803 = 0      "N+1 operation" not active                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                   |
| U804.01 = 30    Control word 1<br><br>U804.02 = 31    Control word 2<br><br>U804.03 = 167 Actual speed value                                                                                                                                            | U804.01 = 32    Status word 1                                                                                                                                                                                                                                                                     |
| U805 = 1    (bus terminator)                  at the two outermost devices<br>(at the two physical ends of the bus cable)<br><br>0    (no bus terminator)                  at all other devices                                                         |                                                                                                                                                                                                                                                                                                   |
| U806.01 = 12 master for one slave<br>13 master for 2 slaves<br>14 master for 3 slaves<br>15 master for 4 slaves<br>16 master for 5 slaves<br><br>set U806.02 as U806.01                                                                                 | U806.01 = 2                                  1 slave<br>U806.01 = 2 and 3                        2 slaves<br>U806.01 = 2, 3 and 4                    3 slaves<br>U806.01 = 2,3,4 and 5                  4 slaves<br>U806.01 = 2,3,4,5 and 6                5 slaves<br><br>set U806.02 as U806.01 |
| P082 <> 0      operating mode for field                                                                                                                                                                                                                 | P082 = 0      internal field is not used                                                                                                                                                                                                                                                          |
| Set P083 according to source of speed actual value                                                                                                                                                                                                      | P083 = 4      Freely connected actual speed value<br><br>P609 = 6023    Use actual speed value of master                                                                                                                                                                                          |
| $P100 = \frac{\text{Motor\_rated\_current}}{\text{Number\_of\_SIMOREG\_units}}$                                                                                                                                                                         | $P100 = \frac{\text{Motor\_rated\_current}}{\text{Number\_of\_SIMOREG\_units}}$                                                                                                                                                                                                                   |
| Set P648, P649 according to source of control word                                                                                                                                                                                                      | P648 = 6021    Use control word 1 from master<br><br>P649 = 6022    Use control word 2 from master                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                         | P821.01 = 31    Suppress alarm A031                                                                                                                                                                                                                                                               |
| P110 = actual armature resistance<br>x no. of SIMOREG converters<br><br>P111 = actual armature inductance<br>x no. of SIMOREG converters<br><br>The optimization run for current controller and precontrol (P051 = 25) sets these parameters correctly. | P110 = set as on master<br><br>P111 = set as on master                                                                                                                                                                                                                                            |

For further details about the operating principle of parallel connections between SIMOREG converters, please refer to Section 8, Function Diagrams, Sheet G195 (paralleling interface).

Notes:

- Control commands "Switch-on/Shutdown", "Enable operation", "Emergency stop" etc. must be connected to a group of parallel-connected SIMOREG converters via the master device. Terminals 37 and 38 must be permanently connected to terminal 34 on the slaves !
- Optimization runs must be started on the master device. All slaves must be connected and ready to run when optimization is started.



**2) Operating mode "N+1 – operation" (redundancy operation)**

| Master                                                                                                                                                                                                                                                  | Standby master                                                                                                                                                                                                                         | Slaves                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U800 = 1 Paralleling interface active                                                                                                                                                                                                                   | U800 = 2 Paralleling interface active<br>Use master firing pulses                                                                                                                                                                      |                                                                                                                                                                                         |
| U803 = 1 "N+1 operation" active                                                                                                                                                                                                                         |                                                                                                                                                                                                                                        |                                                                                                                                                                                         |
| U804.01 = 30 control word 1<br>U804.02 = 31 control word 2<br>U804.02 = 167 speed actual value<br>U804.04 = any<br>U804.05 = any<br><br>U804.06 = 32 status word 1<br>U804.07 = any<br>U804.08 = any<br>U804.09 = any<br>U804.10 = any                  | U804.01 = 32 status word 1<br>U804.02 = any<br>U804.03 = any<br>U804.04 = any<br>U804.05 = any<br><br>U804.06 = 30 control word 1<br>U804.07 = 31 control word 2<br>U804.08 = 167 speed actual value<br>U804.09 = any<br>U804.10 = any | U804.01 = 32 status word 1<br>U804.02 = any<br>U804.03 = any<br>U804.04 = any<br>U804.05 = any<br><br>U804.06 = any<br>U804.07 = any<br>U804.08 = any<br>U804.09 = any<br>U804.10 = any |
| U805 = 1 (bus terminator)<br><br>0 (no bus terminator)                                                                                                                                                                                                  | on the two outermost devices<br>(at the two physical ends of the bus cable)<br>at all other devices                                                                                                                                    |                                                                                                                                                                                         |
| U806.01 = 12 masters + 1 slave<br>13 masters +2 slaves<br>14 masters +3 slaves<br>15 masters +4 slaves<br>16 masters + 5 slaves<br><br>U806.02 = 2 Slave 2                                                                                              | U806.01 = 2 Slave 2<br><br>U806.02 = 12 masters + 1 slave<br>13 masters +2 slaves<br>14 masters +3 slaves<br>15 masters +4 slaves<br>16 masters + 5 slaves                                                                             | U806.01 = 3 2 slaves<br>U806.01 = 3 and 4 3 slaves<br>U806.01 = 3,4 and 5 4 slaves<br>U806.01 = 3,4,5 and 6 5 slaves<br><br>U806.02 = set like U806.01                                  |
| P082 <> 0 operating mode for field                                                                                                                                                                                                                      | P082 = 0 internal field is not used                                                                                                                                                                                                    |                                                                                                                                                                                         |
| Set P083 according to source of speed actual value                                                                                                                                                                                                      |                                                                                                                                                                                                                                        | P083 = 4 Freely connected actual speed value<br><br>P609 = 6023 Use actual speed value of master                                                                                        |
| $P100 = \frac{\text{Motor\_rated\_current}}{\text{Number\_of\_SIMOREG\_units}}$                                                                                                                                                                         |                                                                                                                                                                                                                                        |                                                                                                                                                                                         |
| Set P648, P649 according to source of control word                                                                                                                                                                                                      |                                                                                                                                                                                                                                        | P648 = 6021 Use control word 1 from master<br><br>P649 = 6022 Use control word 2 from master                                                                                            |
|                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                        | P821.01 = 31 Suppress alarm A031                                                                                                                                                        |
| U807 = 0.000s telegram failure does not cause a fault signal                                                                                                                                                                                            |                                                                                                                                                                                                                                        |                                                                                                                                                                                         |
| P110 = Actual armature resistance<br>x no. of SIMOREG converters<br><br>P111 = Actual armature inductance<br>x no. of SIMOREG converters<br><br>The optimization run for current controller and precontrol (P051 = 25) sets these parameters correctly. | P110 = set as on master<br><br>P111 = set as on master                                                                                                                                                                                 |                                                                                                                                                                                         |

For further details about the operating principle of parallel connections between SIMOREG converters, please refer to Section 8, Function Diagrams, Sheet G195 (paralleling interface).

Notes:

In this mode, it is possible to maintain operation of the remaining SIMOREG converters even if one of the devices fails (e.g. fuse tripped on power section). The correctly functioning SIMOREG converters continue operation without interruption even if a device fails. When configuring, it is necessary to take into account that the power of only  $n$  devices (instead of  $n+1$  devices) must be sufficient for the application.

- Control commands "Switch-on/Shutdown", "Enable operation", "Emergency stop" etc. must be connected to a group of parallel-connected SIMOREG converters on the master AND on the "standby" master.  
Terminals 37 and 38 must be permanently connected to terminal 34 on the slaves !
- The speed setpoint and the speed actual value must also be connected to a group of parallel-connected SIMOREG converters on the master AND on the "standby" master. !
- All parameters, with the exception of those specified in the list above, must be set on the master and the "standby" master.
- Optimization runs must be started on the master device. All slaves must be connected and ready to run when optimization is started.

## 6.9.2 Parallel connection of power sections

### 6.9.2.1 Current distribution / symmetry:

When connecting power sections in parallel, correct current distribution is important. None of the power sections must be overloaded in unsuitable conditions. Provision for sufficient power reduction must be made if necessary. The same type of construction and design for all parallel firing transformers / firing pulse amplifiers is therefore urgently recommended. Current distribution in the parallel connected power sections must be checked during commissioning and, if necessary, corrected by adapting the series impedances (commutating reactors, supply leads, and transformer). If there are unexpected problems, the simultaneity of the triggering pulses on the thyristors must be checked. The operating times of the firing pulses must not differ by more than 200 nanoseconds. We recommend comparing the firing currents of the thyristors with two small current probes on the oscilloscope. In the case of a galvanic connection, the power section must be safely de-energized to prevent accidents.

### 6.9.2.2 Comment about voltage measurement / synchronization:

The most suitable method is the connection of voltage measurements 1U1, 1V1, and 1W1 and the branching points of the network supply. The motor voltage connections 1C1 and 1D1 are non-critical.

### 6.9.2.3 Comment about fuse monitoring

As far as possible, all fuses of the parallel connected devices should be monitored. Especially important is the monitoring of the fuses on the branches that are not measured by a current transformer. Here, a current splitting unbalance by the SIMOREG converters is not measurable.

#### NOTE:

The currents measured through the SIMOREG converters (current distribution) are only based on the values derived from the current transformer. Current distribution in the phase that is not routed through current transformers (usually 1V1), cannot be measured on the SIMOREG itself.

When only one 6RA70 closed-loop control electronics board is used, with a corresponding parallel connection of firing pulses, it is not easy to calculate the current distribution between the power sections. One possible method is to measure the current on one device and calculate the other currents, and thus the total current, on the basis of the known current distribution. Alternatively, a separate closed-loop control board can be installed for each power section, which can calculate the assigned direct current itself. These individual currents can then be added and applied.



## WARNING

Disconnect the power supply before making any connections!

The measurements might sustain serious or irreparable damage if connected incorrectly.

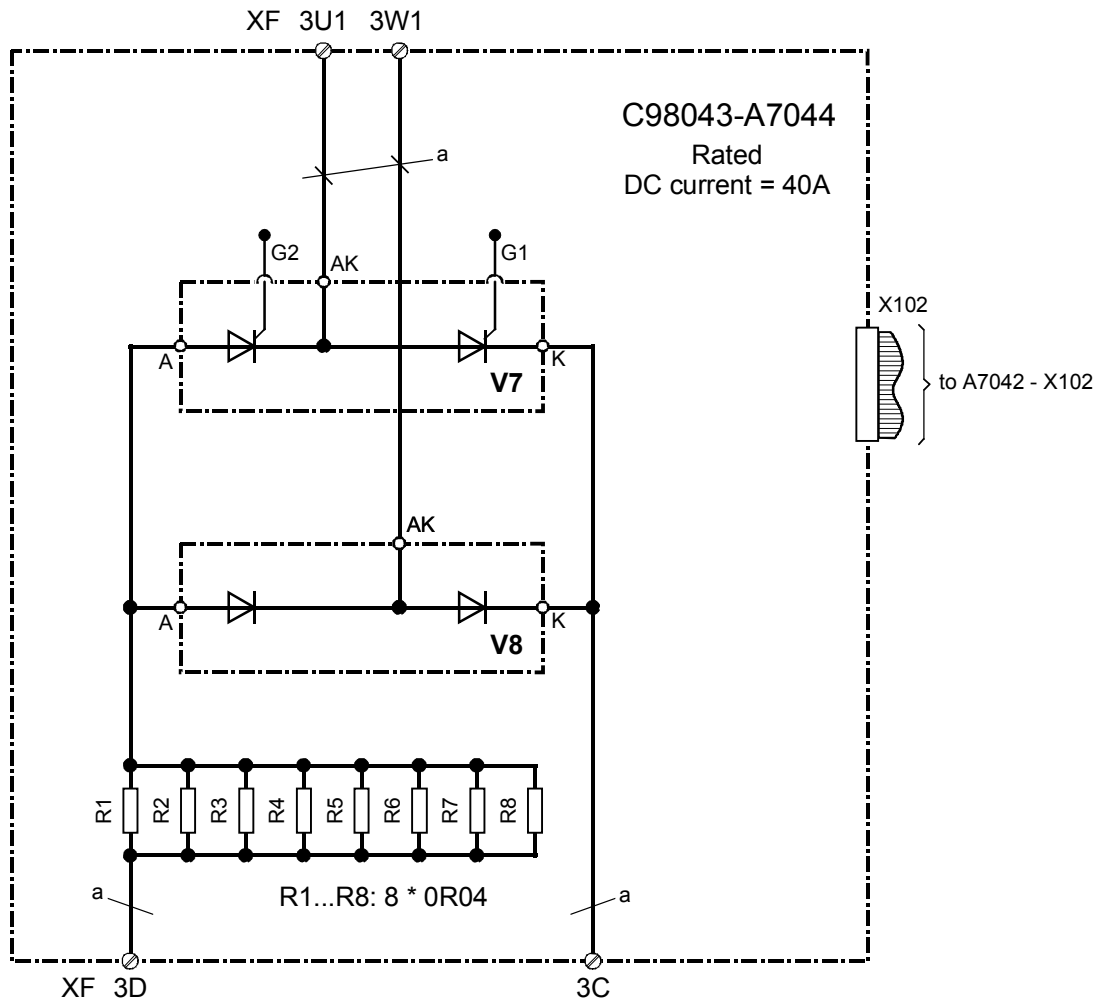


The device must be installed in conformance with the safety regulations (e.g. DIN, VDE) and all other relevant national and regional guidelines. Correct grounding, cable dimensioning, and the relevant short-circuit protection must be provided to guarantee operational safety.

Non-observance of the safety instructions can result in death, severe personal injury or substantial damage to property.

## 6.10 Field supply

### 6.10.1 Circuit diagram of the power section



a = Betatherm 145 6mm<sup>2</sup>  
Gating leads are Betatherm 145 1mm<sup>2</sup>

Fig. 6.10.1.1

### 6.10.2 Voltage measurement of the field power section

| Rated supply voltage            | Parameters | Ground leakage resistance |
|---------------------------------|------------|---------------------------|
| 130 V (field extra-low voltage) | U828 = 130 | 510 kΩ                    |
| 460V (state as delivered)       | U828 = 460 | 1815 kΩ                   |

### 6.10.3 Conversion to field extra-low voltage

For a field supply of less than 130 V supply voltage, the field supply section of module A7044 must be converted.

-Insert wire jumpers acc. to Fig. 6.10.3.1

Ring cable lugs for M6, 6.3 mm Faston connectors, wire cross section > 0.75 mm<sup>2</sup>

-Set parameter U828 = 130 (field extra-low voltage).

-Set P078 index.002 to the actual field rated input voltage

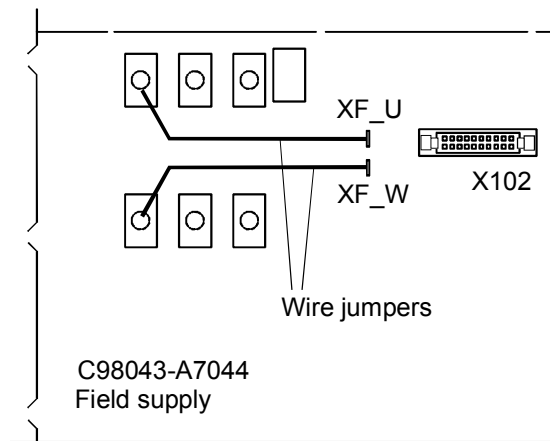


Fig. 6.10.3.1



#### WARNING



Disconnect the power supply before making any connections!

The measurements might sustain serious or irreparable damage if connected incorrectly.

These two wire jumpers must be removed again for operation with a higher field supply voltage.

## 6.11 Fuses and commutating reactors

### 6.11.1 Notes on commutating reactors

The line impedance including commutating reactors must be equivalent of between 4% and 10% short-circuit voltage. Commutating reactors can be provided by the customer to limit commutating voltage dips in the supply system. Commutating reactors must be dimensioned according to the regional guidelines for feedback on the network.

Please refer to Catalog DA93.1 regarding ordering data and selection criteria of commutating reactors.

### 6.11.2 Fuses for the field circuit

For technical data, configuring data and dimension drawings, please refer to Catalog DA94.1.

#### Recommended fuses for the field circuit

| Max. permissible field current | Fuse order No. | Rated current of fuse |
|--------------------------------|----------------|-----------------------|
| 10 A                           | 5SD420         | 16 A                  |
| 15 A                           | 5SD440         | 25 A                  |
| 25 A                           | 5SD440         | 25 A                  |
| 30 A                           | 5SD480         | 30 A                  |
| 40 A                           | 3NE1802-0      | 40 A                  |

### 6.11.3 Fuses in the power interface (board C98043-A7042)

Wickmann 198 1A / 250 V 5 x 20 mm slow

Wickmann 343 1A / 250 V 6.3 x 32 mm slow

Schurter FSD 1A / 250 V 5 x 20 mm slow, order code 0034.3987

Schurter FST 1A / 250 V 5 x 20 mm slow, order code 0034.3117

## 6.12 Arrangement of printed circuit boards

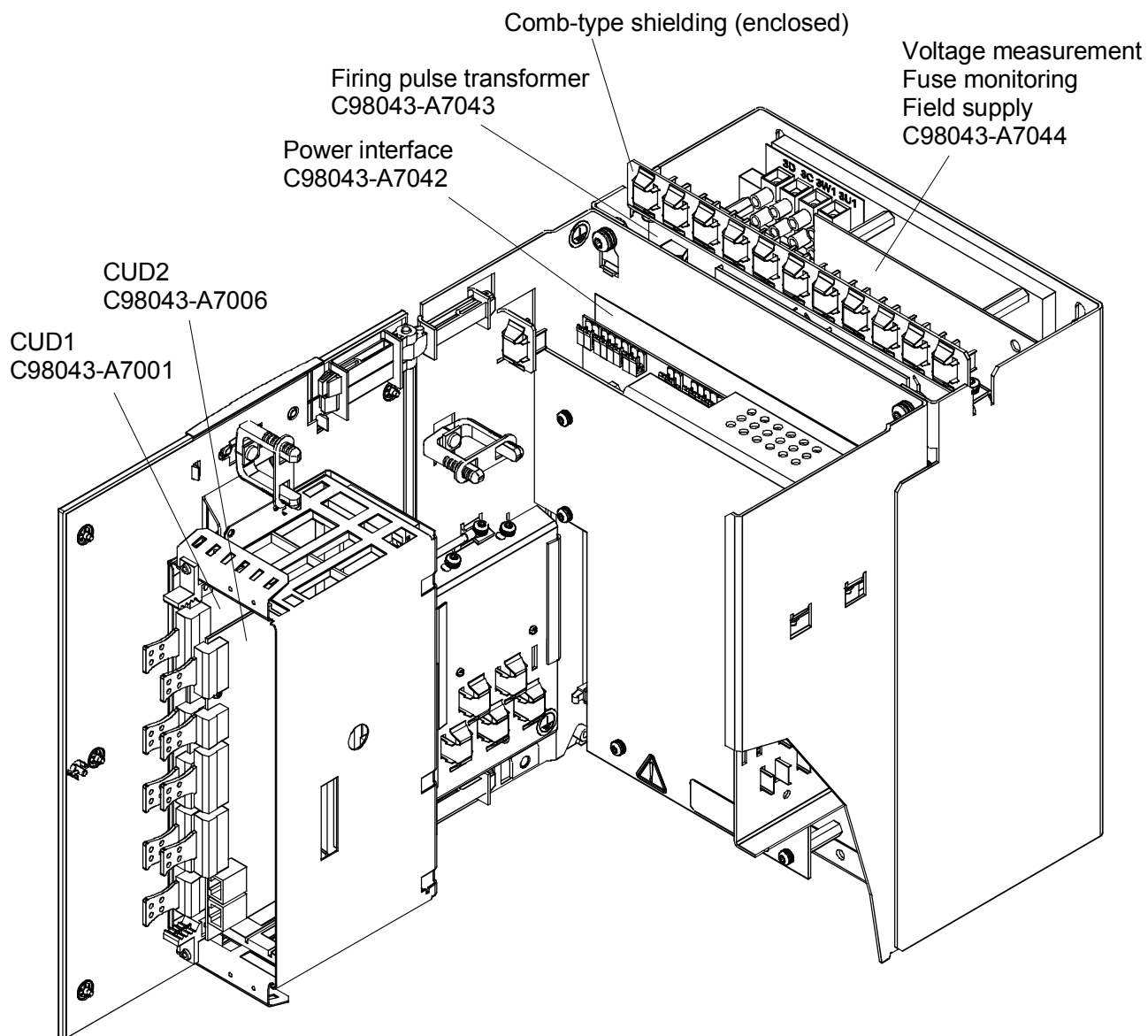


Fig. 6.12.1

## 6.13 Arrangement of customer connections (terminals, connectors, Faston tabs)

### Module C98043-A7001 (CUD1)

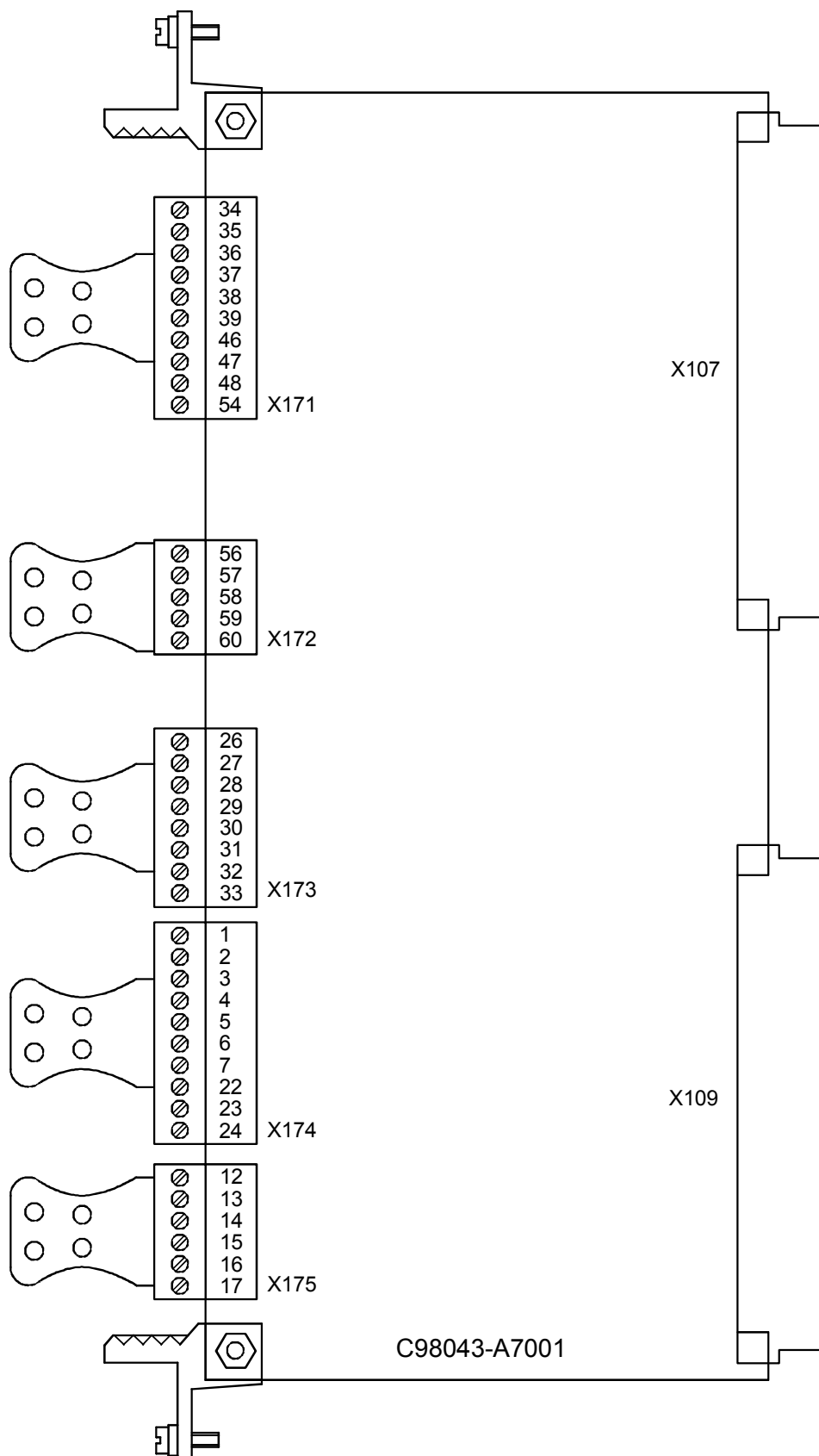


Fig. 6.13.1

Module C98043-A7006 (CUD2)

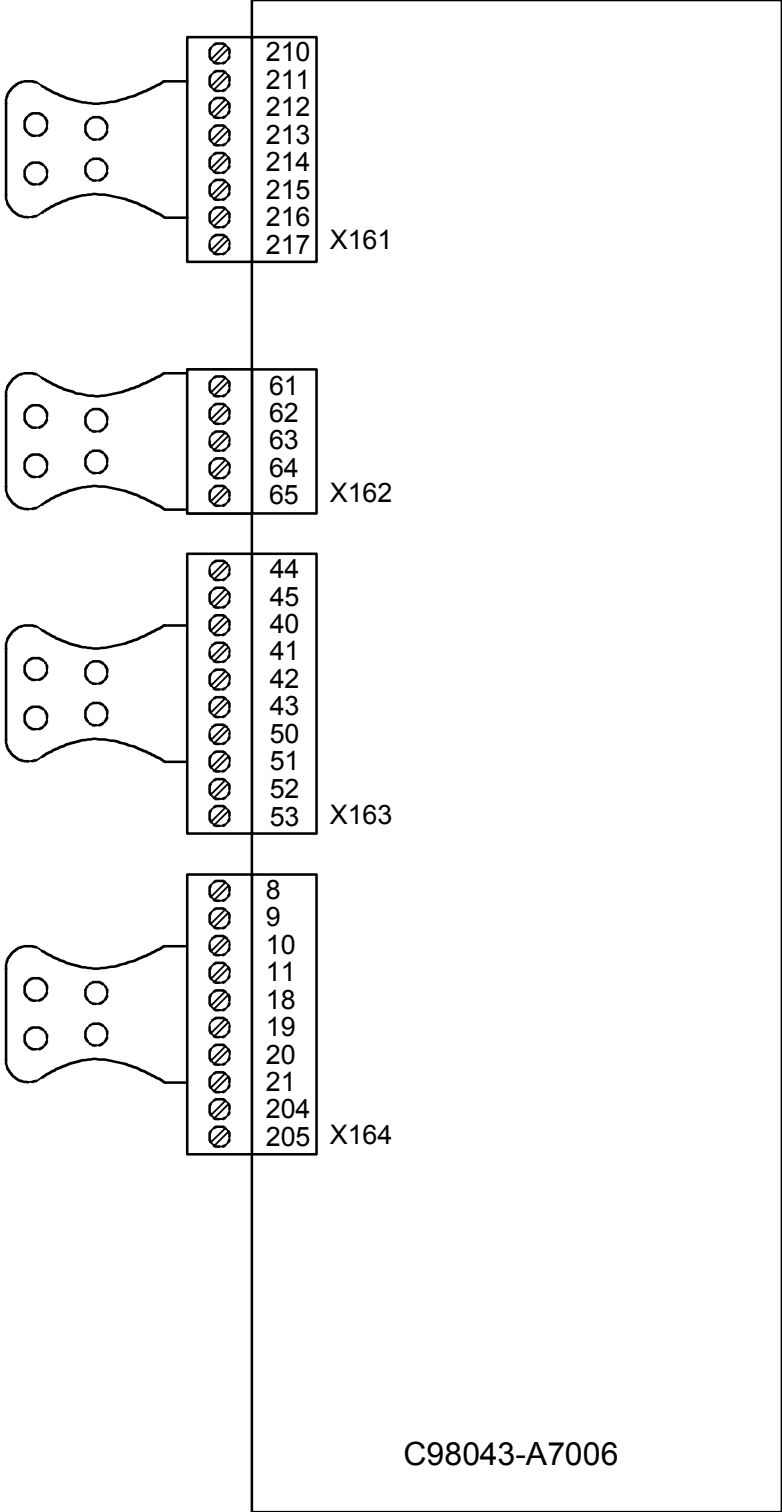


Fig. 6.13.2



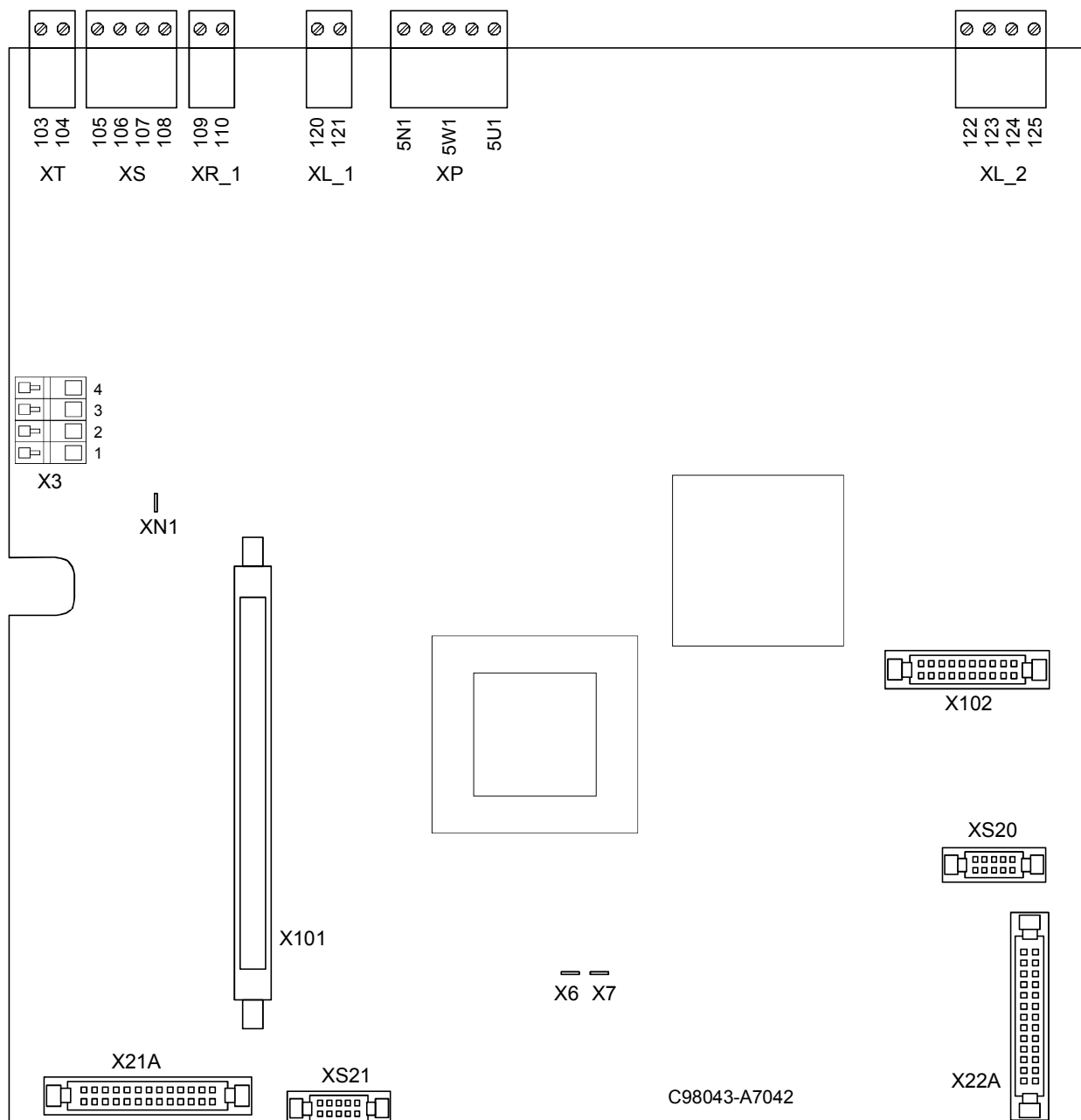
**Module C98043-A7042**

Fig. 6.13.3

## Module C98043-A7043

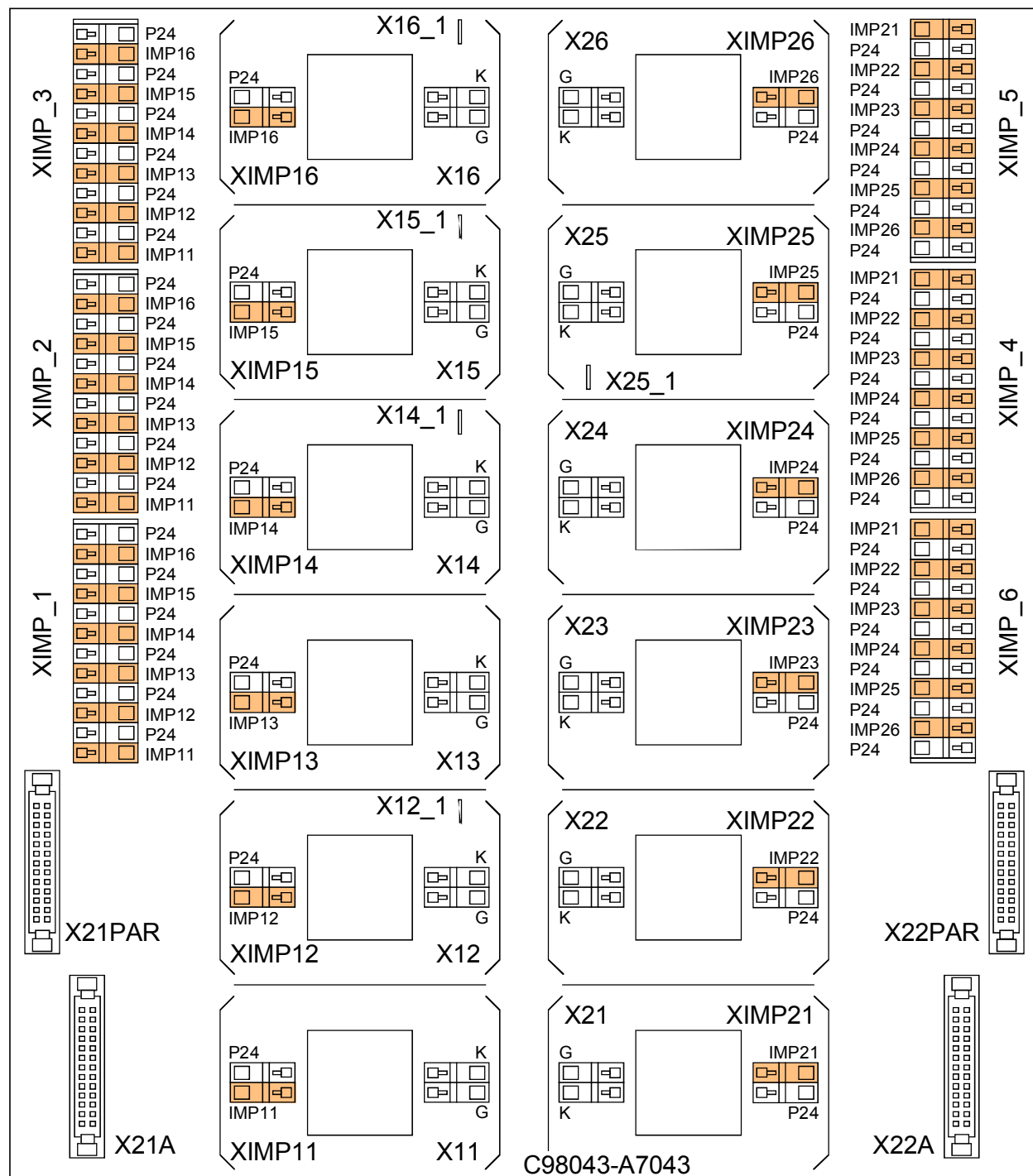


Fig. 6.13.4

## Note:

Each of the following connections are connected in parallel:

- Terminals with the same designation on terminal strips XIMP\_1, XIMP\_2 and XIMP\_3
- Terminals with the same designation on terminal strips XIMP\_4, XIMP\_5 and XIMP\_6
- X21A and X21PAR
- X22A and X22PAR

## Module C98043-A7044

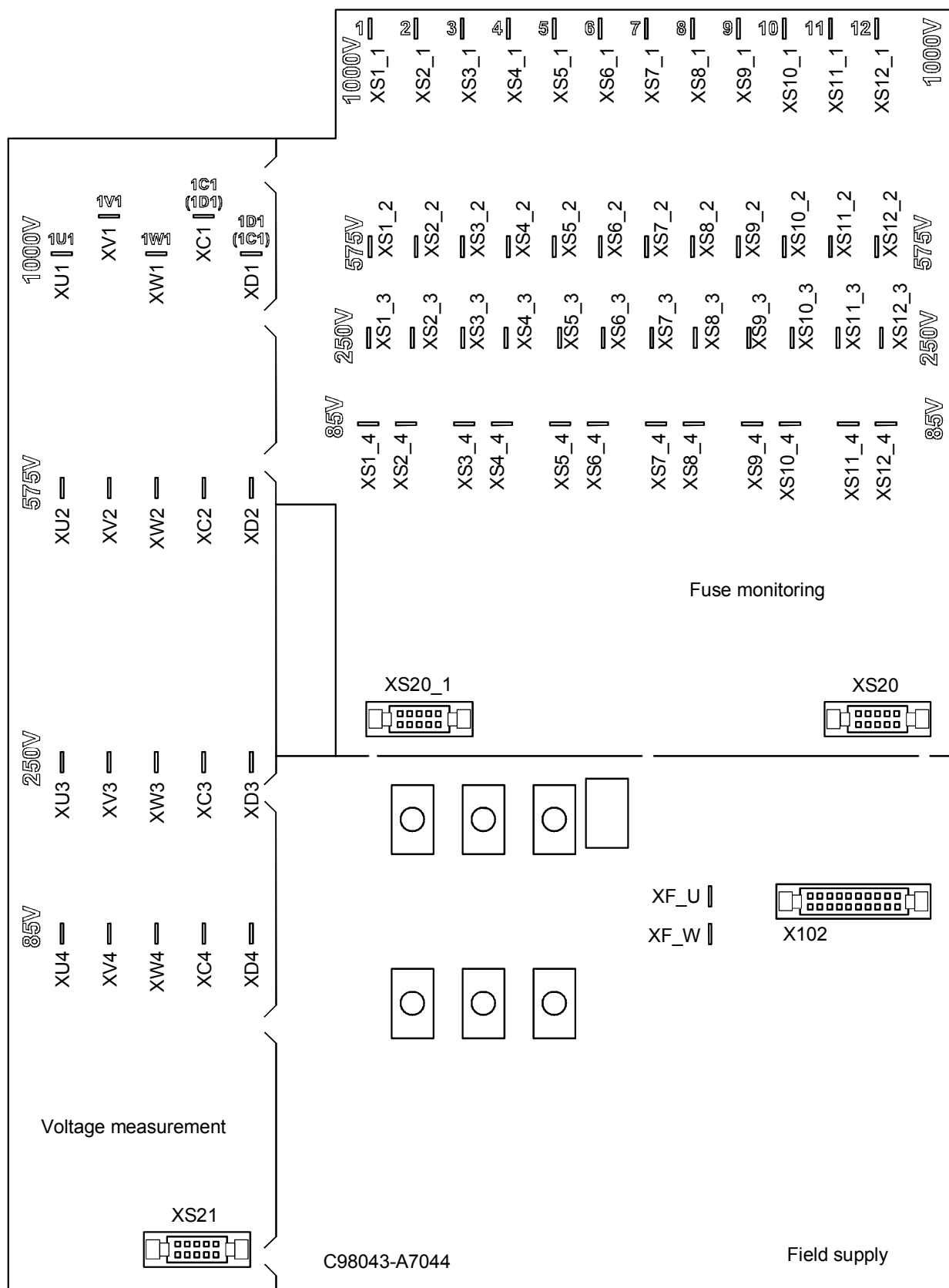


Fig. 6.13.5

## 6.14 Terminal assignment (terminals, Faston tabs, ribbon cables)



### WARNING



The converter might sustain serious or irreparable damage if connected incorrectly.

The power cables and/or busbars must be secured mechanically with strain relief outside the converter.

### Field circuit

Terminal type: European standard terminal strip (screw-type terminal)  
maximum conductor cross section 10 mm<sup>2</sup>

| Function                 | Terminal<br>XF | Connection values/remarks                                             |
|--------------------------|----------------|-----------------------------------------------------------------------|
| Supply connection        | 3U1<br>3W1     | 2AC 400V (– 20%), 2AC 460V (+10%)                                     |
| Field winding connection | 3C<br>3D       | Rated DC voltage 325V / 373V<br>For 2AC 400V / 460V supply connection |

Type of connection: Faston tabs, 6.3mm

| Function | Connection   | Connection values/remarks                                                                         |
|----------|--------------|---------------------------------------------------------------------------------------------------|
|          | XF_U<br>XF_W | For conversion of supply voltage measurement (field) to extra-low voltage acc. to Chapter 6.10.2. |

### Electronics power supply

Terminal type: Type 49 plug-in terminal  
Maximum cross-section 1.5mm<sup>2</sup>, finely stranded

Module C98043-A7042 power interface

| Function                | Connect.                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Terminal<br>XP    | Connection values/remarks                                                                                                                                                                                                |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Incoming supply<br>400V | <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 2px; background-color: black; margin-right: 5px;"></div> 1 </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 2px; background-color: black; margin-right: 5px;"></div> 2 </div> <div style="display: flex; align-items: center;"> NC 3 </div>                                                                                        | 5U1<br>5W1<br>5N1 | 2AC 380V (– 25%) to 460V (+15%); I <sub>n</sub> =1A<br>(– 35% for 1min)<br>Internal fusing with F1, F2 (1A medium time lag) on module C98043-A7042 (see Chapter 6.11.3)<br>External fusing max. 6A, characteristic C     |
| or                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                                                                                                                                                                                                                          |
| Incoming supply<br>230V | <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 2px; background-color: black; margin-right: 5px;"></div> 1 </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 2px; background-color: black; margin-right: 5px;"></div> 2 </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 2px; background-color: black; margin-right: 5px;"></div> 3 </div> | 5U1<br>5W1<br>5N1 | 1AC 190V (– 25%) to 230V (+15%); I <sub>n</sub> =2A<br>(– 35% for 1min)<br>Internal fusing with F1, F2 (2 x 1A medium time lag) on module C98043-A7042 (see Chapter 6.11.3)<br>External fusing max. 6A, characteristic C |

### NOTE

In the case of line voltages which exceed the tolerance range specified in Section 3.4, the electronics supply voltage and the field circuit mains supply connection must be adjusted by means of transformers to the permissible value stated in Section 3.4. It is essential to use an isolating transformer for rated line voltages in excess of 460V.

The rated supply voltage for the armature circuit (index 001) and the field circuit (index 002) must be set in parameter P078.

**Open-loop and closed-loop control section**Terminal type: **X171 to X175**

Plug-in terminal (screw-type)

Maximum connection cross-section 1.5mm<sup>2</sup>**XR\_1, XL\_1, XS, XT**

MSTB2.5 plug-in terminal

Maximum connection cross-section 2.5mm<sup>2</sup>**Analog inputs - setpoint inputs, reference voltage** (see also Section 8, sheet G113)

Module C98043-A7001 (CUD1)

| Function     |                                    | Terminal<br><b>X174</b> | Connection values/remarks                                                                                                                                                                                                                                                                                            |
|--------------|------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference    | M                                  | 1                       | } $\pm 1\%$ at 25°C (stability 0.1% per 10°K); 10mA short-circuit-proof                                                                                                                                                                                                                                              |
|              | P10                                | 2                       |                                                                                                                                                                                                                                                                                                                      |
|              | N10                                | 3                       |                                                                                                                                                                                                                                                                                                                      |
| Select input | main setpoint +<br>main setpoint – | 4<br>5                  | Input type (signal type) parameterizable:<br>- Differential input $\pm 10\text{V}$ ; 150k $\Omega$<br>- Current input 0 - 20mA; 300 $\Omega$ or<br>4 - 20mA; 300 $\Omega$<br><br>Resolution can be parameterized up to approx. 555 $\mu\text{V}$ ( $\pm 14\text{bit}$ )<br>Common mode suppression: $\pm 15\text{V}$ |
| Select input | analog 1 +<br>analog 1 –           | 6<br>7                  |                                                                                                                                                                                                                                                                                                                      |

**Analog inputs - actual speed inputs, tacho inputs** (see also Section 8, sheet G113)

Module C98043-A7042 power interface

| Function                    | Terminal<br><b>XT</b> | Connection values/remarks          |
|-----------------------------|-----------------------|------------------------------------|
| Tacho connection 8V to 270V | 103                   | $\pm 270\text{V}$ ; >143k $\Omega$ |
| Ground analog M             | 104                   |                                    |

**Pulse encoder input** (see also Section 8, sheet G145)

Module C98043-A7001 (CUD1)

| Function                  |                  | Terminal<br>X173 | Connection values/remarks                                                                                                               |
|---------------------------|------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Supply (+13.7V to +15.2V) |                  | 26               | 200mA; short-circuit-proof (electronic protection)<br>Overload response: Fault message F018<br>Warning signal A018                      |
| Ground pulse encoder M    |                  | 27               |                                                                                                                                         |
| Track 1                   | Plus connection  | 28               | Load: $\leq 5.25\text{mA}$ at 15V<br>(w/o switching losses, see below for cable, cable length, shield connection)                       |
|                           | Minus connection | 29               |                                                                                                                                         |
| Track 2                   | Plus connection  | 30               | Switching hysteresis: see below<br>Pulse ratio: 1:1                                                                                     |
|                           | Minus connection | 31               |                                                                                                                                         |
| Zero marker               | Plus connection  | 32               | Level of input pulses: see below.<br>Track offset: Table 1 see below.<br>Pulse frequency: Table 2 see below.<br>Cable length: see below |
|                           | Minus connection | 33               |                                                                                                                                         |

**Characteristic data of pulse generator evaluation electronics****Level of input pulses:**

Encoder signals (symmetrical / asymmetrical) up to a max. 27V differential voltage can be processed by the analyzer electronics.

Electronic adaptation of evaluation electronics to the signal voltage of the encoder:

- Rated input voltage range **5V** (P142=0):  
 Low level: Differential voltage  $< 0.8\text{V}$   
 High level: Differential voltage  $> 2.0\text{V}$   
 Hysteresis:  $> 0.2\text{V}$   
 Common-mode control range:  $\pm 10\text{V}$
- Rated input voltage range **15V** (P142=1):  
 Low level: Differential voltage  $< 5.0\text{V}$   
 High level: Differential voltage  $> 8.0\text{V}$   
 Restriction: See switching frequency  
 Hysteresis:  $> 1\text{V}$   
 Common-mode control range:  $\pm 10\text{V}$

If the pulse encoder does not supply symmetrical encoder signals, then its ground must be routed as a twisted-pair lead with every signal cable and connected to the negative terminals of track 1, track 2, and the zero marker.

**Switching frequency:**

The maximum permissible frequency of the encoder pulses is 300kHz. To ensure correct evaluation of the encoder pulses, the minimum distance  $T_{\min}$  between two encoder signal edges (tracks 1 and 2) specified in the table must be observed:

Table 1:

|               | Rated input voltage 5V  |       | Rated input voltage 15V |       |                |
|---------------|-------------------------|-------|-------------------------|-------|----------------|
|               | Differential voltage 1) |       | 8V                      | 10V   | $> 14\text{V}$ |
| $T_{\min}$ 2) | 630ns                   | 380ns | 630ns                   | 430ns | 380ns          |

1) Differential voltage at the terminals of the evaluation electronics

2) The phase error  $L_G$  (deviating from  $90^\circ$ ), which may occur as the result of encoder and cable, can be calculated from  $T_{\min}$ :

$$L_G = \pm (90^\circ - f_p \cdot T_{\min} \cdot 360^\circ)$$

$L_G$  = phase error

$f_p$  = pulse frequency

$T_{\min}$  = minimum distance between edges

This formula applies only if the encoder pulse ratio is 1:1.

If the pulse encoder is incorrectly matched to the encoder cable, disturbing cable reflections will be produced at the receive end. These reflections must be damped so that the encoder pulses can be correctly evaluated. The limit values listed in the table below must be maintained to ensure that the resultant power loss in the adapting element of the evaluation electronics is not exceeded.

Table 2:

|                                    |           |           |           |           |           |
|------------------------------------|-----------|-----------|-----------|-----------|-----------|
| $f_{\max}$                         | 50kHz     | 100kHz    | 150kHz    | 200kHz    | 300kHz    |
| Differential voltage <sup>3)</sup> | Up to 27V | Up to 22V | Up to 18V | Up to 16V | Up to 14V |

3) Differential voltage of encoder pulses at no load  
(approximate encoder power supply voltage)

### Cable, cable length, shield connection:

The encoder cable capacitance must be recharged at each encoder edge change. The RMS value of this current is proportional to the cable length and the pulse frequency and must exceed the current specified by the encoder manufacturer. A suitable cable as recommended by the encoder manufacturer must be used. The maximum cable length must not be exceeded. Generally, a twisted cable pair with common pair shield is sufficient for each track. Crosstalk between the cables is thus reduced. The shielding of all pairs protects against noise pulses. The shield must be connected to the shield bar of the SIMOREG converter with a large contact surface.

### Temperature sensor inputs – Motor interface (1) (see also Chapter 8, Sheet G185)

Module C98043-A7001 (CUD1)

| Function                         | Terminal<br>X174 | Connection values/remarks                                                                               |
|----------------------------------|------------------|---------------------------------------------------------------------------------------------------------|
| Motor temperature                | 22               | Sensor acc. to P490 index 1                                                                             |
| Connection of temperature sensor | 23               | The cable to the temperature sensor on the motor must be shielded and connected to ground at both ends. |
| Ground analog M                  | 24               |                                                                                                         |

### Analog outputs (see also Section 8, sheet G115)

Module C98043-A7001 (CUD1)

| Function               | Terminal<br>X175 | Connection values/remarks                                                   |
|------------------------|------------------|-----------------------------------------------------------------------------|
| Actual current         | 12               | 0. . . ±10V corresponds to 0. . . ±200%                                     |
| Ground analog M        | 13               | Converter rated DC current (r072.002)<br>Max. load 2mA, short-circuit-proof |
| Select output analog 1 | 14               | 0. . . ±10V, max. 2mA                                                       |
| Ground analog M        | 15               | Short circuit proof                                                         |
| Select output analog 2 | 16               | Resolution ±11bit                                                           |
| Ground analog M        | 17               |                                                                             |

**Digital inputs** (see also Section 8, sheet G110)

Module C98043-A7001 (CUD1)

| Function                                                                                                                                                                                                                                                                                                                                                                                           | Terminal<br>X171 | Connection values/remarks                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supply (output)                                                                                                                                                                                                                                                                                                                                                                                    | 34               | 24V DC, short circuit proof<br>max. load 200mA (terminals 34, 44, and 210 combined),<br>internal supply with respect to internal ground<br>Overload response: Error signal F018<br>Warning signal A018 |
| Ground digital M                                                                                                                                                                                                                                                                                                                                                                                   | 35               |                                                                                                                                                                                                        |
| Select input binary 1                                                                                                                                                                                                                                                                                                                                                                              | 36               |                                                                                                                                                                                                        |
| Power On / Shutdown<br>H signal: Power ON<br>Line contactor CLOSED + (with<br>H signal at terminal 38),<br>acceleration along ramp-function<br>generator ramp to operating<br>speed.<br>L signal: Shutdown<br>Deceleration along ramp-<br>function generator ramp to $n < n_{min}$ (P370) + , controller disable<br>+ line contactor OPEN.<br>See Section 9.3.3 for exact<br>function description. | 37               |                                                                                                                                                                                                        |
| Enable operation<br>H signal: Controller enabled<br>L signal: Controller disabled<br>See Section 9.3.4 for exact<br>function description                                                                                                                                                                                                                                                           | 38               |                                                                                                                                                                                                        |
| Select input binary 2                                                                                                                                                                                                                                                                                                                                                                              | 39               |                                                                                                                                                                                                        |

**Monitoring inputs**

Module C98043-A7042 power interface

| Function                                                 | Terminal<br>XL_2 | Connection values/remarks                                                                                                                                      |
|----------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fan monitoring +<br>(L signal = interference F067)-      | 122<br>123       | Differential inputs<br>Max. input voltage $\pm 50V$<br>Common mode range $-2V$ to $+50V$<br>L signal: $< 8V$<br>H signal: $> 11V$<br>Input resistance 30 kohms |
| External monitoring +<br>(L signal = interference F003)- | 124<br>125       |                                                                                                                                                                |



**Safety shutdown (E-STOP)** (see also Section 9.8 and Section 8, sheet G112)

Module C98043-A7042 power interface

| Function                            | Terminal XS | Connection values/remarks                                                                                  |
|-------------------------------------|-------------|------------------------------------------------------------------------------------------------------------|
| Supply for safety shutdown (output) | 106         | 24V DC, max. load 50mA, short-circuit-proof<br>Overload response: Error signal F018<br>Warning signal A018 |
| Safety shutdown switch              | 105         | $I_e = 20\text{mA}$                                                                                        |
| Safety shutdown pushbutton          | 107         | NC contact $I_e = 30\text{mA}$                                                                             |
| Safety shutdown Reset               | 108         | NO contact $I_e = 10\text{mA}$                                                                             |

**NOTICE**

Both 105 + 106 terminals or 106, 107 + 108 terminals can be used! Combined use of terminals 105 – 108 will result in a malfunction.

Terminal 105 is connected to terminal 106 in the state as delivered.

**Digital outputs** (see also Section 8, sheet G112)

Module C98043-A7001 (CUD1)

| Function                           | Terminal X171 | Connection values/remarks                                                                                     |
|------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------|
| Select output binary 1<br>Ground M | 46<br>47      | H signal: +20V to +26V<br>L signal: 0 to +2V<br>Short-circuit-proof 100mA                                     |
| Select output binary 2<br>Ground M | 48<br>54      | Internal snubber circuit (free-wheeling diode)<br>Overload response: Error signal F018<br>Warning signal A018 |

**Control outputs (isolated relay outputs)**

Module C98043-A7042 power interface

| Function                 | Terminal XR_1 | Connection values/remarks                                                                                                                                                                            |
|--------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Relay for line contactor | 109<br>110    | Load capability:<br>$\leq 250\text{V AC}$ , 4A; $\cos\Phi=1$<br>$\leq 250\text{V AC}$ , 2A; $\cos\Phi=0,4$<br>$\leq 30\text{V DC}$ , 2A<br><br>External fusing max. 4A, characteristic C recommended |

Module C98043-A7042 power interface

| Function                 | Terminal XL_2 | Connection values/remarks                                                                                                                                                                            |
|--------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Relay for fan protection | 120<br>121    | Load capability:<br>$\leq 250\text{V AC}$ , 4A; $\cos\Phi=1$<br>$\leq 250\text{V AC}$ , 2A; $\cos\Phi=0,4$<br>$\leq 30\text{V DC}$ , 2A<br><br>External fusing max. 4A, characteristic C recommended |

### Serial interface 1 RS232 (9-pin SUBMIN D socket connector) (G-SST1) X300

**Use a shielded connecting cable! Ground shield at both ends!**

Module C98043-A7005 PMU

| Con. pin<br>X300 | Function                                                                       |
|------------------|--------------------------------------------------------------------------------|
| 1                | Housing ground                                                                 |
| 2                | Receive cable to RS232 (V.24) standard                                         |
| 3                | Send and receive cables to RS485, two-wire, positive differential input/output |
| 4                | Input: Reserved for later use                                                  |
| 5                | Ground                                                                         |
| 6                | 5 V voltage supply for OP1S                                                    |
| 7                | Send cable to RS232 (V.24) standard                                            |
| 8                | Send and receive cables to RS485, two-wire, positive differential input/output |
| 9                | Ground                                                                         |

Cable length: Up to 15m according to EIA Standard RS232C  
Up to 30 m capacitive load, max. 2.5nF (cable and receiver)

A serial connection can be made to a PLC or PC with cable connector X300 on the PMU. The device can then be controlled and operated from a central control center or control room.

### Serial interface 2 RS485 (G-SST2)

Module C98043-A7001 (CUD1)

| Function | Terminal<br>X172 | Connection values/remarks                                                                                           |
|----------|------------------|---------------------------------------------------------------------------------------------------------------------|
| TX+      | 56               | RS485, 4-wire send cable, positive differential input                                                               |
| TX-      | 57               | RS485, 4-wire send cable, negative differential input                                                               |
| RX+/TX+  | 58               | RS485, 4-wire receive cable, positive differential input,<br>2-wire send/receive cable, positive differential input |
| RX-/TX-  | 59               | RS485, 4-wire receive cable, negative differential input,<br>2-wire send/receive cable, negative differential input |
| M        | 60               | Ground                                                                                                              |

Cable length: For transmission rate =187.5kBd  $\Rightarrow$  600m  
For transmission rate  $\leq$ 93.75kBd  $\Rightarrow$  1200m

The following must be observed: DIN 19245 Part 1

In particular, the difference in potential between the data reference potentials M of all interfaces must not exceed -7V / +12V. If this cannot be guaranteed, equipotential bonding must be provided.

Activation of interface 1 or 2:

- Set the baud rate in parameter P783 or P793.
- Set the protocol in parameter P780 or P790.

**Temperature sensor inputs**

Type of connection: Faston tabs, 2.8mm

Module C98043-A7042 power interface

| Function                         | Connection | Connection values/remarks |
|----------------------------------|------------|---------------------------|
| Heat sink temperature            | X6         | Sensor acc. to U830       |
| Connection of temperature sensor | X7         |                           |

**Current transformer connections**

Terminal type: Cage clamp terminal  
maximum connection cross-section 1.5mm<sup>2</sup>

Module C98043-A7042 power interface

| Function                           | Terminal<br>X3 | Connection values/remarks                                            |
|------------------------------------|----------------|----------------------------------------------------------------------|
| Current transf. T1 Connect. k1     | 4              | see Chapter 6.3<br>Configuration of current transformer acc. to U824 |
| Connect. I1 (M)                    | 3              |                                                                      |
| Current transf. T2 Connect. I2 (M) | 2              |                                                                      |
| Connect. k2                        | 1              |                                                                      |

**Balance actual current measurement**

Type of connection: Faston tabs, 2.8mm

Module C98043-A7042 power interface

| Function                                             | Connection | Connection values/remarks |
|------------------------------------------------------|------------|---------------------------|
| Feed-in point for balance actual current measurement | XN1        | see Chapter 6.5           |

**Monitoring, field supply****Voltage measurement**

Type of connection: Faston tabs, 6.3mm

Module C98043-A7044 voltage measurement

| Function                                               | Connection        | Connection values/remarks                                          |
|--------------------------------------------------------|-------------------|--------------------------------------------------------------------|
| Meas. of the supply voltage<br>Phases U-V-W<br>(1000V) | XU1<br>XV1<br>XW1 | Rated voltage network (armature) = > 575 to 1000V<br>(U821 = 1000) |
| Meas. of armature voltage<br>(1000V)                   | XC1<br>XD1        | Rated voltage network (armature) = > 575 to 1000V<br>(U821 = 1000) |
| Meas. of the supply voltage<br>Phases U-V-W<br>(575V)  | XU2<br>XV2<br>XW2 | Rated voltage network (armature) = > 250 to 600V<br>(U821 = 575)   |
| Meas. of armature voltage<br>(575V)                    | XC2<br>XD2        | Rated voltage network (armature) = > 250 to 600V<br>(U821 = 575)   |
| Meas. of the supply voltage<br>Phases U-V-W<br>(250V)  | XU3<br>XV3<br>XW3 | Rated voltage network (armature) = > 85 to 250V<br>(U821 = 250)    |
| Meas. of armature voltage<br>(250V)                    | XC3<br>XD3        | Rated voltage network (armature) = > 85 to 250V<br>(U821 = 250)    |
| Meas. of the supply voltage<br>Phases U-V-W<br>(85V)   | XU4<br>XV4<br>XW4 | Rated voltage network (armature) = ≤ 85V<br>(U821 = 85)            |
| Meas. of armature voltage<br>(85V)                     | XC4<br>XD4        | Rated voltage network (armature) = ≤ 85V<br>(U821 = 85)            |

## Fuse monitoring

Type of connection: Faston tabs, 6.3mm

Module C98043-A7044 fuse monitoring

| Function          | Connection       | Connection values/remarks                                                             |
|-------------------|------------------|---------------------------------------------------------------------------------------|
| Fuse 1<br>(1000V) | XS1_1<br>XS2_1   | Measuring cables for the monitored fuses at network rated voltage = > 575 to 1000V *) |
| Fuse 2<br>(1000V) | XS3_1<br>XS4_1   |                                                                                       |
| Fuse 3<br>(1000V) | XS5_1<br>XS6_1   |                                                                                       |
| Fuse 4<br>(1000V) | XS7_1<br>XS8_1   |                                                                                       |
| Fuse 5<br>(1000V) | XS9_1<br>XS10_1  |                                                                                       |
| Fuse 6<br>(1000V) | XS11_1<br>XS12_1 |                                                                                       |
| Fuse 1<br>(575V)  | XS1_2<br>XS2_2   | Measuring cables for the monitored fuses at network rated voltage > 250 to 600V *)    |
| Fuse 2<br>(575V)  | XS3_2<br>XS4_2   |                                                                                       |
| Fuse 3<br>(575V)  | XS5_2<br>XS6_2   |                                                                                       |
| Fuse 4<br>(575V)  | XS7_2<br>XS8_2   |                                                                                       |
| Fuse 5<br>(575V)  | XS9_2<br>XS10_2  |                                                                                       |
| Fuse 6<br>(575V)  | XS11_2<br>XS12_2 |                                                                                       |
| Fuse 1<br>(250V)  | XS1_3<br>XS2_3   | Measuring cables for the monitored fuses at network rated voltage > 85 to 250V *)     |
| Fuse 2<br>(250V)  | XS3_3<br>XS4_3   |                                                                                       |
| Fuse 3<br>(250V)  | XS5_3<br>XS6_3   |                                                                                       |
| Fuse 4<br>(250V)  | XS7_3<br>XS8_3   |                                                                                       |
| Fuse 5<br>(250V)  | XS9_3<br>XS10_3  |                                                                                       |
| Fuse 6<br>(250V)  | XS11_3<br>XS12_3 |                                                                                       |
| Fuse 1<br>(85V)   | XS1_4<br>XS2_4   | Measuring cables for the monitored fuses at network rated voltage = 20 to 85V *)      |
| Fuse 2<br>(85V)   | XS3_4<br>XS4_4   |                                                                                       |
| Fuse 3<br>(85V)   | XS5_4<br>XS6_4   |                                                                                       |
| Fuse 4<br>(85V)   | XS7_4<br>XS8_4   |                                                                                       |
| Fuse 5<br>(85V)   | XS9_4<br>XS10_4  |                                                                                       |
| Fuse 6<br>(85V)   | XS11_4<br>XS12_4 |                                                                                       |

\*) The fuse monitoring device is usually connected to the armature current circuit but can also be used for the field circuit, fan circuit, or the primary circuit of a heavy current transformer. The connections of the fuse monitoring used are based on the voltage applied to a tripped fuse.

The fuse monitor is switched on and off in parameter U831 (0=OFF, 1=ON).

**Firing pulse transformer** (C98043-A7043)

Terminal type: Cage clamp terminal  
maximum connection cross-section 1.5mm<sup>2</sup>

Fuse of P24 on power interface (C98043-A7042) with F3 (1A medium time-lag fuse)

Module C98043-A7043 firing pulse module

| Function                                                    | Terminal<br>XIMP_1 | Connection values/remarks                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V11 | IMP11<br>P24       | When the firing pulse transformer module is divided (see Chapter 6.4), the gate controls for the firing pulse transformers are led through these terminal connections<br>The following connections must be implemented for this:<br>XIMP_1 - IMP11 → XIMP11 - IMP11 (for thyristor V11)<br>XIMP_1 - P24 → XIMP11 - P24 (for thyristor V11)<br>XIMP_1 - IMP12 → XIMP12 - IMP12 (for thyristor V12)<br>XIMP_1 - P24 → XIMP12 - P24 (for thyristor V12)<br>etc. |
| Gate control for firing pulse transformer for thyristor V12 | IMP12<br>P24       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Gate control for firing pulse transformer for thyristor V13 | IMP13<br>P24       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Gate control for firing pulse transformer for thyristor V14 | IMP14<br>P24       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Gate control for firing pulse transformer for thyristor V15 | IMP15<br>P24       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Gate control for firing pulse transformer for thyristor V16 | IMP16<br>P24       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

Module C98043-A7043 firing pulse module

| Function                                                    | Terminal<br>XIMP_2 | Connection values/remarks                                                                                             |
|-------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V11 | IMP11<br>P24       | The terminals of terminal strip IMP_2 are parallel to the terminals of the same designation of terminal strip XIMP_1. |
| Gate control for firing pulse transformer for thyristor V12 | IMP12<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V13 | IMP13<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V14 | IMP14<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V15 | IMP15<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V16 | IMP16<br>P24       |                                                                                                                       |

Module C98043-A7043 firing pulse module

| Function                                                    | Terminal<br>XIMP_3 | Connection values/remarks                                                                                             |
|-------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V11 | IMP11<br>P24       | The terminals of terminal strip IMP_3 are parallel to the terminals of the same designation of terminal strip XIMP_1. |
| Gate control for firing pulse transformer for thyristor V12 | IMP12<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V13 | IMP13<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V14 | IMP14<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V15 | IMP15<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V16 | IMP16<br>P24       |                                                                                                                       |

## Module C98043-A7043 firing pulse module

| Function                                                    | Terminal<br>XIMP_4 | Connection values/remarks                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V21 | IMP21<br>P24       | When the firing pulse transformer module is divided (see Chapter 6.4), the gate controls for the firing pulse transformers are led through these terminal connections<br>The following connections must be implemented for this:<br>XIMP_4 - IMP21 → XIMP21 - IMP21 (for thyristor V21)<br>XIMP_4 - P24 → XIMP21 - P24 (for thyristor V11)<br>XIMP_4 - IMP22 → XIMP22 - IMP22 (for thyristor V22)<br>XIMP_4 - P24 → XIMP22 - P24 (for thyristor V12)<br>etc. |
| Gate control for firing pulse transformer for thyristor V22 | IMP22<br>P24       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Gate control for firing pulse transformer for thyristor V23 | IMP23<br>P24       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Gate control for firing pulse transformer for thyristor V24 | IMP24<br>P24       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Gate control for firing pulse transformer for thyristor V25 | IMP25<br>P24       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Gate control for firing pulse transformer for thyristor V26 | IMP26<br>P24       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Module C98043-A7043 firing pulse module

| Function                                                    | Terminal<br>XIMP_5 | Connection values/remarks                                                                                             |
|-------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V21 | IMP21<br>P24       | The terminals of terminal strip IMP_5 are parallel to the terminals of the same designation of terminal strip XIMP_4. |
| Gate control for firing pulse transformer for thyristor V22 | IMP22<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V23 | IMP23<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V24 | IMP24<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V25 | IMP25<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V26 | IMP26<br>P24       |                                                                                                                       |

## Module C98043-A7043 firing pulse module

| Function                                                    | Terminal<br>XIMP_6 | Connection values/remarks                                                                                             |
|-------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V21 | IMP21<br>P24       | The terminals of terminal strip IMP_6 are parallel to the terminals of the same designation of terminal strip XIMP_4. |
| Gate control for firing pulse transformer for thyristor V22 | IMP22<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V23 | IMP23<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V24 | IMP24<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V25 | IMP25<br>P24       |                                                                                                                       |
| Gate control for firing pulse transformer for thyristor V26 | IMP26<br>P24       |                                                                                                                       |

## Module C98043-A7043 firing pulse module

| Function                                                    | Terminal<br>XIMP11 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V11 | IMP11<br>P24       | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_1) |

| Function                   | Terminal<br>X11 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V11 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

| Function                                                    | Terminal<br>XIMP12 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V12 | IMP12<br>P24       | only connect if the firing pulse transformer module is divided (see terminal strip IMP_1) |

| Function                   | Terminal<br>X12 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V12 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

| Function                                                    | Terminal<br>XIMP13 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V13 | IMP13<br>P24       | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_1) |

| Function                   | Terminal<br>X13 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V13 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

| Function                                                    | Terminal<br>XIMP143 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V14 | IMP14<br>P24        | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_1) |

| Function                   | Terminal<br>X14 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V14 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

| Function                                                    | Terminal<br>XIMP15 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V15 | IMP15<br>P24       | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_1) |

| Function                   | Terminal<br>X15 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V15 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |



| Function                                                    | Terminal<br>XIMP16 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V16 | IMP16<br>P24       | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_1) |

| Function                   | Terminal<br>X16 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V16 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

| Function                                                    | Terminal<br>XIMP21 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V21 | IMP21<br>P24       | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_4) |

| Function                   | Terminal<br>X21 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V21 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

| Function                                                    | Terminal<br>XIMP22 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V22 | IMP22<br>P24       | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_4) |

| Function                   | Terminal<br>X22 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V22 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

| Function                                                    | Terminal<br>XIMP23 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V23 | IMP23<br>P24       | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_4) |

| Function                   | Terminal<br>X23 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V23 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

| Function                                                    | Terminal<br>XIMP24 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V24 | IMP24<br>P24       | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_4) |

| Function                   | Terminal<br>X24 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V24 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

| Function                                                    | Terminal<br>XIMP25 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V25 | IMP25<br>P24       | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_4) |

| Function                   | Terminal<br>X25 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V25 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

| Function                                                    | Terminal<br>XIMP26 | Connection values/remarks                                                                 |
|-------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------|
| Gate control for firing pulse transformer for thyristor V26 | IMP26<br>P24       | Only connect if the firing pulse transformer module is divided (see terminal strip IMP_4) |

| Function                   | Terminal<br>X26 | Connection values/remarks                                          |
|----------------------------|-----------------|--------------------------------------------------------------------|
| Firing cable thyristor V26 | G<br>K          | Firing pulse (see below)<br>gate (G) against auxiliary cathode (K) |

## Firing pulse:

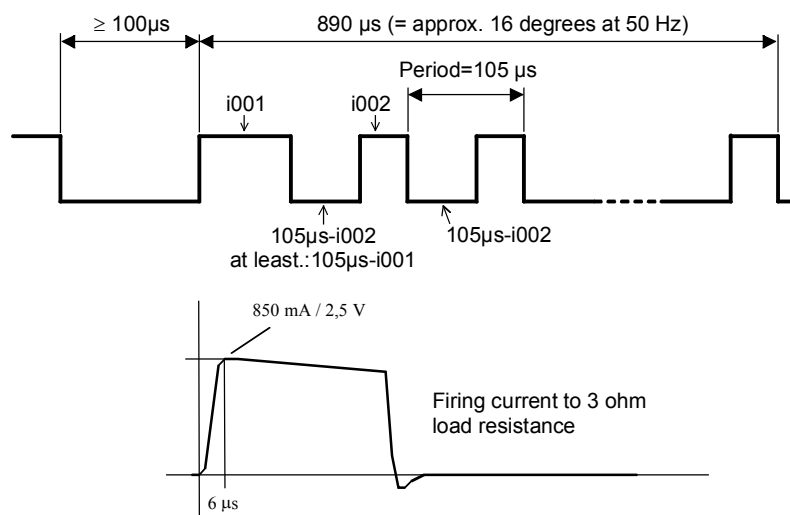
### Time characteristic:

The time characteristic of the firing pulses is set via parameter U826:

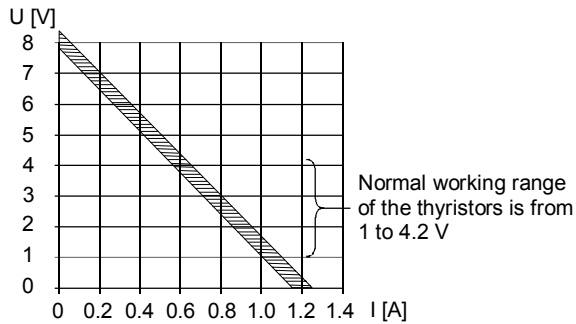
Parameter U826    Index i001: Length of first pulse (factory setting = 50  $\mu$ s)  
                          Index i002: Length of subsequent pulses (factory setting = 35  $\mu$ s)

### Notes:

- If U826.001 = 105  $\mu$ s or U826.002 = 105  $\mu$ s:  
Block pulse (without pulse chopping)
- If U826.001 is set to  $\leq$  U826.002, then U826.001 is ignored and the first pulse is output with the same length as all other pulses
- The choice between short pulses or long pulses is made in P079  
   P079 = 0: Short pulses (pulse length 890  $\mu$ s)  
   P079 = 1: Long pulses (pulse duration up to approx. 0.1 ms before next pulse)



The pulse shape of the current depends on the length of the cable to the thyristor (cathode / gate). Because of the cable inductance, the rising edge of the current pulse slows down as the cable length increases.

**Relationship between firing current and output voltage (incl. tolerances):**

Open-circuit voltage = 7.8 to 8.4 V

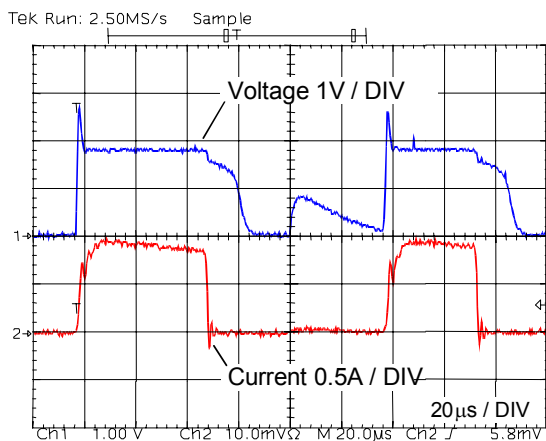
Short circuit current = 1.15 to 1.25 A

**Application:**

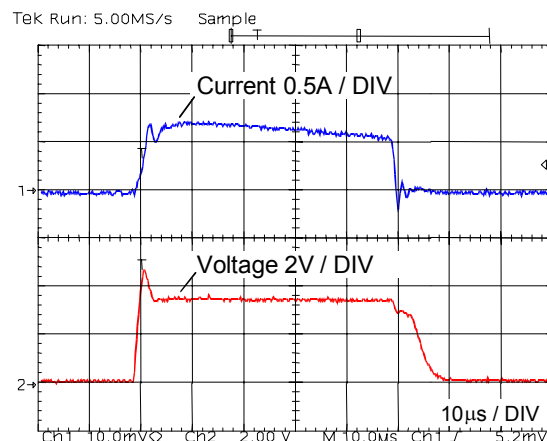
The firing condition for the thyristor used (minimum firing current) must be to the left of the characteristic of the firing circuit. The firing current can be derived graphically by intersecting the input characteristic of the thyristor with the output characteristic of the firing circuit. In this respect it is important to consider that as the temperature decreases, the voltage drop gate / cathode of the thyristor increases.

**Examples of oscillograms**

Firing voltage = voltage gate / cathode with 1 m twisted cable from the firing circuit  
firing current in the gate connection of the thyristor



2 diodes || 20 ohm (1.8V and 950 mA)



4 diodes || 20 ohm (3.5V and 700 mA)

## Outputs of the voltage measurement

Type of connection: Faston tabs, 6.3mm

Module C98043-A7043 firing pulse module

| Function                |     | Connection | Connection values/remarks                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------|-----|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Armature supply voltage | W   | X12_1      | When the firing cables are connected to the thyristors in the power section, the supply voltage and armature voltage are automatically available on the firing pulse module (C98043-A7043). These voltage can then be led from there (connections X12_1 etc.) to the voltage measurement (C98043-A7044) without connecting additional cables to the power section. See also Chapter 6.3 |
| Armature supply voltage | U   | X14_1      |                                                                                                                                                                                                                                                                                                                                                                                         |
| Armature voltage        | 1C1 | X15_1      |                                                                                                                                                                                                                                                                                                                                                                                         |
| Armature supply voltage | V   | X16_1      |                                                                                                                                                                                                                                                                                                                                                                                         |
| Armature voltage        | 1D1 | X25_1      |                                                                                                                                                                                                                                                                                                                                                                                         |

**Ribbon cables****Firing pulse cable torque direction 1, connector X21A, X21PAR**

Ribbon cable 26-way

C98043-A7042 power interface / C98043-A7043 firing pulse module

| Function                           | Pin<br>X21A/<br>X21PAR | Signal name | Connection values/remarks |
|------------------------------------|------------------------|-------------|---------------------------|
| Free                               | 1                      |             |                           |
| Free                               | 2                      |             |                           |
| Free                               | 3                      |             |                           |
| Electronics ground                 | 4                      | M           |                           |
| Firing pulse thyristor armature 2  | 5                      | IMP_12      | 24 V / 2 A pulse          |
| Firing 24 V supply                 | 6                      | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                 | 7                      | M           |                           |
| Firing pulse thyristor armature 6  | 8                      | IMP_16      | 24 V / 2 A pulse          |
| Firing 24 V supply                 | 9                      | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                 | 10                     | M           |                           |
| Firing pulse thyristor armature 4  | 11                     | IMP_14      | 24 V / 2 A pulse          |
| Firing 24 V supply                 | 12                     | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                 | 13                     | M           |                           |
| Firing pulse thyristor armature 5  | 14                     | IMP_15      | 4 V / 2 A pulse           |
| Firing 24 V supply                 | 15                     | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                 | 16                     | M           |                           |
| Firing pulse thyristor armature 3  | 17                     | IMP_13      | 24 V / 2 A pulse          |
| Firing 24 V supply                 | 18                     | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                 | 19                     | M           |                           |
| Firing pulse thyristor armature 1  | 20                     | IMP_11      | 24 V / 2 A pulse          |
| Firing 24 V supply                 | 21                     | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                 | 22                     | M           |                           |
| Actual current                     | 23                     | I_IST       | analog $\pm 10$ V         |
| Reference ground to actual current | 24                     | M_I_IST     | analog $\pm 10$ V         |
| Electronics ground                 | 25                     | M           |                           |
| Free                               | 26                     |             |                           |

Connectors X21A and X21PAR are connected in parallel on module C98043-A7043

**Firing pulse cable torque direction 2, connector X22A, X22PAR**

Ribbon cable 26-way

C98043-A7042 power interface / C98043-A7043 firing pulse module

| Function                          | Pin<br>X22A/<br>X22PAR | Signal name | Connection values/remarks |
|-----------------------------------|------------------------|-------------|---------------------------|
| Free                              | 1                      |             |                           |
| Free                              | 2                      |             |                           |
| Free                              | 3                      |             |                           |
| Electronics ground                | 4                      | M           |                           |
| Firing pulse thyristor armature 2 | 5                      | IMP_22      | 24 V / 2 A pulse          |
| Firing 24 V supply                | 6                      | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                | 7                      | M           |                           |
| Firing pulse thyristor armature 6 | 8                      | IMP_26      | 24 V / 2 A pulse          |
| Firing 24 V supply                | 9                      | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                | 10                     | M           |                           |
| Firing pulse thyristor armature 4 | 11                     | IMP_24      | 24 V / 2 A pulse          |
| Firing 24 V supply                | 12                     | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                | 13                     | M           |                           |
| Firing pulse thyristor armature 5 | 14                     | IMP_25      | 4 V / 2 A pulse           |
| Firing 24 V supply                | 15                     | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                | 16                     | M           |                           |
| Firing pulse thyristor armature 3 | 17                     | IMP_23      | 24 V / 2 A pulse          |
| Firing 24 V supply                | 18                     | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                | 19                     | M           |                           |
| Firing pulse thyristor armature 1 | 20                     | IMP_21      | 24 V / 2 A pulse          |
| Firing 24 V supply                | 21                     | P24_Z       | 24 VDC / 2 A              |
| Electronics ground                | 22                     | M           |                           |
| Free                              | 23                     |             |                           |
| Free                              | 24                     |             |                           |
| Electronics ground                | 25                     | M           |                           |
| Free                              | 26                     |             |                           |

Connectors X22A and X22PAR are connected in parallel on module C98043-A7043

**Connecting cable power interface – fuse monitoring**

Ribbon cable 10-way

C98043-A7042 power interface / C98043-A7044 firing pulse module

| Function           | Pin<br>XS20 | Signal name  | Connection values/remarks |
|--------------------|-------------|--------------|---------------------------|
| 24 V supply        | 1           | P24          | 22...26 V                 |
| 24 V supply        | 2           | P24          | 22...26 V                 |
| Fuse monitoring    | 3           | SICHERUNG_OK | CMOS 5V                   |
| Electronics ground | 4           | M            |                           |
| Free               | 5           |              |                           |
| Electronics ground | 6           | M            |                           |
| Fuse monitoring    | 7           | SICHERUNG_OK | CMOS 5V                   |
| Electronic ground  | 8           | M            |                           |
| Free               | 9           |              |                           |
| Free               | 10          |              |                           |

**Connecting cable power interface – voltage measurement**

Ribbon cable 10-way

C98043-A7042 power interface / C98043-A7044 voltage measurement

| Function                           | Pin<br>XS21 | Signal name | Connection values/remarks |
|------------------------------------|-------------|-------------|---------------------------|
| 15 V vers. of voltage measurement  | 1           | P15_MESS    | 15 V / 20 mA              |
| 15 V vers. of voltage measurement  | 2           | P15_MESS    | 15 V / 20 mA              |
| Supply voltage V-U signal          | 3           | NETZ_VU     | Analog $\pm 5$ V          |
| Ground of voltage meas.            | 4           | M_MESS      |                           |
| Armature voltage signal            | 5           | ANKERSPG    | Analog $\pm 10$ V         |
| Ground of voltage meas.            | 6           | M_MESS      |                           |
| Supply voltage V-U signal          | 7           | NETZ_VW     | Analog $\pm 5$ V          |
| Ground of voltage meas.            | 8           | M_MESS      |                           |
| -15 V vers. Of voltage measurement | 9           | N15_MESS    | -15 V / 20 mA             |
| -15 V vers. Of voltage measurement | 10          | N15_MESS    | -15 V / 20 mA             |

**Connecting cable power interface – field supply**

Ribbon cable 20-way

C98043-A7042 power interface / C98043-A7044 field supply

| Function                         | Pin<br>X102 | Signal name  | Connection values/remarks |
|----------------------------------|-------------|--------------|---------------------------|
| Electronics ground               | 1           | M            |                           |
| Field current measurement supply | 2           | HF_16        | ± 16 V HF                 |
| Electronics ground               | 3           | M            |                           |
| Firing pulse thyristor field 1   | 4           | IMP_F1       | CMOS 5V                   |
| 24 V supply                      | 5           | P24          | 22...26 V                 |
| Firing pulse thyristor field 2   | 6           | IMP_F2       | CMOS 5V                   |
| 24 V supply                      | 7           | P24          | 22...26 V                 |
| Field current amplification      | 8           | FELD_VERST   | CMOS 5V                   |
| Electronics ground               | 9           | M            |                           |
| Field current frequency coded    | 10          | FELD_STROM   | CMOS 5V                   |
| Electronic ground                | 11          | M            |                           |
| Fuse monitoring                  | 12          | SICHERUNG_OK | CMOS 5V                   |
| 15 V supply of voltage meas.     | 13          | P15_MESS     | 15 V / 7 mA               |
| Fan monitoring                   | 14          | LUEFTER_OK   | Open collector            |
| Ground voltage measurement       | 15          | M_MESS       |                           |
| Fan control                      | 16          | LUEFTER_EIN  | CMOS 5V                   |
| Ground voltage measurement       | 17          | M_MESS       |                           |
| Signal supply voltage field      | 18          | NETZ_FELD    | Analog                    |
| -15 V supply of voltage meas.    | 19          | N15_MESS     | -15 V / 7 mA              |
| Electronics ground               | 20          | M            |                           |



**Options:****Terminal expansion CUD2**

Terminal type: Plug-in terminal (screw-type)  
max. connection cross-section 1.5mm<sup>2</sup>

**Motor interface** (see also function diagrams, Section 8, sheets G185 and G186)

Module C98043-A7006 (CUD2)

| Function                                        | Terminal<br>X164 | Connection values/remarks                                                                                                              |
|-------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Motor temperature<br>(temperature sensor input) | 204<br>205       | Sensor acc. to P490 index 2<br>The cable to the temperature sensor on the motor must be shielded and connected to ground at both ends. |

Module C98043-A7006 (CUD2)

| Function                  | Terminal<br>X161 | Connection values/remarks                                                                                                                                                                                                         |
|---------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supply for digital inputs | 210              | 24V DC, short circuit proof with respect to internal ground<br>max. load 200mA (terminals 34, 44, and 210 combined),<br>Overload response: Error signal F018<br>Warning signal A018                                               |
| Binary input              | 211              | <div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">}</div> <div> H signal: +13V to +33V<br/> L signal: – 33V to +3V or terminal open<br/> Input resistance = 2.8 kΩ </div> </div> |
| Binary input              | 212              |                                                                                                                                                                                                                                   |
| Binary input              | 213              |                                                                                                                                                                                                                                   |
| Binary input              | 214              |                                                                                                                                                                                                                                   |
| Ground for binary inputs  | 215              | can be isolated from internal ground                                                                                                                                                                                              |
| Ground for binary inputs  | 216              | (Open wire jumper between terminal 216 and 217)                                                                                                                                                                                   |
| M                         | 217              |                                                                                                                                                                                                                                   |

**Analog inputs** (see also Section 8, sheet G114)

Module C98043-A7006 (CUD2)

| Function              | Terminal<br>X164 | Connection values/remarks     |
|-----------------------|------------------|-------------------------------|
| Select input analog 2 | 8                | ±10V, 52kΩ                    |
| Ground analog         | 9                | Resolution: ±10bit            |
| Select input analog 3 | 10               | Common mode suppression: ±15V |
| Ground analog         | 11               |                               |

**Analog outputs** (see also Section 8, sheet G116)

Module C98043-A7006 (CUD2)

| Function               | Terminal<br>X164 | Connection values/remarks |
|------------------------|------------------|---------------------------|
| Select output analog 3 | 18               | 0... ±10V, max. 2mA       |
| Ground analog M        | 19               | Short-circuit-proof       |
| Select output analog 4 | 20               | Resolution ±11bit         |
| Ground analog M        | 21               |                           |

**Digital inputs** (see also Section 8, sheet G111)

Module C98043-A7006 (CUD2)

| Function              | Terminal<br>X163 | Connection values/remarks                                                                                                               |
|-----------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Supply (output)       | 44               | 24V DC, short circuit proof<br>max. load 200mA (terminals 34, 44, and 210 combined),<br>internal supply with respect to internal ground |
| Ground digital M      | 45               | Overload response: Fault signal F018<br>Warning signal A018                                                                             |
| Select input binary 3 | 40               | H signal: +13V to +33V                                                                                                                  |
| Select input binary 4 | 41               | L signal: – 33V to +3V or terminal open                                                                                                 |
| Select input binary 5 | 42               | 8.5mA at 24V                                                                                                                            |
| Select input binary 6 | 43               |                                                                                                                                         |

**Digital outputs** (see also Section 8, sheet G112)

Module C98043-A7006 (CUD2)

| Function               | Terminal<br>X163 | Connection values/remarks                                   |
|------------------------|------------------|-------------------------------------------------------------|
| Select output binary 3 | 50               | H signal: +20 to +26V                                       |
| Ground M               | 51               | L signal: 0 to +2V<br>short circuit proof 100mA             |
| Select output binary 4 | 52               | Overload response: Fault signal F018<br>Warning signal A018 |
| Ground M               | 53               | Internal suppressor circuit (freewheeling diode)            |

**Serial interface 3 RS485** (G-SST3)

Module C98043-A7006 (CUD2)

| Function | Terminal<br>X162 | Connection values/remarks                                                                                           |
|----------|------------------|---------------------------------------------------------------------------------------------------------------------|
| TX+      | 61               | RS485, 4-wire send cable, positive differential input                                                               |
| TX-      | 62               | RS485, 4-wire send cable, negative differential input                                                               |
| RX+/TX+  | 63               | RS485, 4-wire receive cable, positive differential input,<br>2-wire send/receive cable, positive differential input |
| RX-/TX-  | 64               | RS485, 4-wire receive cable, negative differential input,<br>2-wire send/receive cable, negative differential input |
| M        | 65               | Ground                                                                                                              |

Cable length: For transmission rate =187.5kBd  $\Rightarrow$  600m  
For transmission rate =93.75kBd  $\Rightarrow$  1200m

The following must be observed: DIN 19245 Part 1

The potential difference between the data reference potentials M of all interfaces must not exceed -7V / +12V. If this cannot be guaranteed, then equipotential bonding must be provided.

Activate interface 3:

- Set the baud rate in parameter P803.
- Set the protocol in parameter P800.



## 7 Start-Up

### 7.1 General safety information for start-up



#### **DANGER**



Before you commission the units, please make sure that all transparent covers are mounted at the correct position in the unit (see Section 5.1).



#### **WARNING**



The manufacturer can only provide a warranty for correct functioning of the SIMOREG CM converter and accept liability for any damage if the device is installed and started up by qualified personnel and the instructions in this manual are correctly observed. The converters are operated at high voltages.

#### **CAUTION**

Before handling any boards (in particular, the A7001 electronics board), please make sure that your body is electrostatically discharged to protect electronic components against high voltages caused by electrostatic charges. The simplest way of doing this is to touch a conductive, grounded object (e.g. bare metal cabinet component immediately beforehand).

PCBs must not be allowed to come into contact with highly insulating materials (e.g. plastic foil, insulating table tops or clothing made of synthetic fibers).

PCBs may only be set down on electrically conducting surfaces.

**WARNING**

These converters contain hazardous voltages and control rotating mechanical components (drives). Non-observance of the safety instructions can result in death, severe personal injury or substantial property damage.

Hazardous voltage may be present at the signaling relays in the customer's installation.

The converters must not be connected to a supply with earth-leakage circuit-breaker (VDE 0160, Section 6.5) since, in the event of a fault to frame or ground, the fault current may contain a DC component that will either prevent or hinder a higher-level e.l.c.b. from tripping. In this case, all loads connected to this e.l.c.b. have no protection either.

Only qualified personnel who are thoroughly familiar with all safety notices contained in the operating instructions as well as erection, installation, operating and maintenance instructions should be allowed to work on these devices.



The successful and safe operation of this equipment is dependent on careful transportation, proper storage and installation as well as correct operation and maintenance.

The converter is at a hazardous voltage level even when the line contactor is open. The gating board (board mounted directly to lower part of housing) has many circuits at hazardous voltage levels. Before carrying out any maintenance or repair work, all converter power sources must be disconnected and locked out.

These instructions do not claim to list all of the measures required to ensure safe and reliable operation of the converter. For special applications, additional, supplementary information or instructions might be required. If problems do occur and you feel in any way uncertain, please contact your local Siemens office or representative.

The use of unauthorized parts in the repair of this converter and handling of the equipment by unqualified personnel can give rise to hazardous conditions which may cause death, severe personal injury or substantial property damage. All safety notices contained in this instruction manual and attached to the converter itself must be carefully observed.

Please read the safety information given in Section 1 of this instruction manual.

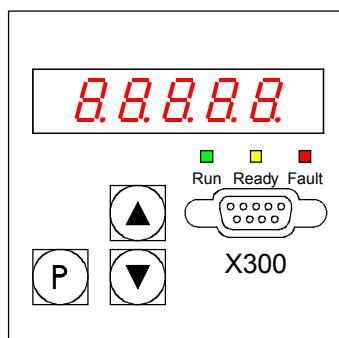
## 7.2 Operator control panels

The basic converter is equipped with a simple operator panel (PMU) as standard. A user-friendly panel with plaintext display (OP1S) can be connected as an option.

### 7.2.1 Simple operator control panel (PMU “Parameterization Unit”)

The simple operator control panel is mounted in the converter door and consists of a 5-digit, 7-segment display with three status display LEDs and three parameterization keys below.

All adjustments and settings that need to be undertaken for the purpose of start-up can be made on the simple control panel.



- **P key**
  - Switches over between parameter number (parameter mode), parameter value (value mode) and index number (index mode) on indexed parameters.
  - Acknowledges active fault messages.
  - P and RAISE keys to switch a fault message and alarm to the background (see Section 10, Fault Messages and Alarms)
  - P and LOWER key to switch a fault message and alarm from the background back to the foreground display on the PMU (see Section 10, Fault Messages and Alarms)
- **UP key (▲)**
  - Selects a higher parameter number in parameter mode. When the highest number is displayed, the key can be pressed again to return to the other end of the number range (i.e. the highest number is thus adjacent to the lowest number).
  - Increases the selected and displayed parameter value in value mode.
  - Increases the index in index mode (for indexed parameters)
  - Accelerates an adjustment process activated with the DOWN key (if both keys are pressed at the same time).
- **DOWN key (▼)**
  - Selects a lower parameter number in parameter mode. When the lowest number is displayed, the key can be pressed again to return to the other end of the number range (i.e. the lowest number is thus adjacent to the highest number).
  - Decreases the selected and displayed parameter value in value mode.
  - Decreases the index in index mode (for indexed parameters)
  - Accelerates an adjustment process activated with the UP key (if both keys are pressed at the same time).

### LED displays

#### Run green LED

LED illuminated ⇒ in "Torque direction active" state (MI, MII, M0).  
(see r000 in Section 11)

#### Ready yellow LED

LED illuminated ⇒ in "Ready" state (o1 .. o7).  
(see r000 in Section 11)

#### Fault red LED

LED illuminated ⇒ in "Fault signal present" state (o11)  
(see r000 in Section 11 and Faults and Alarms (Section 10))

LED flashing ⇒ An alarm is active (see Faults and Alarms in Section 10).

## 7.2.2 User-friendly operator control panel (OP1S)

The optional, user-friendly, operator control panel with plaintext display (order no.: 6SE7090-0XX84-2FK0) is mounted in the special location provided in the converter door.

This location provides a connection to the serial basic converter interface SST1.

Parameters can be selected directly through input of the parameter number via the keyboard of the OP1S. The following interrelationships apply:

|                            | Displayed number  | Number to be keyed in on OP1S |
|----------------------------|-------------------|-------------------------------|
| Basic converter parameter  | <b>rxxx, Pxxx</b> | (0)xxx                        |
|                            | <b>Uxxx, nxxx</b> | <b>2xxx</b>                   |
| Technology board parameter | <b>Hxxx, dxxx</b> | <b>1xxx</b>                   |
|                            | <b>Lxxx, cxxx</b> | <b>3xxx</b>                   |

If the RAISE or LOWER key on the OP1S is used to select adjacent parameter numbers, then any missing numbers in the range of basic converter parameters are skipped.

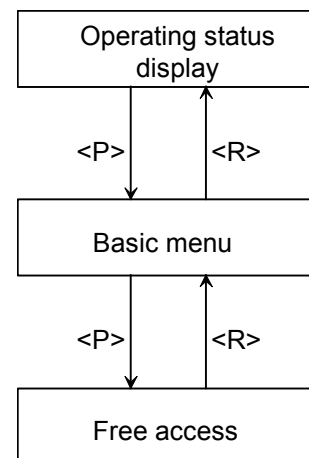
This automatic skipping over missing numbers does not work for technology board parameters. In this case, the numbers of existing parameters must be entered directly.

The OP1S switches to **operational display** a few seconds after initialization.

By pressing the <P> key, you can switch from the operating display to the **Basic Menu** in which you can either select "Free access" to all parameters or a variety of functions. Details of these functions can be found in the function diagram "OP1S operational display" (Section 8, Sheet Z123) and the OP1S operating instructions.

The converter parameters can be set in "**Free access**" status.

You can return to the operating status display by pressing the <R> key (several times if necessary).



### Control bits from OP1S operator panel:

(see also function diagram "OP1S operational display" (Section 8, Sheet Z123) and the OP1S operating instructions)

Data are exchanged between the OP1S and SIMOREG 6RA70 converter via the G-SST1 interface (RS485) and USS protocol.

The OP1S operator panel transfers the following control bits in process data word 1 in the USS message:

| Key on OP1S              | Function *)                           | Bit in PZD word1<br>(connector K2001) | Binector |
|--------------------------|---------------------------------------|---------------------------------------|----------|
| ON key / OFF key (I / 0) | ON / OFF1                             | Bit 0                                 | B2100    |
| Reset                    | Acknowledge                           | Bit 7                                 | B2107    |
| Jog                      | Jog (inch)                            | Bit 8                                 | B2108    |
| Reverse                  | Enable positive direction of rotation | Bit 11                                | B2111    |
|                          | Enable negative direction of rotation | Bit 12                                | B2112    |
| UP key                   | Increase motorized potentiometer      | Bit 13                                | B2113    |
| DOWN key                 | Decrease motorized potentiometer      | Bit 14                                | B2114    |

\*) Suggested functions. Since binectors can be freely wired up to any selector switch, the control signals from the OP1S can be used for any type of control task in the SIMOREG 6RA70.

#### Connection of control signals from the OP1S for the suggested functions:

Functions can be implemented via the OP1S only if the following conditions are fulfilled:

- 1) Bit-by-bit input of control bits in control word 1 (P648 = 9), see also Section 8, Function Diagrams, Sheet G180
- 2) OP1S in "Operational display" status

#### ON / OFF1:

Parameterization of switch-on/shutdown via OP1S by setting  
P654 = 2100

Please also note AND operation with "Switch-on/Shutdown" from terminal 37 (see also Function Diagrams, Sheet G130 in Section 8 and Section "Switch-on/Shutdown (ON / OFF) terminal 37" in Section 9)

#### Acknowledge:

Parameterization of fault message acknowledgements via OP1S by setting  
P665, P666 or P667 = 2107

Faults can always be acknowledged by pressing the <P> key on the PMU.

#### Inching:

Parameterization of inching via OP1S by setting  
P668 or P669 = 2108

Selection of source of inching setpoint via the corresponding index of P436 (see "Inching setpoint" function diagram)

#### Direction of rotation enable:

Parameterization of direction of rotation enabling via OP1S by setting

P671 = 2111 (positive direction of rotation)

P672 = 2112 (negative direction of rotation)

#### Motorized potentiometer:

Parameterization of motorized potentiometer via OP1S by setting

P673 = 2113 (higher)

P674 = 2114 (lower)

P644 = 240 (main setpoint from motorized potentiometer)



## 7.3 Parameterization procedure

Parameterization is the process of changing setting values (parameters) via the operator panel, activating converter functions or displaying measured values.

Parameters for the basic converter are called P, r, U or n parameters. Parameters for an optional supplementary board are called H, d, L or c parameters.

The basic unit parameters are displayed first on the PMU, followed by the technology board parameters (if such a board is installed). It is important not to confuse the parameters of the optional S00 technology software of the basic unit with the parameters of an optional supplementary board (T100, T300 or T400).

Depending on how parameter P052 is set, only some parameter numbers (see Section 11, Parameter List) are displayed.

### 7.3.1 Parameter types

**Display parameters** are used to display current quantities such as the main setpoint, armature voltage, setpoint/actual value difference of speed controller, etc. The values of display parameters are read-only values and cannot be changed.

**Setting parameters** are used to both display and change quantities such as the rated motor current, thermal motor time constant, speed controller P gain, etc.

**Indexed parameters** are used to both display and change several parameter values which are all assigned to the same parameter number.

### 7.3.2 Parameterization on simple operator control panel

After the electronics supply voltage has been switched on, the PMU is either in the operational display state and indicating the current operating status of the SIMOREG 6RA70 (e.g. o7.0), or in the fault/alarm display state and indicating a fault or alarm (e.g. F021).

Operational states are described under parameter r000 in Section 11 and the fault and alarm messages in Section 10.

1. To reach the parameter number level from the operational display state (e.g. o7.0), press the P key and then the <Up> or <Down> key to select individual parameter numbers.
2. To reach the parameter index level (for indexed parameters) from the parameter number level, press P and then the <Up> or <Down> key to select individual indices.  
If you press P when a non-indexed parameter is displayed, you go directly to the parameter value level.
3. To reach the parameter value level from the parameter index level (for indexed parameters), press P.
4. On the parameter value level, you can change the setting of a parameter value by pressing the <Up> or <Down> key.

#### NOTE

Parameters can be altered only if the following conditions are fulfilled:

- The appropriate access authorization is set in key parameter P051, e.g. "40" (see Section 11, "Parameter List").
- The converter is the correct operational state. Parameters with characteristic "offline" cannot be changed when the converter is in the "Run" (online) state. To change parameters with this characteristic, switch the converter to the  $\geq 01.0$  status ("Ready").
- The values of display parameters can never be changed (read only).

## 5. Manual shifting

If the 5 existing digits on the 7-segment display are not sufficient to display a parameter value, the display first shows just 5 digits (see Fig. 7.1). To indicate that digits are concealed to the right or left of this "window", the right-hand or left-hand digit flashes. By pressing the <P>+<Down> or <P>+<Up> key, you can shift the window over the remaining digits of the parameter value. As an orientation guide, the position of the right-hand digit within the overall parameter value is displayed briefly during manual shifting.

Example: Parameter value "208.173"

"208.17" is displayed when the parameter is selected. When the P and LOWER keys are pressed, "1" appears briefly followed by "08.173", i.e. the right-hand digit 3 is the 1<sup>st</sup> position in the parameter value.

When the P and RAISE keys are pressed, "2" appears briefly followed by "208.17", i.e. the right-hand digit 7 is the 2<sup>nd</sup> position in the parameter value.

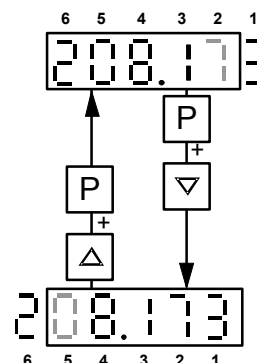


Fig. 7.1 Shifting the PMU display for parameter values with more than 5 digits

6. Press the P key to return to the parameter number level from the parameter value level.

Tables 7.1 and 7.2 below show an overview of displays which may appear on the PMU:

|                    |            | Parameter number<br>e. g. | Index<br>e. g. | Parameter value<br>e. g. |
|--------------------|------------|---------------------------|----------------|--------------------------|
| Display parameters | Basic unit | r000 or n000              | 00             | o 7.0                    |
|                    | Technology | d000 or c000              |                |                          |
| Setting parameters | Basic unit | P051 or U051              | 00             | -2.08                    |
|                    | Technology | H002 or L002              |                |                          |

Table 7.1 Display of visualization and setting parameters on the PMU

|         | Actual value | Parameter value<br>not (currently)<br>possible | Alarm | Fault |
|---------|--------------|------------------------------------------------|-------|-------|
| Display | -2.08        | ----                                           | R022  | F006  |

Table 7.2 Status displays on the PMU

## NOTE

Parameters are described in the Parameter List in Section 11 and faults and alarms in Section 10.

## 7.4 Reset to default value and adjust offset

Restoring parameters values to defaults (works settings) and performing an internal converter offset adjustment.

The "Restore factory setting" function must be executed after every software update if the converter software has been updated from version 1.0 or 1.1.

With converter SW version 1.2 and later, it is no longer necessary to execute "Restore factory settings" after a software update because the parameter settings prior to the update remain valid.

The "Restore to default" function can be executed if a defined basic setting is to be established, e.g. in order to carry out a complete new start-up operation.

### NOTICE

When the "Restore to default" function is activated, all parameters set for a specific installation are overwritten (deleted). We therefore recommend that all old settings be read out beforehand with **DriveMonitor** and stored on a PC or programmer.

"Restore to default" must be followed by a completely new start-up operation or else the converter will not be "ready" with respect to safety.

Execution of function:

1. Set parameter **P051 = 21**
2. Transfer parameter values to the non-volatile memory.  
The parameter values are stored in non-volatile storage (EEPROM) so that they will still be available when the converter is switched off. This operation takes at least 5 s (but may also last several minutes). The number of the parameter currently being processed is displayed on the PMU during the process. The electronics power supply must remain connected while this operation is in progress.
3. Offset adjustments  
Parameter P825.ii is set (takes approx. 10 s).

The offset adjustment can also be activated as an individual function by means of parameter **P051 = 22**.

## 7.5 Start-up procedure



### WARNING



The converter is at a hazardous voltage level even when the line contactor is open. The gating board (board mounted directly to lower part of housing) has many circuits at hazardous voltage levels.

Non-observance of the safety instructions given in this manual can result in death, severe personal injury or substantial property damage.



### 1 Access authorization

P051 . . . Key parameter

- 0 Parameter cannot be changed
- 40 Parameter can be changed

P052 . . . Selection of parameters to be displayed

- 0 Only parameters that are not set to default are visible
- 3 All parameters are visible



### 2 Definition of the external power section

The external power section must be defined with parameters U820 to U833 (see Section 11)



### 3 Adjustment of converter rated currents

The **rated converter armature DC current** must be adapted by the setting in parameter P076.001 (in %) or parameter P067, if:

$$\frac{\text{Max. armature current}}{\text{Rated armature DC current}} < 0,5$$

The **rated converter field DC current** must be adjusted by the setting in parameter P076.002 (in %) if:

$$\frac{\text{Max. field current}}{\text{Rated converter field DC current}} < 0,5$$



### 4 Adjustment to actual converter supply voltage

P078.001 . . . Rated input voltage converter armature (in volts)

P078.002 . . . Rated input voltage converter field (in volts)



## Input of motor data

In the parameters below, the motor data must be entered as specified on the motor rating plate.

|            |                                                       |                       |
|------------|-------------------------------------------------------|-----------------------|
| P100 . . . | Rated armature current (in amps)                      |                       |
| P101 . . . | Rated armature voltage (in volts)                     |                       |
| P102 . . . | Rated field current (in amps)                         |                       |
| P104 . . . | Speed $n_1$ (in rpm)                                  | see also Section 9.16 |
| P105 . . . | Armature current $I_1$ (in amperes)                   | see also Section 9.16 |
| P106 . . . | Speed $n_2$ (in rpm)                                  | see also Section 9.16 |
| P107 . . . | Armature current $I_2$ (in amperes)                   | see also Section 9.16 |
| P108 . . . | Maximum operating speed $n_3$ (in rpm)                | see also Section 9.16 |
| P109 . . . | 1 = speed-dependent current limitation active         | see also Section 9.16 |
| P114 . . . | Thermal time constant of motor (in minutes)           | see also Section 9.14 |
|            | (if necessary: activate fault signal F037 with P820!) |                       |



## Actual speed sensing data



### Operation with analog tacho

P083 = 1: The actual speed is supplied from the "Main actual value" channel (K0013)  
(terminals XT.103, XT.104)

P741 Tacho voltage at maximum speed (– 270,00V to +270,00V)



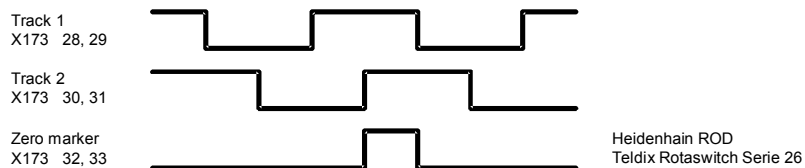
### Operation with pulse encoder

P083 = 2: The actual speed is supplied by the pulse encoder (K0040)

- P140 Selecting a pulse encoder type (pulse encoder types see below)
- 0 No encoder/"Speed sensing with pulse encoder" function not selected
  - 1 Pulse encoder type 1
  - 2 Pulse encoder type 1a
  - 3 Pulse encoder type 2
  - 4 Pulse encoder type 3

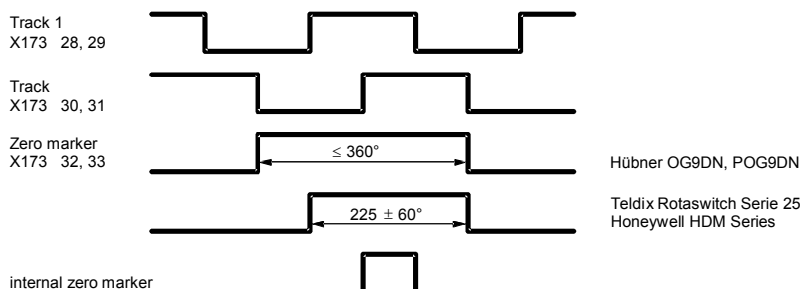
#### 1. Pulse encoder type 1

Encoder with two pulse tracks mutually displaced by 90° (with/without zero marker)



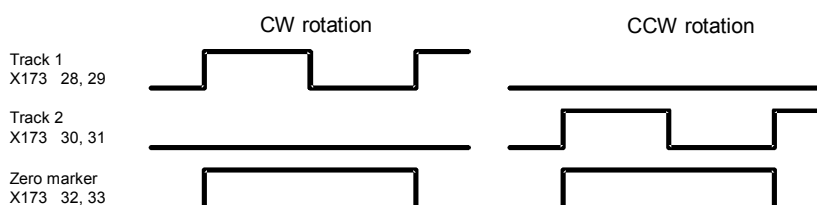
## 2. Pulse encoder type 1a

Encoder with two pulse tracks mutually displaced by 90° (with/without zero marker).  
The zero marker is converted internally to a signal in the same way as on encoder type 1.



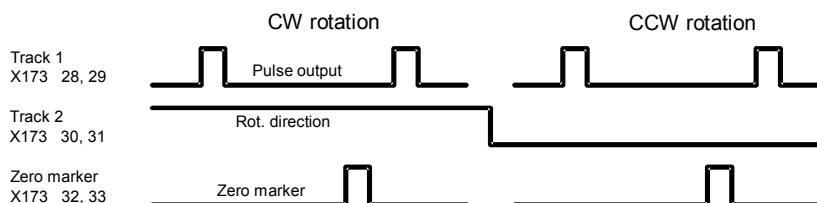
## 3. Pulse encoder type 2

Encoder with one pulse track per direction of rotation (with/without zero marker).



## 4. Pulse encoder type 3

Encoder with one pulse track and one output for direction of rotation (with/without zero marker).



P141 Number of pulses of pulse encoder (in pulses/rev)

P142 Matching to pulse encoder signal voltage

0 Pulse encoder outputs 5 V signals

1 Pulse encoder outputs 15V signals

Matching of internal operating points to signal voltage of incoming pulse encoder signals.

### NOTICE

Resetting parameter P142 to the alternative setting does not switch over the supply voltage for the pulse encoder (terminals X173.26 and 27).  
Terminal X173.26 always supplies +15V. An external voltage supply must be provided for pulse encoders requiring a 5V supply.

P143 Setting the maximum speed for pulse encoder operation (in pulses/rev)  
The speed set in this parameter corresponds to an actual speed (K0040) of 100%.



### 6.3 Operation without tacho (EMF control)

P083 = 3: The actual speed is supplied from the “Actual EMF” channel (K0287), but weighted with P.

P115 EMF at maximum speed  
(1.00 to 140.00% of rated converter supply voltage (r078.001)).



### 6.4 Freely wired actual value

P083 = 4: The actual value input is defined with P609.

P609 Number of connector to which actual speed controller value is connected.



## 7 Field data



### 7.1 Field control

P082 = 0: Internal field is not used  
(e.g. with permanent-field motors)

P082 = 1: The field is switched together with the line contactor  
(field pulses are enabled/disabled when line contactor closes/opens)

P082 = 2: Automatic connection of standstill field set via P257 after a delay parameterized via P258, after operating status o7 or higher has been reached

P082 = 3: Field current permanently connected



### 7.2 Field weakening

P081 = 0: No field weakening as a function of speed or EMF

P081 = 1: Field weakening operation as a function of internal EMF control so that, in the field weakening range, i.e. at speeds above rated motor speed (= “threshold speed”), the motor EMF is maintained constantly at setpoint  
 $EMF_{set} (K289) = P101 - P100 * P110$ .



## 8 Selection of basic technological functions



### 8.1 Current limits

P171 Motor current limit in torque direction I (in% of P100)

P172 Motor current limit in torque direction II (in% of P100)



### 8.2 Torque limits

P180 Torque limit 1 in torque direction I  
(in % of rated motor torque)

P181 Torque limit 1 in torque direction II  
(in % of rated motor torque)



### 8.3 Ramp-function generator

|      |                                  |
|------|----------------------------------|
| P303 | Acceleration time 1 (in seconds) |
| P304 | Deceleration time 1 (in seconds) |
| P305 | Initial rounding 1 (in seconds)  |
| P306 | Final rounding 1 (in seconds)    |



## 9 Execution of optimization runs



**9.1** The drive must be in operating state o7.0 or o7.1 (enter SHUTDOWN!).



**9.2** Select one of the following optimization runs in key parameter P051:

- P051 = 25 Optimization run for precontrol and current controller for armature and field
- P051 = 26 Speed controller optimization run  
can be preceded by selection of the degree of dynamic response of the speed control loop with P236, where lower values produce a softer controller setting.
- P051 = 27 Optimization run for field weakening
- P051 = 28 Optimization run for compensation of friction moment and moment of inertia
- P051 = 29 Speed controller optimization run for drives with oscillating mechanical system.



**9.3** The SIMOREG converter switches to operating state o7.4 for several seconds and then to o7.0 or o7.1 and waits for the input of SWITCH-ON and OPERATING ENABLE..

Enter the commands SWITCH-ON and OPERATING ENABLE.

The flashing of the decimal point in the operational status display on the PMU (simple operator control panel) indicates that an optimization run will be performed after the switch-on command.

If the switch-on command is not given within 30 s, this waiting status is terminated and fault message F052 displayed.



**9.4** As soon as the converter reaches operating status <o1.0 (RUN), the optimization run is executed.

An activity display appears on the PMU, consisting of two 2-digit numbers, separated by a bar that moves up and down. These two numbers indicate (for SIEMENS personnel) the current status of the optimization run.

- P051 = 25 Optimization run for precontrol and current controller for armature and field**  
(process lasts approximately 40s)  
The current controller optimization run may be executed without a mechanical load coupled to the motor; it may be necessary to lock the rotor.  
The following parameters are set automatically: P110, P111, P112, P155, P156, P255, P256, P826.

### CAUTION

Permanent-field motors (and motors with an extremely high residual flux) must be mechanically locked during this optimization run.



**WARNING**

The set current limits are not effective during the current controller optimization run. 75% of the rated motor armature current flows for approximately 0.7s. Furthermore, individual current spikes of approximately 120% of the motor rated armature current are generated.

**P051 = 26****Speed controller optimization run** (process lasts approximately 6s)

The degree of dynamic response of the speed control loop can be selected with P236, where lower values produce a softer control loop. P236 must be set before the speed controller is optimized, and affects the settings of P225, P226, and P228.

For the purpose of speed controller optimization, the ultimate mechanical load should be connected to the motor where possible, since the parameter settings are determined by the measured moment of inertia.

The following parameters are set automatically: P225, P226 and P228.

**Note:**

The speed controller optimization run takes only the filtering of the actual speed controller value parameterized in P200 into account and, if P083=1, filtering of the main actual value parameterized in P745.

When  $P200 < 20\text{ms}$ , P225 (gain) is limited to a value of 30.00.

The speed controller optimization run sets P228 (speed setpoint filter) to the same value as P226 (speed controller integration time) (for the purpose of achieving an optimum control response to abrupt setpoint changes).

**WARNING**

During the speed controller optimization run, the motor is accelerated at a maximum of 45% of its rated armature current. The motor may reach speeds of up to approximately 20% of maximum speed.

If field weakening is selected ( $P081 = 1$ ), if closed-loop torque control ( $P170=1$ ) or torque limiting ( $P169=1$ ) is selected or if a variable field current setpoint is applied:

**P051 = 27****Optimization run for field weakening** (process lasts approx. 1min)

This optimization run may also be started without a mechanical load.

The following parameters are set automatically: P117 to P139, P275 and P276.

**Note:**

In order to determine the magnetization characteristic, the field current setpoint is reduced during the optimization run from 100% of the motor rated field current as set in P102 down to a minimum of 8%. The field current setpoint is limited to a minimum according to P103 by parameterizing P103 to values  $< 50\%$  of P102 for the duration of the run. This might be necessary in the case of uncompensated motors with a very high armature reaction.

The magnetizing characteristic is approximated linearly to 0, starting from the measuring point, at a minimum field current setpoint.

To execute this optimization run, the minimum field current (P103) must be parameterized to less than 50% of the rated motor field current (P102).

|                                                                                   |                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>WARNING</b>                                                                                                                                                                                                                                                                       |
|                                                                                   |  <p>During this optimization run, the drive accelerates to approximately 80% of rated motor speed (the armature voltage corresponds to maximum 80% of the rated motor armature voltage (P101)).</p> |

**P051 = 28**
**Optimization run for compensation of friction moment and moment of inertia (if desired)** (process lasts approx. 40s)

The following parameters are set automatically: P520 to P530, P540

|                                                                                   |                                                                                                                                                                  |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>WARNING</b>                                                                                                                                                   |
|                                                                                   |  <p>The drive accelerates up to maximum speed during this optimization run.</p> |

On completion of this run, the friction and inertia moment compensation function must be activated manually by setting P223=1.

When the operating mode is switched from current control to torque control with P170, the optimization run for friction and inertia moment compensation must be repeated.

**Note:**

The speed controller may not be parameterized as a pure P controller or as a controller with droop when this optimization run is executed.

**P051 = 29**
**Speed controller optimization run on drives with oscillating mechanical components** (takes up to 10 minutes)

The following parameters are set automatically: P225, P226 and P228.

The frequency response of the controlled system for frequencies of 1 to 100 Hz are recorded during this optimization run.

The drive is first accelerated up to a base speed (P565, FS=20%). A sinusoidal speed setpoint with low amplitude (P566, FS=1%) is then injected. The frequency of this supplementary setpoint is changed in steps of 1 Hz from 1 Hz to 100 Hz. An average is calculated from a programmable number of current peaks (P567, WE=300) for each frequency.

[The value set in P567 is significant in determining the time taken to perform the run. With a setting of 300, the run can take about 3 to 4 minutes.]

The optimum speed controller setting for the controlled system is calculated on the basis of the frequency response measured for the system.

|                                                                                     |                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>WARNING</b>                                                                                                                                                                                                                                                        |
|                                                                                     |  <p>This optimization run must <u>not</u> be carried out if the motor is coupled to a mechanical load which is capable of moving the torque-free motor (e.g. a vertical load).</p> |



At the end of the optimization run, P051 is displayed on the operator panel and the drive switches to operating state o7.2.

## NOTICE

In the case of drives with a limited travel path, the optimization run for field weakening (P051=27) may not be interrupted by the SHUTDOWN command until the 1st field weakening measuring point has been plotted. Likewise, the optimization run for the friction moment and moment of inertia compensation function (P051=28) may not be interrupted by SHUTDOWN until the measuring point at 10% of maximum speed has been determined. Premature interruption in both cases will lead to activation of fault message F052. When either of these optimization runs is restarted (P051=27 or P051=28), it will be continued at a more advanced position. In this way, the respective run can be completed in several stages, even if the travel path is limited.

### Note:

The respective optimization run is executed completely after a restart if a) a fault message is activated during the optimization run, b) if the electronics supply is disconnected before the relevant optimization run is restarted, c) if another function dataset than the one before is selected or d) if another optimization run is started in-between.

The parameters of the function data set selected in each case are optimized.

While optimization runs are being executed, the function data set selection must not be changed or else a fault message will be activated.

## NOTE

Optimization runs should be executed in the order listed above (precontrol and current controller, speed controller, field weakening control, friction moment and moment of inertial compensation).

The determined parameters are dependent on the motor temperature. Values set automatically when the motor is cold can be used as effective defaults.

For highly dynamic drives, the optimization run P051=25 should be repeated after the drive has been operated under load (i.e. when motor is warm).



## 10 Checking and possible fine adjustment of maximum speed

After the optimization runs have been executed, the maximum speed must be checked and it's setting corrected if necessary.

If it is necessary to change the maximum speed setting by more than about 10%, the control response of the speed control loop must be checked. It may be necessary to repeat the speed controller optimization run or re-optimize the controller manually.

The optimization runs for field weakening and friction motor and moment of inertial compensation must be repeated every time the maximum speed setting is altered.



## 11 Checking the drive settings

The optimization runs do not provide optimum results for every application. The controller settings must therefore be checked by suitable means (oscilloscope, DriveMonitor, Trace etc.). In some cases, manual re-optimization will be necessary.



## Manual (post-)optimization (if necessary)

### Precontrol and current controller for armature and field

Instructions on how to manually set parameters for the precontrol function can be found in Section 7.2 "Manual optimization".

### Speed controller

|      |                                   |
|------|-----------------------------------|
| P200 | Actual speed filtering            |
| P225 | Speed controller P gain           |
| P226 | Speed controller integration time |
| P227 | Speed controller droop            |
| P228 | Speed setpoint filtering          |

Note:

P228 is set to the same value as P226 (speed controller integration time) during the speed controller optimization run (P051=26) (for the purpose of achieving an optimum control response to abrupt setpoint changes). When the ramp-function generator is used, it may be better to parameterize a lower speed setpoint filtering value (P228).

Setting of empirical values or optimization using setpoint control boxes according to generally applicable optimization guidelines.

### EMF controller

|      |                                 |
|------|---------------------------------|
| P275 | EMF controller P gain           |
| P276 | EMF controller integration time |

Setting of empirical values or optimization using setpoint control boxes according to generally applicable optimization guidelines.



## Setting of supplementary functions

e.g. activating monitoring functions

### NOTE

In the factory setting, the following fault signals are deactivated with parameters P820.01 to P820.06:

- F007 (overvoltage)
- F018 (short circuit at the binary outputs)
- F031 (controller monitoring speed controller)
- F035 (drive blocked)
- F036 (no armature current can flow)
- F037 (i<sup>2</sup>t monitoring of motor)

Activate the monitoring functions required in your applications by replacing the fault number in question with the value 0.

e.g. activating the free function blocks

### NOTE

Freely assignable function blocks are enabled in parameter U977.  
For enabling instructions, please refer to Section 11, Parameter List, description of parameters U977 and n978.



## Documentation of setting values

- Read out parameters with DriveMonitor (see Section 15 “DriveMonitor”) or
- Document parameters  
If P052=0, only parameters that are not set to the default setting are displayed on the operator control panel.

## 7.6 Manual optimization (if required)

### 7.6.1 Manual setting of armature resistance $R_A$ (P110) and armature inductance $L_A$ (P111)

- **Setting of armature circuit parameters according to motor list**

Disadvantage: The data is very inaccurate and/or the actual values deviate significantly.

The feeder resistances are not taken into account in the armature circuit resistance.  
Additional smoothing reactors and feeder resistances are not taken into account in the armature circuit inductance.

- **Rough estimation of armature circuit parameters from motor and supply data**

#### Armature circuit resistance P110

$$R_A [\Omega] = \frac{\text{Rated motor armature voltage [V] (P101)}}{10 * \text{Rated motor armature current [A] (P100)}}$$

The basis for this formula is that 10% of the rated armature voltage drops across armature circuit resistor  $R_A$  at rated armature current.

#### Armature circuit inductance P111

$$L_A [\text{mH}] = \frac{1.4 * \text{Rated converter supply voltage of armature power section [V] (P071)}}{\text{Rated motor armature current [A] (P100)}}$$

The basis for this formula is the empirical value: The transition from discontinuous to continuous current is at approx. 30% of the rated motor armature current.

- **Calculation of armature circuit parameters based on current/voltage measurement**
  - Select current-controlled operation: **P084=2**
  - Set parameter **P153=0** (precontrol deactivated)
  - The field must be switched off by setting **P082=0** and, in the case of excessively high residual flux, the rotor of the DC motor locked so that it cannot rotate.
  - Set the overspeed protection threshold **P354=5%**
  - Enter a main setpoint of 0
  - If “ENABLE OPERATION” is applied and the “SWITCH ON” command entered, an armature current of approximately 0% now flows.

### Calculation of armature circuit resistance P110 from measured armature current and armature voltage values

- Increase the main setpoint (displayed at r001) slowly until the actual armature current value (r019 in % of rated converter armature current) reaches approximately 70% of the rated motor armature current.
- Read out r019 (actual armature current value) and convert to amps (using P100)
- Read out r038 (actual armature voltage in volts)
- Calculate the armature circuit resistance:

$$R_A[W] = \frac{r038}{r019 \text{ (converted to amps)}}$$

- Set the armature circuit resistance in parameter P110

### Calculation of armature circuit inductance P111 from measured armature current at transition from discontinuous to continuous current

- Make an oscilloscope trace of the armature current (e.g. at terminal 12) Increase the main setpoint (displayed at r001) slowly starting from 0 until the armature current reaches the transition from discontinuous to continuous current.
- Measure armature current at transition (at standstill EMF=0)  $I_{LG, EMF=0}$  or read out the value of r019 and convert to amps using P100.
- Measure the phase-to-phase voltage of the armature power section  $U_{supply}$  or read out the value of r015.
- Calculate the armature circuit inductance using the following formula:

$$L_A[mH] = \frac{0.4 * U_{supply} [V]}{I_{LG, EMF=0} [A]}$$

- Set the armature circuit inductance in parameter P111.

## 7.6.2 Manual setting of field circuit resistance $R_F$ (P112)

- **Rough estimation of field circuit resistance  $R_F$  (P112) from motor rated field data**

$$R_F = \frac{\text{Rated motor field voltage}}{\text{Rated motor field current (P102)}}$$

- **Adapt the field circuit resistance  $R_F$  (P112) using a field current setpoint/actual value comparison**

- Set parameter **P112=0** to produce a 180° field precontrol output, and thus an actual field current value = 0
- Set parameter **P082=3** to ensure that the field remains permanently energized, even when the line contactor has dropped out
- Set parameters **P254=0** and **P264=0**, i.e. only field precontrol active and field current controller disabled
- Set parameter **P102** to the rated field current
- **Increase** parameter **P112** until the actual field current (r035 converted to amps by means of r073.002) is equal to the required setpoint (P102).
- Reset parameter **P082** to the plant operating value.

## 7.7 Starting up optional supplementary boards

For board mounting instructions, see Section 5.3.2 , Mounting Optional Supplementary Boards. This section also contains details on the number of supplementary boards that can be installed and in which slots they may be inserted.

The basic converter automatically detects all installed supplementary boards during power-up.

All communications-related settings must be made by means of parameters. The function diagrams in Section 8 show a general overview of the parameters provided for this purpose.

If two boards of the same type (e.g. two EB1s) are installed in a converter, the slots in which they are installed determine the parameter settings. The board in the slot with the lower slot letter is the 1<sup>st</sup> board (e.g. the 1<sup>st</sup> EB1) of this particular type and the board with the higher letter the 2<sup>nd</sup> board (e.g. 2<sup>nd</sup> EB1).

The 1<sup>st</sup> board is parameterized via index 1 and the 2<sup>nd</sup> board via index 2 of the corresponding parameter (e.g. to define the signal type of the analog inputs of boards of type EB1, parameter U755.001 is used for the 1<sup>st</sup> EB1 and parameter U755.002 for the 2<sup>nd</sup> EB1).

### 7.7.1 Procedure for starting up technology boards (T100, T300, T400):

#### NOTE

Freely configurable technology boards T300 and T400 are guaranteed to operate correctly (board run up and data exchange with the SIMOREG 6RA70). The user, however, must bear responsibility for ensuring that the system is properly configured.



1 Disconnect the power supply and insert the board in location 2.



2 Power up the system again to gain access to the parameters of the technology board (d and H parameters, as well as c and L parameters if programmed).

The process data are interconnected at the basic converter end by means of the appropriate connectors and binectors (see Section 8, function diagram Z110)

For meaning of bits of control and status words, please see Section 8, Sheets G180 to G183.

If a communication board is used in addition to a technology board, then data are exchanged with the basic converter via the technology board. The basic converter cannot directly access the data of the communication board. The connections of the transfer data are then determined by the configuration or parameter settings of the technology board.

Module T100 comprising software submodule MS100 already contains several technology functions and arithmetic, control, and logic modules, which are freely configurable using parameters. This software can be expanded with customized components, if required.

As module T300 has already been replaced by T400, T300 should only be used in special circumstances.

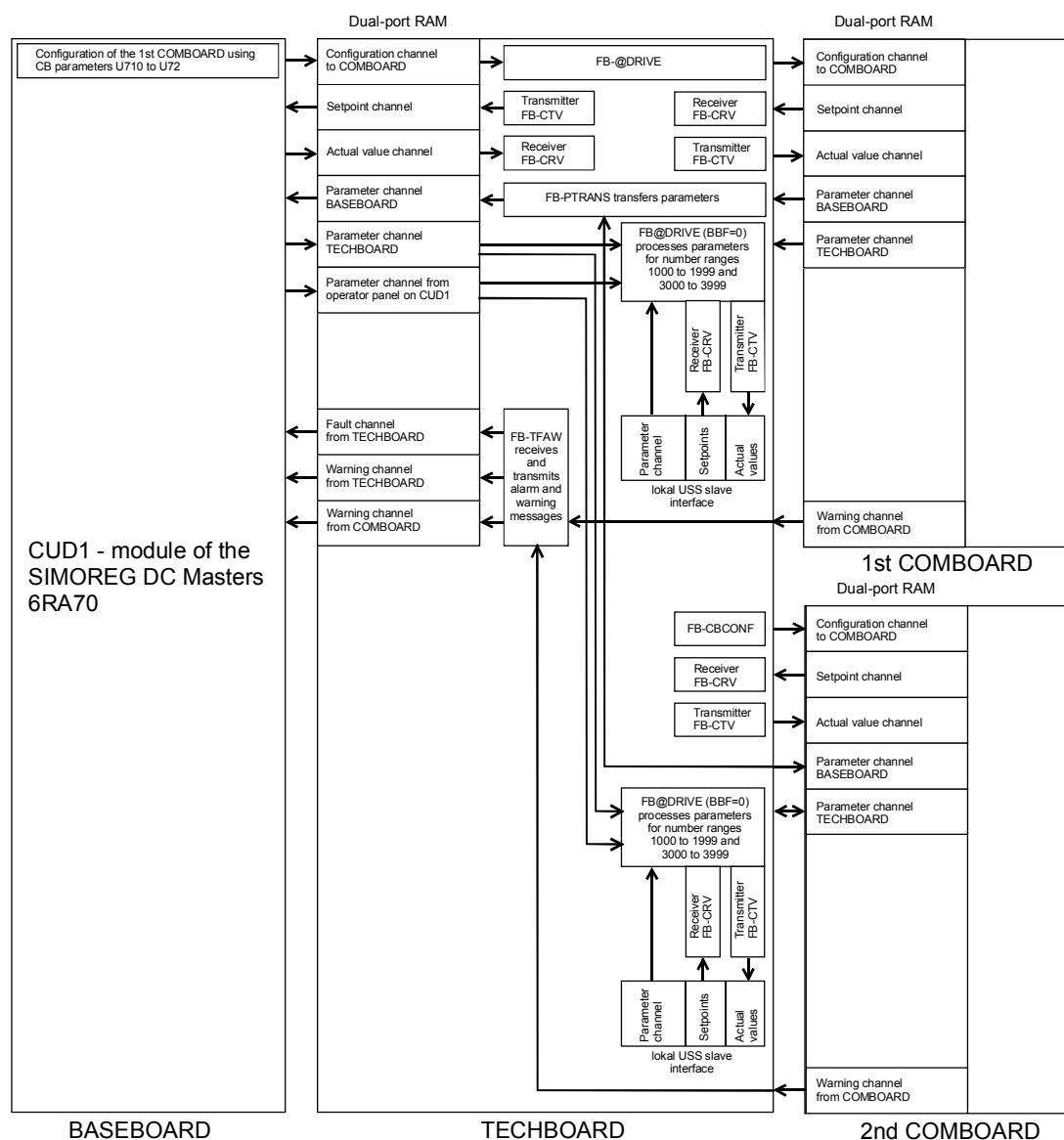
Only one communication module (CBC, CBD, CBP2, SCB1) is permitted in slot G in addition to the technology modules T100 and T300 in slot 2.

Module T400 is already available with standard configurations for frequent applications. They permit the use of several functions (e.g. inputs/outputs, serial interfaces, link to a communications module) without any additional configuration.

As from configuration software D7-SYS V4.0 R07/98, it is possible to configure not only one, but two communications modules (CBC, CBD, CBP2) for module T400. These modules are then located on an ADB in slots G (1. CB) and F (2. CB).

In this case, the 2<sup>nd</sup> CB is not configured with parameters of the basic device, but the CB parameters must be configured as modifiable parameters of the T400.

Possible communications paths are shown in the figure below. For details of how to configure a T400, please consult the relevant documentation (e.g. SIMADYN D – Configuring Instructions T400, 6DD1903-0EA0 etc.).



The SIMOREG CM 6RA70 does not permit direct evaluation of the signals of a pulse generator connected to the terminals of the CUD1 by the T400.



## 7.7.2 Sequence of operations for starting up PROFIBUS boards (CBP2):



Switch off the power supply and insert the board or adapter with board. For board mounting instructions, see Section 5.3.2 , Mounting Optional Supplementary Boards.



The following are important communication parameters. Index 1 of each parameter is set for the 1<sup>st</sup> communication board (1<sup>st</sup> CB) and index 2 for the 2<sup>nd</sup> communication board (2<sup>nd</sup> CB):

- U712 PPO type, definition of the number of words in the parameter and process data section of the telegram (required only if the PPO type cannot be set via PROFIBUS-DP master)
- U722 Telegram failure time for process data (0 = deactivated)  
The DP master configuring data determine whether the slave (CBP2) must monitor telegram traffic with the master. If this monitoring function is activated, the DP master passes a time value (watchdog time) to the slave when the link is set up. If no data are exchanged within this period, the slave terminates the process data exchange with the SIMOREG converter. The latter can monitor the process data as a function of U722 and activate fault message F082.
- P918 Bus address
- P927 Parameterization enable (need only be set if parameters are to be assigned via PROFIBUS)
- The process data of the 1<sup>st</sup> or 2<sup>nd</sup> communication board are connected by means of the appropriate connectors and binectors (see Section 8, function diagrams Z110 and Z111)  
For meaning of bits of control and status words, please see Section 8, Sheets G180 to G183.



Turn the electronics supply voltage off and on again or set U710.001 or U710.002 to "0" to transfer the values of parameters U712, U722 and P918 to the supplementary board.



### WARNING



This initialization process will interrupt the communication of any supplementary board that has already been started up.

The CBP2 (Communication Board PROFIBUS) serves to link drives and higher-level automation systems via the PROFIBUS-DP. For the purpose of PROFIBUS, it is necessary to distinguish between master and slave converters.

**Masters** control the data traffic via the bus and are also referred to as **active nodes**. There are two classes of master:

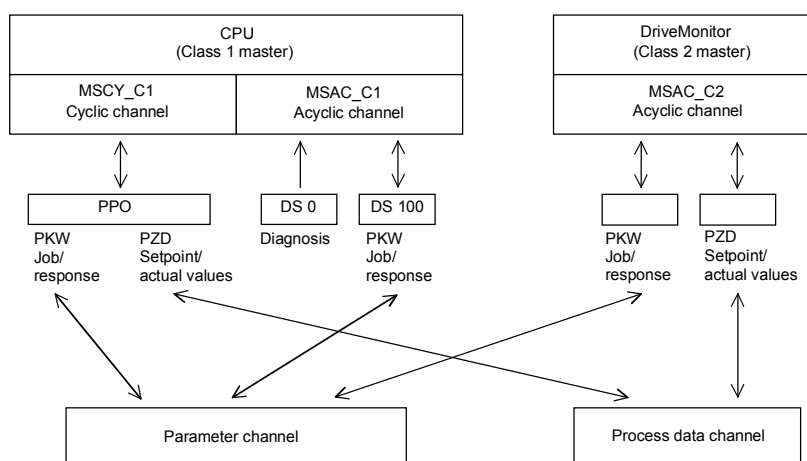
**DP masters of class 1** (DPM1) are central stations (e.g. SIMATIC S5, SIMATIC S7 or SIMADYN D) which exchange data with slaves in predefined message cycles. DPM1s support both a **cyclic channel** (transmission of process data and parameter data) and an **acyclic channel** (transmission of parameter data and diagnostic data).

**DP masters of class 2** (DPM2) are programming, configuring or operator control/visualization devices (e.g. DriveMonitor) which are used in operation to configure, start up or monitor the installation.

DPM2s support only an **acyclic channel** for transferring parameter data.

The contents of the data frames transferred via these channels are identical to the structure of the parameter section (PKW) as defined by the USS specification.

The following diagram shows the services and channels supported by a CBP2:



**Slaves** (e.g. CBP2) may only respond to received messages and are referred to as **passive nodes**.

**PROFIBUS (Process Field Bus)** combines high baud rates (to RS485 standard) with simple, low-cost installation. The PROFIBUS baud rate can be selected within a range of 9.6 kbaud to 12 Mbaud and is set for all devices connected to the bus when the bus system is started up. The bus is accessed according to the token-passing method, i.e. permission to transmit for a defined time window is granted to the active stations (masters) in a "logical ring". The master can communicate with other masters, or with slaves in a subordinate master-slave process, within this time window.

**PROFIBUS-DP (Distributed Peripherals)** predominantly utilizes the master-slave method and data is exchanged cyclically with the drives in most cases.

The user data structure for the **cyclic channel MSCY\_C1** (see picture above) is referred to as a **Parameter Process(data) Object (PPO)** in the PROFIBUS profile for variable-speed drives. This channel is also frequently referred to as the **STANDARD** channel.

The user data structure is divided into two different sections which can be transferred in each telegram:

#### **PZD section**

The process data (PZD) section contains control words, setpoints, status words and actual values.

#### **PKW section**

The parameter section (PKW - Parameter ID Value) is used to read and write parameter values.

When the bus system is started up, the type of PPO used by the PROFIBUS master to address the drive is selected. The type of PPO selected depends on what functions the drive has to perform in the automation network.

Process data are always transferred and processed as priority data in the drive.

Process data are "wired up" by means of connectors of the basic unit (drive) or via technology board parameters, if these are configured.

Parameter data allow all parameters of the drive to be accessed, allowing parameter values, diagnostic quantities, fault messages, etc. to be called by a higher-level system without impairing the performance of the PZD transmission.

A total of five PPO types are defined:

| PKW section |                         |                         |                         |                         | PZD section                  |                         |                         |                         |                         |                         |                         |                         |                         |                          |
|-------------|-------------------------|-------------------------|-------------------------|-------------------------|------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|
|             | PKE                     | IND                     | PWE                     |                         | PZD1<br>STW<br>1<br>ZSW<br>1 | PZD2<br>HSW<br>HIW      | PZD3                    | PZD4                    | PZD5                    | PZD6                    | PZD7                    | PZD8                    | PZD9                    | PZD<br>10                |
|             | 1 <sup>st</sup><br>word | 2 <sup>nd</sup><br>word | 3 <sup>rd</sup><br>word | 4 <sup>th</sup><br>word | 1 <sup>st</sup><br>word      | 2 <sup>nd</sup><br>word | 3 <sup>rd</sup><br>word | 4 <sup>th</sup><br>word | 5 <sup>th</sup><br>word | 6 <sup>th</sup><br>word | 7 <sup>th</sup><br>word | 8 <sup>th</sup><br>word | 9 <sup>th</sup><br>word | 10 <sup>th</sup><br>word |
| PPO<br>1    |                         |                         |                         |                         |                              |                         |                         |                         |                         |                         |                         |                         |                         |                          |
| PPO<br>2    |                         |                         |                         |                         |                              |                         |                         |                         |                         |                         |                         |                         |                         |                          |
| PPO<br>3    |                         |                         |                         |                         |                              |                         |                         |                         |                         |                         |                         |                         |                         |                          |
| PPO<br>4    |                         |                         |                         |                         |                              |                         |                         |                         |                         |                         |                         |                         |                         |                          |
| PPO<br>5    |                         |                         |                         |                         |                              |                         |                         |                         |                         |                         |                         |                         |                         |                          |

PKW: Parameter ID value

IND: Index

ZSW: Status word

PZD: Process data

PWE: Parameter value

HSW: Main setpoint

PKE: Parameter identifier

STW: Control word

ISW: Main actual value

The **acyclic channel MSCY\_C2** (see diagram above) is used exclusively for the start-up and servicing of DriveMonitor.

#### 7.7.2.1 Mechanisms for processing parameters via the PROFIBUS:

The PKW mechanism (with PPO types 1, 2 and 5 and for the two acyclic channels MSAC\_C1 and MSAC\_C2) can be used to read and write parameters. A parameter request job is sent to the drive for this purpose. When the job has been executed, the drive sends back a response. Until it receives this response, the master must not issue any new requests, i.e. any job with different contents, but must repeat the old job.

The parameter section in the telegram always contains at least 4 words:

|                             |              |                                    |                                    |
|-----------------------------|--------------|------------------------------------|------------------------------------|
| Parameter identifier<br>PKE | Index<br>IND | Parameter value 1<br>PWE1 (H word) | Parameter value 2<br>PWE2 (L word) |
|-----------------------------|--------------|------------------------------------|------------------------------------|

Details about the telegram structure can be found in Section 7.7.9, "Structure of request/response telegrams", and in the PROFIBUS profile "PROFIBUS Profile, Drive technology" of the user's organization PROFIBUS International (<http://www.profibus.com>).

The **parameter identifier PKE** contains the number of the relevant parameter and an identifier which determines the action to be taken (e.g. "read value").

The **index IND** contains the number of the relevant index value (equals 0 in the case of nonindexed parameters). The IND structure differs depending on the communication mode:

- Definition in the PPOs (structure of IND with cyclical communication via PPOs)
- Definition for acyclical channels MSAC\_C1 and MSAC\_C2 (structure of IND with acyclical communication)

The array subindex (referred to simply as "subindex" in the PROFIBUS profile) is an 8-bit value which is transferred in the **high-order** byte (bits 8 to 15) of the index (IND) **when data are transferred cyclically via PPOs**. The low-order byte (bits 0 to 7) is not defined in the DVA profile. The low-order byte of the index word is used in the PPO of CBP2 to select the correct number range (bit7 = Page Select bit) in the case of parameter numbers of > 1999.

In the case of **acyclical data traffic** (MSAC\_C1, MSAC\_C2) the number of the index is transferred in the **low-order** byte (bits 0 to 7). Bit 15 in the high-order byte is used as the Page Select bit. This assignment complies with the USS specification.

Index value 255 (request applies to all index values) is meaningful only for acyclical transmission via MSAC\_C1. The maximum data block length is 206 bytes with this transmission mode.

The **parameter value PWE** is always transferred as double word (32-bit value) PWE1 and PWE2. The high-order word is entered as PWE1 and the low-order word as PWE2. In the case of 16-bit values, PWE1 must be set to 0 by the master.

### Example

Read parameter P101.004 (for details, see Section 7.7.9, "Structure of request/response telegrams"):

Request identifier PKE = 0x6065 (request parameter value (array) P101),  
Index IND = 0004h = 4d  
Parameter value PWE1 = PWE2 = 0

SIMOREG response:

Response identifier PKE = 0x4065,  
Index IND = 0004h = 4d  
Value of P101.004 = 0190h = 400d (PWE1 = 0, because it is not a double word parameter)

### Rules for job/response processing:

A job or a response can only ever refer to one parameter.

The master must send the job repeatedly until it receives an appropriate response from the slave. The master recognizes the response to the job it has sent by analyzing the response identifier, the parameter number, the parameter index and the parameter value.

The complete job must be sent in one telegram. The same applies to the response.

The actual values in repeats of response telegrams are always up-to-date values.

If no information needs to be fetched via the PKW interface (but only PZD) in cyclic operation, then a "No job" job must be issued.

PROFIBUS devices have a variety of difference performance features. In order to ensure that all master systems can correctly address each supplementary board, the characteristic features of each board are stored in a separate device master file (GSD).

You need file <siem8045.gsd> for CBP2.

The appropriate file can be chosen in the selection menu for the SIMOVERT MASTER DRIVES files in later versions of the configuring tool.

If a device master file is not available in the menu, it can be collected from an Internet site. The Internet address is <http://www4.ad.siemens.de/view/cs/en/4647098>.

Product Support/PROFIBUS GSD files/Drives/. Have all entries displayed using the search function and click on the search results.

SIMOVERT/SIMOREG/SIMADYN CBP

File: siem8045.gsd

The communication boards can only be operated on a non-Siemens master as a DP standard slave, the corresponding GSD file containing all necessary information for this mode.

Detailed information about communication via PROFIBUS can be found in Section 8.2 of the compendium for SIMOVERT MASTER DRIVES Motion Control (order no. 6SE7080-0QX50). The description in this document is fully applicable in every respect, except that the specified parameter numbers differ from those used on the SIMOREG CM 6RA70.

### 7.7.2.2 Diagnostic tools:

LED displays of CBP2 (flashing LEDs mean normal operation):

|            |                                         |
|------------|-----------------------------------------|
| Red LED    | Status of CBP2                          |
| Yellow LED | Communication between SIMOREG and CBP2  |
| Green LED  | Communication between CBP2 and PROFIBUS |

As a start-up support tool, the PROFIBUS board supplies data which can be displayed in n732.001 to n732.032 (1<sup>st</sup> CB) or n732.033 to n732.064 (2<sup>nd</sup> CB).  
The values of the indices are as follows:

| Index   | Meaning for CBP2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 001/033 | <b>CBP_Status</b><br>Bit0: "CBP Init", CBP is being initialized or waiting to be initialized by the basic unit (not set in normal operation)<br>Bit1: "CBP Online", CBP is selected by basic unit (set in normal operation)<br>Bit2: "CBP Offline", CBP not selected by basic unit (not set in normal operation)<br>Bit3: Illegal bus address (P918) (not set in normal operation)<br>Bit4: Diagnostic mode activated (U711 <> 0) (not set in normal operation)<br>Bit8: Incorrect identifier bytes transferred (incorrect configuring message from PROFIBUS Master) (not set in normal operation)<br>Bit9: Incorrect PPO type (incorrect configuring message from PROFIBUS Master) (not set in normal operation)<br>Bit10: Correct configuring data received from PROFIBUS_DP Master (set in normal operation)<br>Bit12: Fatal error detected by DPS Manager software (not set in normal operation)<br>Bit13: Program in endless loop in main.c (loop can only be exited by a Reset)<br>Bit15: Program in communications online loop (loop can only be exited through re-initialization by basic unit) |
| 002/034 | <b>SPC3_Status</b><br>Bit0: Offline/Passive Idle<br>(0=SPC3 is operating in normal mode (offline)<br>1=SPC3 is operating in Passive Idle)<br>Bit2: Diag flag<br>(0=diagnostic buffer has been picked up by master<br>1= diagnostic buffer has not been picked up by master)<br>Bit3: RAM Access Violation, memory access >1.5kB<br>(0=no address violation, 1=for addresses > 1536 bytes, 1024 is subtracted from address and access made to the new address)<br>Bit4+5: DP state (00=Wait_Prm, 01=Wait_Cfg, 10=Data_Ex, 11=not possible)<br>Bit6+7: WD state (00=Baud search, 01=Baud_Control, 10=DP_Control, 11=not possible)<br>Bit8-11: Baud rate (0000=12MBd, 0001=6MBd, 0010=3MBd, 0011=1.5MBd, 0100=500kBd, 0101=187.5kBd, 0110=93.75kBd, 0111=45.45kBd, 1000=19.2kBd, 1001=9.6kBd)<br>Bit12-15: SPC3-Release (0000=Release 0)                                                                                                                                                                                                                                                                   |
| 003/035 | <b>SPC3_Global_Controls</b><br>Bits remain set until the next DP global command<br>Bit1: 1=Clear_Data message received<br>Bit2: 1=Unfreeze message received<br>Bit3: 1=Freeze message received<br>Bit4: 1=Unsync message received<br>Bit5: 1=Sync message received                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 004/036 | L byte: No. of received error-free messages (DP Standard only)<br>H byte: Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 005/037 | L byte: "Timeout" counter<br>H byte: Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 006/038 | L byte: "Clear Data" counter<br>H byte: Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 007/039 | L byte: "Heartbeat counter error" counter<br>H byte: Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 008/040 | L byte: No. bytes for special diagnosis<br>H byte: Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 009/041 | L byte: Mirroring of slot identifier 2<br>H byte: Mirroring of slot identifier 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 010/042 | L byte: Mirroring of P918 (CB bus addr.)<br>H byte: Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 011/043 | L byte: "Re-config. by CUD" counter<br>H byte: "Initialization runs" counter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 012/044 | L byte: Error ID DPS manager error<br>H byte: Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Index   | Meaning for CBP2                                                                                       |
|---------|--------------------------------------------------------------------------------------------------------|
| 013/045 | L byte: PPO type found<br>H byte: Reserved                                                             |
| 014/046 | L byte: Mirroring of "DWord specifier ref"                                                             |
| 015/047 | H byte: Mirroring of "DWord specifier act"                                                             |
| 016/048 | L byte: DPV1:DS_Write, pos. ack. counter<br>H byte: Reserved                                           |
| 017/049 | L byte: DPV1:DS_Write, neg. ack. counter<br>H byte: Reserved                                           |
| 018/050 | L byte: DPV1:DS_Read, pos. ack. counter<br>H byte: Reserved                                            |
| 019/051 | L byte: DPV1:DS_Read, neg. ack. counter<br>H byte: Reserved                                            |
| 020/052 | L byte: DP/T:GET DB99 pos. ack. counter<br>H byte: DP/T:PUT DB99 pos. ack. counter                     |
| 021/053 | L byte: DP/T:GET DB100 ps. ack. counter<br>H byte: DP/T:PUT DB100 ps. ack. counter                     |
| 022/054 | L byte: DP/T:GET DB101 ps. ack. counter<br>H byte: DP/T:PUT DB101 ps. ack. counter                     |
| 023/055 | L byte: DP/T service neg. acknow. counter<br>H byte: DP/T:Application association pos. acknow. counter |
| 024/056 | Reserved                                                                                               |
| 025/057 | Date of creation: Day, month                                                                           |
| 026/058 | Date of creation: Year                                                                                 |
| 027/059 | Software version (Vx.yz, display x)                                                                    |
| 028/060 | Software version (Vx.yz, display yz)                                                                   |
| 029/061 | Software version: Flash-EPROM checks.                                                                  |
| 030/062 | Reserved                                                                                               |
| 031/063 | Reserved                                                                                               |
| 032/064 | Reserved                                                                                               |

#### Fault and alarm messages:

For details about fault messages, see Section 10.

##### **Fault F080**

An error occurred as board CBP2 was being initialized, e.g. incorrect value of a CB parameter, incorrect bus address or defective module.

##### **Fault F081**

The heartbeat counter (counter on CBP2) which is monitored by SIMOREG for "signs of life" from the board has not changed for at least 800 ms.

##### **Fault F082**

Failure of PZD telegrams or a fault in the transmission channel.

##### **Alarm A081 (1<sup>st</sup> CB) or alarm A089 (2<sup>nd</sup> CB)**

The identifier byte combinations transmitted by the DP master in the configuration telegram do not match the permitted identifier byte combinations (configuring error on DP master)  
Effect: No link can be established with the DP master, reconfiguration necessary.

**Alarm A082 (1<sup>st</sup> CB) or alarm A090 (2<sup>nd</sup> CB)**

No valid PPO type can be determined from the configuration telegram from the DP master.

Effect: No link can be established with the DP master, reconfiguration necessary.

**Alarm A083 (1<sup>st</sup> CB) or alarm A091 (2<sup>nd</sup> CB)**

No user data, or only invalid data, are being received from the DP master.

Effect: The process data are not transferred to the basic unit. When the telegram failure monitoring function is active (U722 set to value other than 0), this disturbance generates fault message F082 with fault value 10.

**Alarm A084 (1<sup>st</sup> CB) or alarm A092 (2<sup>nd</sup> CB)**

The exchange of data between the communication board and DP master has been interrupted (e.g. cable break, bus connector removed or DP master switched off).

Effect: When the telegram failure monitoring function is active (U722 set to value other than 0), this disturbance generates fault message F082 with fault value 10.

**Alarm A085 (1<sup>st</sup> CB) or alarm A093 (2<sup>nd</sup> CB)**

Error in the DPS software of the communication board.

Effect: Fault message F081 is generated.

**Alarm A086 (1<sup>st</sup> CB) or alarm A094 (2<sup>nd</sup> CB)**

Failure of heartbeat counter detected by SIMOREG CM.

Effect: Interruption in communication with PROFIBUS.

**Alarm A087 (1<sup>st</sup> CB) or alarm A095 (2<sup>nd</sup> CB)**

DP slave software has detected serious fault, fault number in diagnostic parameter n732.08.

Effect: Total communication failure (secondary fault F082).

**Alarm A088 (1<sup>st</sup> CB) or alarm A096 (2<sup>nd</sup> CB)**

At least 1 configurable internode transmitter is not yet active or has failed again (for details, see diagnostic parameter n732).

Effect: If a transmitter is not yet active, the associated setpoints are set to "0" as an alternative. If an internode transmitter fails again, transmission of the setpoints to the SIMOREG may be interrupted depending on the setting of U715 (with secondary fault F082).



### 7.7.3 Sequence of operations for starting up CAN bus boards (CBC):



With the power supply switched off, insert the board with adapter board (ADB) into the slot. For board mounting instructions, see Section 5.3.2 , Mounting Optional Supplementary Boards.



The following are important communication parameters. Index 1 of each parameter is set for the 1<sup>st</sup> communication board (1<sup>st</sup> CB) and index 2 for the 2<sup>nd</sup> communication board (2<sup>nd</sup> CB): Exception: In parameter U721, i001 to i005 are applicable to the 1<sup>st</sup> CB and i006 to i010 to the 2<sup>nd</sup> CB (indices 3 to 5 and 8 to 10 are reserved).

The meaning of the parameters also differs depending on the setting of U721, i.e. CAN-Layer 2 (U721=0) and CANopen (U721=1):

|                          | CAN-Layer 2                                                                                                                                                     | CANopen                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U711                     | Basic identifier for PKW Request/PKW Response                                                                                                                   | 1 <sup>st</sup> Receive-PDO                                                                                                                                     |
| U712                     | Basic identifier for PZD Receive                                                                                                                                | 2 <sup>nd</sup> Receive-PDO                                                                                                                                     |
| U713                     | Basic identifier for PZD Send                                                                                                                                   | 3 <sup>rd</sup> Receive-PDO                                                                                                                                     |
| U714                     | Number of PZD for PZD Send                                                                                                                                      | 4 <sup>th</sup> Receive-PDO                                                                                                                                     |
| U715                     | Updating rate for PZD Send                                                                                                                                      | 1 <sup>st</sup> Transmit-PDO                                                                                                                                    |
| U716                     | Basic identifier for PZD Receive-Broadcast                                                                                                                      | 2 <sup>nd</sup> Transmit-PDO                                                                                                                                    |
| U717                     | Basic identifier for PZD Receive-Multicast                                                                                                                      | 3 <sup>rd</sup> Transmit-PDO                                                                                                                                    |
| U718                     | Basic identifier for PZD Receive-Internode                                                                                                                      | 4 <sup>th</sup> Transmit-PDO                                                                                                                                    |
| U719                     | Basic identifier for PKW Request-Broadcast                                                                                                                      | Response to Life Time Event                                                                                                                                     |
| U720                     | Baud rate when U721.002 or U721.007 = 0:<br>0=10kbit/s, 1=20kbit/s, 2=50kbit/s, 3=100kbit/s,<br>4=125kbit/s, 5=250kbit/s, 6=500kbit/s,<br>7=Reserved, 8=1Mbit/s | Baud rate when U721.002 or U721.007 = 0:<br>0=10kbit/s, 1=20kbit/s, 2=50kbit/s, 3=100kbit/s,<br>4=125kbit/s, 5=250kbit/s, 6=500kbit/s,<br>7=Reserved, 8=1Mbit/s |
| U721.01<br>or<br>U721.06 | 0 = Functionality according to Layer 2 of ISO-OSI-7 Layer Model                                                                                                 | 1 = Functionality according to Layer 7 of ISO-OSI-7 Layer Model (CANopen)                                                                                       |
| U721.02<br>or<br>U721.07 | Bus timing (this should not be changed)                                                                                                                         | Bus timing (this should not be changed)                                                                                                                         |
| U722                     | Telegram failure time (0 = deactivated)                                                                                                                         | Telegram failure time (0 = deactivated)                                                                                                                         |
| P918                     | Bus address (node ID)                                                                                                                                           | Bus address (node ID)                                                                                                                                           |
| P927                     | Parameterizing enable (required only in cases where parameter values must be altered via the CAN Bus)                                                           | Parameterizing enable (required only in cases where parameter values must be altered via the CAN Bus)                                                           |

The process data of the 1<sup>st</sup> or 2<sup>nd</sup> communication board are connected by means of the appropriate connectors and binectors (see Section 8, function diagrams Z110 and Z111) For meaning of bits of control and status words, please see Section 8, Sheets G180 to G183.



Turn the electronics supply voltage off and on again or set U710.001 or U710.002 to "0" to transfer the values of parameters U711 to U721 and P918 to the supplementary board. Note: The initialization process may interrupt the communication link to a supplementary board which is already operational.



#### WARNING

This initialization process will interrupt the communication of any supplementary board that has already been started up.

The CAN (**C**ontroller **A**rea **N**etwork) fieldbus is being used increasingly for industrial applications in spite of its limited network length (max. 40 m with a data transmission rate of 1 Mbaud).



Data are transferred by means of telegrams. Each data message, the so-called **COBs** (**Communication Objects**), has its own individual **identifier** and contains a maximum of 8 bytes of user data. The CBC board uses the Standard Message Format with **11-bit identifier**. Simultaneous use by other nodes of Extended Message Format with 29-bit identifiers is tolerated, but messages with this format are not evaluated.

**Nodes** on the bus determine from the identifier which telegrams apply to them. The COBs to be sent and received by each node must be defined before data transmission commences. The identifiers also determine bus accessing priority. Low identifiers gain faster access to the bus, i.e. they have higher priority than high identifiers.

Errored telegrams can be reliably detected by means of a number of interactive error detection mechanisms. A transmission is automatically repeated when errors are detected.

The figure below shows a diagram of the CAN architecture model that is oriented toward the ISO-OSI-7 layer reference model. The CBC supports the functionalities provided by layers 2 and 7 of this model.

Functionality according to layer 2

The user data from the user software (as COBs on byte level) must be transferred directly to layer 2 (see also the examples of PZD and PKW data exchange given further down).

Functionality according to layer 7 (CANopen)

Process data are exchanged rapidly by means of so-called PDOs (**Process Data Objects**) analogous to the transmission method used for layer 2.

Parameter data are exchanged by means of so-called SDOs (**Service Data Objects**).

|               |           |                            | CAN protocol                              | Device net                                                                                               |
|---------------|-----------|----------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Application   |           | Device profile             |                                           | Device net specification includes:<br>- Device profile<br>- Communication profile<br>- Application layer |
|               |           | Communication profile      | CIA DS 301                                |                                                                                                          |
| Communication | Layer 7   | Application layer          | CIA CAL DS 201 .. 205, 207<br>CANopen CAL |                                                                                                          |
|               | Layer 3-6 |                            |                                           |                                                                                                          |
|               | Layer 2   | Data link layer            | ISO-DIS 11898                             |                                                                                                          |
|               | Layer 1   | Physical layer, electrical |                                           |                                                                                                          |
|               |           | Physical layer, mechanical | CIA DS 102-1                              | Device Net ODVA                                                                                          |

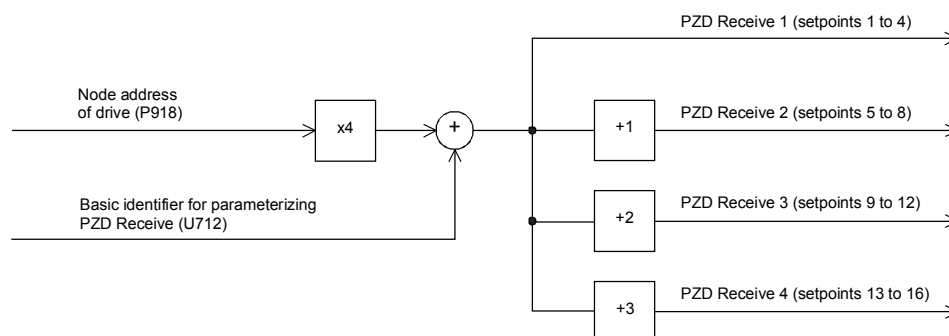
### 7.7.3.1 Description of CBC with CAN Layer 2

User data are exchanged between the CAN master and the CAN boards on the drives, i.e. the slaves. User data are categorized as either process data (control and status information, setpoints and actual values) or data which relate to parameters.

Process data (**PZDs**) are time-critical and therefore processed faster by the drive (every 3.3 ms at system frequency of 50 Hz) than the non-time-critical **PKW data** (parameter identifier value), which is processed by the drive every 20 ms.

All settings required to operate the communication board are made in drive parameters (see Section 8, function diagrams Z110 and Z111).

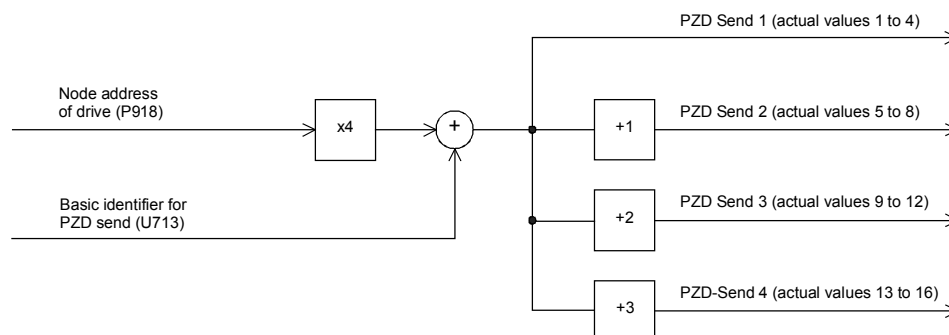
Process data (PZD) are categorized as either data received by the drive (control words and setpoints: **PZD Receive**) or data transmitted by the drive (status words and actual values: **PZD Send**). A maximum of 16 PZDs can be transferred in either direction; these are divided into COBs with 4 data words each by the communication board. In other words, 4 COBs are required to transfer 4 PZD words, with each COB requiring its own separate identifier. Identifiers are assigned in the CB parameters as shown in the following diagram:



Example of PZD Receive:

P918 = 1  
U712 = 96

This settings assigns identifier 100 to the first 4 receive PZDs, identifier 101 to the second 4 receive PZDs, etc.



Example of PZD Send:

P918 = 1  
U713 = 196

This setting assigns identifier 200 to the first 4 send PZDs, identifier 201 to the second 4 send PZDs, etc.

How received data are utilized by the drive or which data are to be sent by the drive is determined by connectors (see Section 8, function diagrams Z110 and Z111).

3 different modes of COB transmission can be selected in CB parameter 5 (U715):

- U715 = 0 Actual values are transmitted only on request (Remote Transmission Requests)
- U715 = 1 to 65534 Actual values are transmitted after the set time [ms] or on request (Remote Transmission Requests)
- U715 = 65535 Actual values are transmitted if the values have changed (event) or on request (Remote Transmission Requests). This option should only be used in cases where values seldom change so as to prevent excessive bus loading.

### Structure of a telegram for PZD data exchange:

The telegram consists of the following data words:

| Identifier ID | Process data word 1 PZD1 | Process data word 2 PZD2 | Process data word 3 PZD3 | Process data word 4 PZD4 |
|---------------|--------------------------|--------------------------|--------------------------|--------------------------|
|---------------|--------------------------|--------------------------|--------------------------|--------------------------|

**ID** is the CAN identifier that is defined for the COB in question by parameterization.

**PZDx** are process data words

Example of a PZD setpoint telegram:

Using the receive identifier of the above example

|                    |                    |                   |                    |
|--------------------|--------------------|-------------------|--------------------|
| Receive identifier | 100 <sub>d</sub>   | 0064 <sub>h</sub> |                    |
| 1. Setpoint        | 40063 <sub>d</sub> | 9C7F <sub>h</sub> | control word 1     |
| 2. Setpoint        | 8192 <sub>d</sub>  | 2000 <sub>h</sub> | speed setpoint 50% |
| 3. Setpoint        | 123 <sub>d</sub>   | 007B <sub>h</sub> |                    |
| 4. Setpoint        | 0 <sub>d</sub>     | 0 <sub>h</sub>    |                    |

Using the CAN BusAnalyser++ from Steinbeis, the setpoint data appear as follows (data field length = 8 bytes, low and high bytes are shown swapped round):

| Identifier | Data field |       |       |       |
|------------|------------|-------|-------|-------|
| 64 00      | 7F 9C      | 00 20 | 7B 00 | 00 00 |
| ID         | PZD1       | PZD2  | PZD3  | PZD4  |

The following functions are also available, each allowing a maximum of 16 process data to be transferred:

#### PZD Receive Broadcast

This function is used to send setpoints and control words from the master **to all slaves** on the bus simultaneously. With this option, an identical identifier must be set on all slaves utilizing the function. This common identifier is set in CB parameter 6 (U716). The first 4 PZDs are transferred with the value set in U716 and the second 4 PZDs with the value in U716+1, etc.

#### PZD Receive Multicast

This function is used to send setpoints and control words from the master to a **group of slaves** on the bus simultaneously. With this option, all slaves within the group using the function must be set to an identical identifier. This group identifier is set in CB parameter 7 (U717). The first 4 PZDs are transferred with the value set in U717 and the second 4 PZDs with the value in U717+1, etc.

#### PZD Receive Internode

This function is used to **receive** setpoints and control words **from another slave**, allowing PZDs to be exchanged between drives without intervention by a CAN master. For this purpose, the identifier of PZD Receive Internode on the receiving slave must be set to the identifier of PZD Send on the transmitting slave. This identifier is set in CB parameter 8 (U718). The first 4 PZDs are transferred with the value set in U718 and the second 4 PZDs with the value in U718+1, etc.

#### Notes regarding PZD transmission:

Control word 1 must always be transferred as the first PZD word for setpoints. If control word 2 is needed, then it must be transferred as the fourth PZD word.

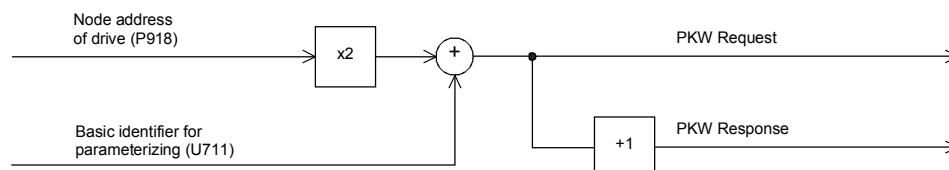
Bit 10 (control by PLC) must always be set in control word 1 or else the drives will not accept setpoints and control words.

The consistency of process data can only be guaranteed within a COB. If more than 4 data words are needed, these must be divided among several COBs. Since drives accept the data asynchronously, the data transferred in several COBs may not always be accepted and processed in the same processing cycle.

For this reason, interrelated data should be transferred within the same COB. If this is not possible, data consistency can be assured by means of control word bit 10 (control by PLC), i.e. by setting the bit to "off" in the first COB to temporarily prevent the drive from accepting the data from the communications board. The remaining data are then transmitted. Finally, a COB containing a control word bit 10 set to "on" is transmitted. Since a drive can accept up to 16 PZDs simultaneously from the communication board, data consistency is assured.

Since a variety of different functions can be used to transfer PZDs simultaneously, data are overlayed in the drive. For example, the first PZD from PZD Receive and PZD Receive Broadcast are always interpreted as the same control word 1. For this reason, care should be taken to ensure that data are transferred in meaningful combinations.

Two CAN identifiers are required for the purpose of processing parameters, i.e. one CAN identifier for PKW Request (parameter request job to drive) and one CAN identifier for PKW Response (parameter response by drive). These assignments are made in CB parameters as shown in the following diagram:



Example of PKW data exchange:

P918 = 1                      This setting assigns identifier 300 to the parameter job (request)  
 U711 = 298                    and identifier 301 to the parameter response.

#### Structure of a telegram for PKW data exchange:

The telegram consists of the following data words:

| Identifier ID | Parameter identifier PKE | Parameter index IND | Parameter value 1 PWE1 | Parameter value 2 PWE2 |
|---------------|--------------------------|---------------------|------------------------|------------------------|
|---------------|--------------------------|---------------------|------------------------|------------------------|

**ID** is the CAN identifier that is defined for the COB in question by parameterization.

**PKE** contains the request or response ID and the parameter number

| Request or response ID | Parameter number PNU |
|------------------------|----------------------|
|------------------------|----------------------|

Bit 0 to bit 10 contain the number of the parameter concerned. Bit 12 to bit 15 contain the request or response ID.

The index **IND** contains the value 0 for unindexed parameters, for indexed parameters it contains the corresponding index value. Bit15 also has a special function as the page select bit for parameter numbers greater than 1999.

The index value 255 means that the request concerns all indices of the parameter in question. For a change request, the parameter values must then be passed on for all indices of the parameter. Because a COB can only contain up to 4 data words (8 bytes) of net data, use of this request is only possible for parameters with (up to ) 2 indices. In the other direction, the drive supplies all index values in the response telegram to a read request.

Details about the telegram structure can be found in Section 7.7.9, "Structure of request/response telegrams".

#### Example of a PKW request:

Changing the parameter value of the indexed parameter P301.02 (in the RAM) to -95.00%.

The example telegram therefore contains the following values:

|                    |                   |                   |                                                                                                                |
|--------------------|-------------------|-------------------|----------------------------------------------------------------------------------------------------------------|
| Request identifier | 300 <sub>d</sub>  | 012C <sub>h</sub> | For use of the IDs of the example above<br>"Change parameter value (array word)"<br>=> PKE = 712D <sub>h</sub> |
| Request code       | 7 <sub>d</sub>    | 7 <sub>h</sub>    |                                                                                                                |
| Parameter number   | 301 <sub>d</sub>  | 012D <sub>h</sub> |                                                                                                                |
| Index              | 2 <sub>d</sub>    | 0002 <sub>h</sub> |                                                                                                                |
| Parameter value    | 9500 <sub>d</sub> | DAE4 <sub>h</sub> |                                                                                                                |

Using the CAN BusAnalyser++ from Steinbeis, the transmit data appear as follows (data field length = 8 bytes, low and high bytes are shown swapped round):

| Identifier | Data field |       |       |       |
|------------|------------|-------|-------|-------|
| 2C 01      | 2D 71      | 02 00 | E4 DA | 00 00 |
| ID         | PKE        | IND   | PWE1  |       |

The following transfer function is also available:

#### **PKW Request Broadcast**

A parameter job (request) is processed simultaneously by all slaves on the bus. The node address is not used to generate the CAN identifier because this must be set identically on all slaves utilizing the PKW Request Broadcast function. This common identifier is set in CB parameter 9 (U719). The corresponding parameter response is made with the CAN identifier for PKW Response described above.

#### **Notes regarding PKW transmission:**

The length of the job and the response is always 4 words. Jobs which apply to all indices of a parameter (e.g. "Request all indices") are not possible.

As a general rule, the low-order byte (in words) or the low-order word (in double words) is transferred first. SIMOREG 6RA70 does not use double word parameters itself, these jobs can only be executed where access is available to technology board parameters (e.g. T400).

The CBC does not respond to a parameter request job until the drive data are available. This normally takes 20 ms. The response times will be longer only if change (write) jobs including storage of the value in the EEPROM are received from other sources (e.g. serial basic converter interface), resulting in a delay in job execution.

In certain system states (e.g. initialization states), parameter processing is greatly delayed or does not take place at all.

The master may not issue a new parameter request job until any current parameter job has been acknowledged.

### **7.7.3.2 Description of CBC with CANopen**

#### **7.7.3.2.1 Introduction to CANopen**

CANopen is a standardized application for distributed, industrial automation systems based on CAN and the CAL communication standard. CANopen is a standard of CAN in Automation (CiA) and was in widespread use shortly after it became available.

CANopen can be regarded in Europe as the definitive standard for the implementation of industrial CAN-based system solutions.

CANopen is based on a so-called "communication profile" which specifies the underlying communication mechanisms and their definition [CiA DS-301].

The main types of device deployed for automating industrial systems, such as digital and analog input/output modules [CiA DS-401], drives [CiA DS-402], control panels [CiA DS-403], controllers [CiA DS-404], PLCs [CiA DS-405] or encoders [CiA DS-406], are described in so-called "device profiles". These profiles define the functionality of standard equipment of the relevant type.

A central component of the CANopen standard is the definition of device functionality using an "Object Directory" (OD). This object directory is subdivided into two sections, one which contains general information about the device, such as identification, manufacturer's name, etc. and the communication parameters, and the other describing the scope of device functions. An entry ("object") in the object directory is identified by means of a 16-bit index and an 8-bit subindex.

The "application objects" of a device, such as input and output signals, device parameters, device functions or network variables, are made accessible in standardized form via the network by means of the entries in the object directory.

Similar to other field bus systems, CANopen employs two basic data transmission mechanisms: The rapid exchange of short process data via so-called "process data objects" (**PDOs**) and the accessing of entries in the object directory via so-called "service data objects" (**SDOs**). Process data objects are generally transferred either event-oriented, cyclically or on request as broadcast objects without an additional protocol overhead. SDOs are used mainly to transmit parameters during the device configuring process and generally for the transmission of longer data areas.

A total of 8 bytes of data can be transferred in a PDO. The assignment between application objects and a PDO (transfer object) can be set by means of a structure definition ("PDO mapping") stored in the OD and is thus adaptable to the individual operating requirements of a device.

SDOs are transmitted as a confirmed data transfer with two CAN objects in each case between two network nodes. The relevant object directory entry is addressed through the specification of index and subindex. Messages of unrestricted length can be transferred in principle. The transmission of SDO messages involves an additional overhead.

Standardized, event-oriented, high priority alarm messages ("**Emergency Messages**") are available for signaling device malfunctions.

The functionality required for the preparation and coordinated starting of a distributed automation system corresponds to the mechanisms defined under CAL Network Management (NMT); this also applies to the "**Node Guarding**" principle underpinning the cyclical node monitoring function.

Identifiers can be entered directly into the data structures of the object directory to assign CAN message identifiers to PDOs and SDOs; predefined identifiers can be used for simple system structures.

#### 7.7.3.2.2 Functionality of CBC with CANopen

The CBC with CANopen supports only minimal boot-up as defined in communication profile CiA DS-301 (Application Layer and Communication Profile).

Up to four Receive PDOs and four Transmit PDOs are available. Parameters U711 to U714 can be programmed to select the mapping and communication properties of the Receive PDOs and parameters U715 to U718 to set the mapping and communication properties of the Transmit PDOs.

**Dynamic mapping**, i.e. changing the assignment between the objects from the object directory and a PDO in operation, is not supported by the CBC. Transmission type and identifier of the communication objects (PDO, SDO, SYNC, EMCY and Node Guarding Object) can, however, be set via SDOs in operation. These settings override the settings of the CP parameters and are erased when the supply voltage is switched off.

One server SDO is available.

Another available communication object is the **SYNC object**. Using a synchronization message, the CAN master can synchronize the transmission and reception of PDOs for the whole network ("synchronous PDOs").

The EMCY object (**Emergency Object**) is implemented. This telegram is used to signal all faults and alarms generated in the SIMOREG system via the CAN Bus.

The network functionality is monitored via the **Node Guarding Telegram** with which the master addresses the slaves cyclically. Each slave must individually respond to this telegram within a parameterizable time frame.

If the master does not receive a response to its request, the communication link to the slave must be malfunctioning in some way (e.g. cable break, bus connector removed, etc.).

If the slave does not receive a Node Guarding Telegram from the master within a particular time period (**Life Time Event**), it can assume that there is error in the communication link. The reaction of the slave to this event can be parameterized in parameter U719.

Canopen modes **Velocity Mode** (speed control) and **Profile Torque Mode** (torque control), both in accordance with CiA DS-401 (Device Profile for Drives and Motion Control), and the manufacturer-specific **Current Mode** (current control) are implemented.

### 7.7.3.2.3 Requirements for operating the CBC with CANopen

To be able to operate the CBC with CANopen, the following two conditions must be fulfilled:

- SIMOREG firmware, V1.9 and later
- CBC firmware, V2.2 and later

To be able to operate the individual CANopen profiles, certain parameter settings must be made in the SIMOREG.

### 7.7.3.3 Diagnostic tools:

LED displays on the CBC (flashing LEDs indicate normal operation):

|            |                                       |
|------------|---------------------------------------|
| Red LED    | Status of CBC                         |
| Yellow LED | Communication between SIMOREG and CBC |
| Green LED  | Communication between CBC and CAN Bus |

| LED      |          |          | Status                                                    |
|----------|----------|----------|-----------------------------------------------------------|
| red      | yellow   | green    |                                                           |
| flashing | flashing | flashing | Normal operation                                          |
| flashing | off      | on       | CBC waiting for commencement of initialization by SIMOREG |
| flashing | on       | off      | CBC waiting for end of initialization by SIMOREG          |
| flashing | flashing | off      | No PZD data exchange via CAN Bus                          |
| flashing | on       | on       | CBC defective                                             |



**Diagnostic parameter n732:**

Indices i001 to i032 apply to a CBC as the first communication board; indices i033 to i064 apply to a CBC as the second communication board.

|                            | Value | Meaning                                                                                                                                                                                       |
|----------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n732.001<br>or<br>n732.033 | 0     | No fault<br>Fault F080/fault value 5 is displayed under fault conditions:<br><br><u>Fault values for CAN layer 2:</u>                                                                         |
|                            | 1     | Incorrect address on CAN Bus (P918 / slave address)                                                                                                                                           |
|                            | 2     | Incorrect CAN identifier with PKW Request (U711)                                                                                                                                              |
|                            | 5     | Incorrect CAN identifier with PKW Request-Broadcast (U719)                                                                                                                                    |
|                            | 7     | Incorrect CAN identifier with PZD Receive (U712)                                                                                                                                              |
|                            | 13    | Incorrect CAN identifier with PZD Transmit (U713)                                                                                                                                             |
|                            | 14    | PZD transmit length = 0 (U714)                                                                                                                                                                |
|                            | 15    | PZD transmit length > 16 , i.e. too long (U714)                                                                                                                                               |
|                            | 20    | Incorrect CAN identifier with PZD Receive-Broadcast (U716)                                                                                                                                    |
|                            | 21    | Incorrect CAN identifier with PZD Receive-Multicast (U717)                                                                                                                                    |
|                            | 22    | Incorrect CAN identifier with PZD Receive-Internode (U718)                                                                                                                                    |
|                            | 23    | Invalid baud rate (U720)                                                                                                                                                                      |
|                            | 35    | Incorrect CAN protocol type (U721)                                                                                                                                                            |
|                            | 36    | PKW Request-Broadcast (U719) without PKW Request (U711)                                                                                                                                       |
|                            | 48    | Overlap between CAN identifier PKW and PKW Broadcast                                                                                                                                          |
|                            | 49    | Overlap between CAN identifier PKW and PZD Receive                                                                                                                                            |
|                            | 50    | Overlap between CAN identifier PKW and PZD Transmit                                                                                                                                           |
|                            | 51    | Overlap between CAN identifier PKW and PZD Receive-Broadcast                                                                                                                                  |
|                            | 52    | Overlap between CAN identifier PKW and PZD Receive-Multicast                                                                                                                                  |
|                            | 53    | Overlap between CAN identifier PKW and PZD Receive-Internode                                                                                                                                  |
|                            | 54    | Overlap between CAN identifier PKW Broadcast and PZD Receive                                                                                                                                  |
|                            | 55    | Overlap between CAN identifier PKW Broadcast and PZD Transmit                                                                                                                                 |
|                            | 56    | Overlap between CAN identifier PKW Broadcast and PZD Receive-Broadcast                                                                                                                        |
|                            | 57    | Overlap between CAN identifier PKW Broadcast and PZD Receive-Multicast                                                                                                                        |
|                            | 58    | Overlap between CAN identifier PKW Broadcast and PZD Receive-Internode                                                                                                                        |
|                            | 59    | Overlap between CAN identifier PZD Receive and PZD Transmit                                                                                                                                   |
|                            | 60    | Overlap between CAN identifier PZD Receive and PZD Receive-Broadcast                                                                                                                          |
|                            | 61    | Overlap between CAN identifier PZD Receive and PZD Receive-Multicast                                                                                                                          |
|                            | 62    | Overlap between CAN identifier PZD Receive and PZD Receive-Internode                                                                                                                          |
|                            | 63    | Overlap between CAN identifier PZD Transmit and PZD Receive-Broadcast                                                                                                                         |
|                            | 64    | Overlap between CAN identifier PZD Transmit and PZD Receive-Multicast                                                                                                                         |
|                            | 65    | Overlap between CAN identifier PZD Transmit and PZD Receive Internode                                                                                                                         |
|                            | 66    | Overlap between CAN identifier PZD Receive-Broadcast and PZD Receive-Multicast                                                                                                                |
|                            | 67    | Overlap between CAN identifier PZD Receive-Broadcast and PZD Receive-Internode                                                                                                                |
|                            | 68    | Overlap between CAN identifier PZD Receive-Multicast and PZD Receive-Internode                                                                                                                |
|                            |       | <u>Fault values for CANopen:</u>                                                                                                                                                              |
|                            | 1     | Incorrect bus address (P918)                                                                                                                                                                  |
|                            | 23    | Invalid baud rate (U720)                                                                                                                                                                      |
|                            | 35    | Incorrect CAN protocol type (U721)                                                                                                                                                            |
|                            | 257   | Invalid mapping of 1 <sup>st</sup> Receive PDO (U711)                                                                                                                                         |
|                            | 258   | Invalid transmission type of 1 <sup>st</sup> Receive PDO (U711)                                                                                                                               |
|                            | 273   | Invalid mapping of 1 <sup>st</sup> Transmit PDO (U715)                                                                                                                                        |
|                            | 274   | Invalid transmission type of 1 <sup>st</sup> Transmit PDO (U715)                                                                                                                              |
|                            | 513   | Invalid mapping of 2 <sup>nd</sup> Receive PDO (U712)                                                                                                                                         |
|                            | 514   | Invalid transmission type of 2 <sup>nd</sup> Receive PDO (U712)                                                                                                                               |
|                            | 529   | Invalid mapping of 2 <sup>nd</sup> Transmit PDO (U716)                                                                                                                                        |
|                            | 530   | Invalid transmission type of 2 <sup>nd</sup> Transmit PDO (U716)                                                                                                                              |
|                            | 769   | Invalid mapping of 3 <sup>rd</sup> Receive PDO (U713)                                                                                                                                         |
|                            | 770   | Invalid transmission type of 3 <sup>rd</sup> Receive PDO (U713)                                                                                                                               |
|                            | 785   | Invalid mapping of 3 <sup>rd</sup> Transmit PDO (U717)                                                                                                                                        |
|                            | 786   | Invalid transmission type of 3 <sup>rd</sup> Transmit PDO (U717)                                                                                                                              |
|                            | 1025  | Invalid mapping of 4 <sup>th</sup> Receive PDO (U714)                                                                                                                                         |
|                            | 1026  | Invalid transmission type of 4 <sup>th</sup> Receive PDO (U714)                                                                                                                               |
|                            | 1041  | Invalid mapping of 4 <sup>th</sup> Transmit PDO (U718)                                                                                                                                        |
|                            | 1042  | Invalid transmission type of 4 <sup>th</sup> Transmit PDO (U718)                                                                                                                              |
|                            | 1092  | Invalid Life Time Event or incorrect basic unit parameterized (U719)                                                                                                                          |
| n732.002<br>or<br>n732.034 |       | Number of correctly received PZD CAN telegrams since Power ON<br><br>Irrelevant for CANopen                                                                                                   |
| n732.003<br>or<br>n732.035 |       | Number of PZD telegrams lost since Power ON<br>Telegrams will be lost if the CAN Bus master sends PZD telegrams faster than they can be processed by the slave.<br><br>Irrelevant for CANopen |



|                            | Value              | Meaning                                                                                                                                                                                                                                                          |
|----------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n732.004<br>or<br>n732.036 |                    | Counter of Bus Off states since Power ON (alarm A084)                                                                                                                                                                                                            |
| n732.005<br>or<br>n732.037 |                    | Counter of Error Warning states since Power ON (alarm A083)                                                                                                                                                                                                      |
| n732.006<br>or<br>n732.038 |                    | Status of the CAN controller                                                                                                                                                                                                                                     |
| n732.007<br>or<br>n732.039 |                    | Number of errors occurring during reception of PCD frames                                                                                                                                                                                                        |
| n732.008<br>or<br>n732.040 |                    | Type of error occurring during reception of PCD frames                                                                                                                                                                                                           |
| n732.009<br>or<br>n732.041 |                    | Value of error occurring during reception of PCD frames                                                                                                                                                                                                          |
| n732.010<br>or<br>n732.042 |                    | Number of correctly transmitted PZD CAN telegrams since Power ON<br>Irrelevant for CANopen                                                                                                                                                                       |
| n732.011<br>or<br>n732.043 |                    | Number of errors during transmission of PZD telegrams<br>PZD telegrams cannot be transmitted when the bus is overloaded<br>Irrelevant for CANopen                                                                                                                |
| n732.012<br>or<br>n732.044 |                    | Type of error occurring during transmission of PCD frames                                                                                                                                                                                                        |
| n732.013<br>or<br>n732.045 |                    | Value of error occurring during transmission of PCD frames                                                                                                                                                                                                       |
| n732.014<br>or<br>n732.046 |                    | Number of correctly processed PKW requests and responses since Power ON<br>Irrelevant for CANopen                                                                                                                                                                |
| n732.015<br>or<br>n732.047 |                    | Number of PKW request processing errors, e.g. owing to bus overload or missing responses from CUD1 (see below for error type)<br>Irrelevant for CANopen                                                                                                          |
| n732.016<br>or<br>n732.048 | 0<br>9<br>11<br>12 | Type of PKW request processing error:<br>No error<br>Error transmitting the PKW response (while waiting for a free channel)<br>Timeout waiting for the PKW response from the CUD1<br>Timeout waiting for a free channel (bus overload)<br>Irrelevant for CANopen |
| n732.017<br>or<br>n732.049 |                    | Value of error occurring while processing PKW requests                                                                                                                                                                                                           |
| n732.018<br>or<br>n732.050 |                    | Number of lost PKW requests<br>Irrelevant for CANopen                                                                                                                                                                                                            |
| n732.026<br>or<br>n732.058 |                    | Software version of CBC<br>(e.g. "12" = version 1.2, see also r060)                                                                                                                                                                                              |
| n732.027<br>or<br>n732.059 |                    | Software identifier<br>(extended software version identifier, see also r065)                                                                                                                                                                                     |
| n732.028<br>or<br>n732.060 |                    | Date of generation of CBC software<br>Day (H byte) and month (L byte)                                                                                                                                                                                            |
| n732.029<br>or<br>n732.061 |                    | Date of generation of CBC software<br>Year                                                                                                                                                                                                                       |

**Fault and alarm messages:**

Detailed information about fault messages can be found in Section 10.

**Fault F080**

An error occurred during initialization of the CBC board, e.g. incorrect setting of a CB parameter, incorrect bus address or defective board.

**Fault F081**

The heartbeat counter (counter on CBC) which is monitored by SIMOREG for "signs of life" from the board has not changed for at least 800 ms.

**Fault F082**

Failure of PZD telegrams or a fault in the transmission channel

**Alarm A083 (Error Warning)**

Errored telegrams are being received or sent and the error counter on the supplementary board has exceeded the alarm limit.

Errored telegrams are ignored. The data most recently transferred remain valid. If the errored telegrams contain process data, fault message F082 with fault value 10 may be activated as a function of the telegram failure time set in U722. No fault message is generated for PKW data.

**Alarm A084 (Bus Off)**

Errored telegrams are being received or sent and the error counter on the supplementary board has exceeded the fault limit.

Errored telegrams are ignored. The data most recently transferred remain valid. If the errored telegrams contain process data, fault message F082 with fault value 10 may be activated as a function of the telegram failure time set in U722. No fault message is generated for PKW data.

### 7.7.4 Procedure for starting up the SIMOLINK board (SLB):



1 Disconnect the power supply and insert adapter board (ADB) containing SLB in a location. Please remember to insert a board in location 2 before you use location 3. .



2 The SLBs must be connected up using fiber optics in such a manner as to avoid long distances between two units (max. 40m with plastic fiber optics and max. 300 m with glass fiber optics). Please also note that the transmitter (in center of SLB) on one unit is connected to the receiver (at corner of SLB) on the next unit. These connections must be made on all units until they are linked in a closed circuit.



3 The following are important communication parameters. Index 1 of each parameter is set for the 1<sup>st</sup> SIMOLINK board (1<sup>st</sup> SLB) and index 2 for the 2<sup>nd</sup> SIMOLINK board (2<sup>nd</sup> SLB) (the use of a 2<sup>nd</sup> SLB is planned for future software versions):

- U740 Node address (address 0 identifies the dispatcher)  
Node addresses must be assigned consecutively unless a SIMOLINK master is being used.
- U741 Telegram failure time (0 = deactivated)
- U742 Transmitter power  
The output of the fiber optic transmitter module can be set on each active bus node.
- U744 Reserved for SLB selection (leave at 0 setting)
- U745 Number of channels (telegrams) used per node  
The SLB with dispatcher function assigns the same number of channels to all nodes
- U746 Traffic cycle time

In contrast to converters of the SIMOVERT series, the line-synchronous SIMOREG converter cannot be synchronized with the cycle time of the SIMOLINK bus in order to minimize the data interchange time.

The user data in the telegrams are exchanged cyclically (6x per mains period, i.e. every 3.3 ms at 50 HZ) between the SIMOREG converter and the SLB, irrespective of the cycle time on the bus (U746). A shorter cycle time still means, however, that the data are transferred more quickly after they have been made available by the converter or more up-to-date information for the converter.

U745 and U746 together determine the number of addressable nodes (this can be checked with diagnostic parameter n748.4 in the converter with the dispatcher board).

$$\text{No. of addressable nodes} = \left( \frac{U746[\mu s] + 3,18\mu s}{6,36\mu s} - 2 \right) * \frac{1}{U745}$$

The number of nodes serves only to check whether data can be exchanged with the values set in U745 and U746. These parameters must otherwise be corrected.

A maximum of 201 nodes (dispatcher and 200 transceivers) can be connected to the SIMOLINK bus. Node addresses 201 to 255 are reserved for special telegrams and others. Consequently, with 8 channels per node, a bus cycle can be a maximum of 6.4 ms in duration.



Process data are connected to the SIMOLINK board through assignment of the corresponding connectors and/or binectors to telegram addresses and channel numbers (see Section 8, Sheet Z122 ).

Example:

|               |                                                                                         |
|---------------|-----------------------------------------------------------------------------------------|
| U749.01 = 0.2 | means that the values of node 0 / channel 2 are read as word1 (K7001) and word2 (K7002) |
| U740.01 = 1   | means that node 1 in channel 0 transmits status word 1 (K0032) as                       |
| U751.01 = 32  | word1 and status word 2 (K0033) as word2                                                |
| U751.02 = 33  |                                                                                         |

Changes to the settings of the receive data parameters do not take effect until the electronics power supply is switched on again.



## WARNING



Changing parameters U740, U745, U746 and U749 causes re-initialization, resulting in an interruption in communication with all drives linked to the SIMOLINK bus.

SIMOLINK (**Siemens Motion Link**) is a digital, serial data transmission protocol which uses fiber optics as a transmission medium. The SIMOLINK drive link has been developed to allow a fast, cyclic exchange of process data (control information, setpoints, status information and actual values) via a closed ring bus.

Parameter data cannot be transferred via SIMOLINK.

SIMOLINK consists of the following components:

### SIMOLINK **Master**

Active bus node as interface to higher-level automation systems (e.g. SIMATIC M7 or SIMADYN)

### SIMOLINK Board (**SLB**)

Active bus node as interface for drives on SIMOLINK

### SIMOLINK **Switch**

Passive bus node with switching function between two SIMOLINK ring busses. The separating filter and concentrator are identical in terms of hardware, but perform different functions. Separating filters are used to reverse the signal flow, e.g. in order to link the nodes on one ring bus to another ring bus after the failure of their master. Concentrators allow ring segments to be star-connected to form a complete ring.

### Fiber optic cables

Transmission medium between the SIMOLINK nodes. Glass or plastic fiber optic cables can be used. The permissible maximum distances between adjacent nodes in the ring differs depending on the type of fiber optic used (plastic: max 40m, glass: max. 300m).

SIMOLINK is a closed fiber optic ring. One of the nodes on the bus has a **dispatcher** function (SIMOLINK master or SLB parameterized as the dispatcher). This dispatcher node is identified by **node address 0** and controls communication on the bus. Using SYNC telegrams, it supplies the common system clock cycle for all nodes and sends telegrams in ascending sequence of telegram addresses and channel numbers in the task table. The **task table** contains all telegrams which are transmitted cyclically in normal data interchange.

When an SLB is employed as the dispatcher, the task table is configured solely on the basis of drive parameters. The following restrictions apply as compared to the use of a SIMOLINK master as the dispatcher:

Flexible address lists with gaps in address sequence are not allowed on the bus. Addresses are assigned consecutively to the nodes, starting with address 0.

The number of telegrams (channels) used per node is identical for all nodes.

It is not possible to use application-specific special data.

All other active bus nodes apart from the dispatcher are **transceivers**. These simply forward telegrams (with updated contents in some cases) along the bus.

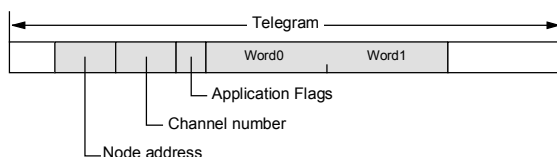
**Active** bus nodes receive and/or send telegrams (SIMOLINK master, dispatcher, transceivers).

**Passive** bus nodes simply forward received telegrams along the bus without changing their contents (separating filters, concentrators).

A separate address is assigned to each active bus node; the dispatcher is always assigned node address 0.

A maximum of 8 telegrams can be transferred per active node. The number of telegrams used per node is a parameterizable quantity.

Telegrams are identified by the node address and distinguished by their channel number of between 0 and 7, with 2 data words transferred as user data in each telegram. The first channel number starts with 0 and is counted in ascending sequence.



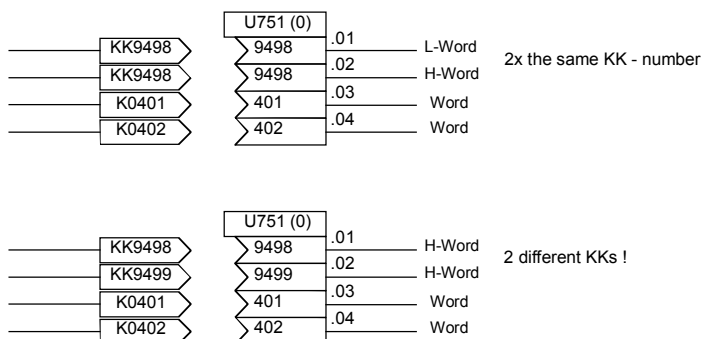
The assignment between connector values to be transferred and individual telegrams and channels is also parameterized (see Section 8, Sheet Z122).

Transmission of double-word connectors:

The values of double-word connectors can be transmitted in the first four channels (selected with U749.01 to U749.04 in the receive direction or with U751.01 to U751.08 in the transmission direction). In the receive direction, the values of any two adjacent connectors (K) are combined to form a double-word connector (KK) (e.g. K7001 and K7002 to KK7031). These double-word connectors can be connected to other function blocks in the usual way. For details of how to connect with double-word connectors, see Section 9.1, subsection, "The following rules apply to the selection of double-word connectors".

In the transmission direction, a double-word connector is applied by entering the same double-word connector at two contiguous indices of selection parameter U751.

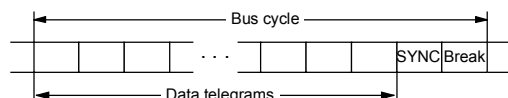
Examples:



Apart from these data, a SIMOLINK master can also send **special telegrams** with application-specific data (addresses 201 to 204 and channel number 0). An SLB as dispatcher does not support these special telegrams.

If a transceiver stops receiving telegrams due to an interruption, it automatically transmits special telegram "Time Out".

The transmission rate is **11 Mbits/s**. The data telegrams are transmitted in direct succession, followed by a SYNC telegram and a pause telegram, within one bus cycle. Transferring the data telegrams without pauses ensures a higher data throughput. At a data transmission rate of 11 Mbit/s, the transmission time for one telegram is 6.36µs.



The assignment of telegrams to nodes is determined by the type of SIMOLINK application, i.e. peer-to-peer functionality or master-slave functionality.

When an SLB is configured as the dispatcher, only the peer-to-peer functionality is available.

#### Peer-to-peer functionality

In this mode, there is no defined logical master for distributing information. The drives have **equal status** in logical terms and exchange data with one another via the ring bus. One node (SLB) specifies the bus cycle in its dispatcher role to keep the transmission alive. All nodes receive and/or send user data. Dispatcher and transceivers can read any telegram, but may only write information in the telegrams specifically assigned to them (node address = address in telegram).

#### Master-slave functionality

A **logical master** (e.g. SIMATIC) supplies all nodes with information on the one hand and, on the other, specifies the bus clock cycle (dispatcher function). All other nodes behave as described above under peer-to-peer functionality, i.e. they receive and/or send user data, but are only permitted to read or write telegrams containing their address.

In contrast to peer-to-peer functionality, the restrictions described above (no gaps in address sequence, uniform number of used channels, no special data) do not apply. The master has its own 8 channels for transferring data, but can also use telegrams with the address and channel numbers of the transceivers for its data transmissions.

### NOTE

An external 24V power supply to the SIMOLINK modules ensures that communication with the other bus nodes continues if a device fails.

However, this power supply does not prevent the short interruption in communication when the device is switched on again when establishing communication is forced.

### 7.7.5 Procedure for starting up expansion boards (EB1 and EB2)

- 1 Remove connector X480 from the EB1 board for safety reasons. A short circuit could otherwise occur should the signal direction of the bidirectional binary inputs/outputs be incorrectly parameterized (see also point 3).  
This risk of short circuits does not exist on EB2 boards.
- 2 The analog inputs on the EB1 can be used either as current or voltage inputs, the mode being selected by setting **jumper**s (X486, X487, X488) appropriately (see Function Diagrams, Section 8). The same applies to EB2 (X498); on this board, the analog output can also be configured as a current or voltage source (X499).
- 3 Parameterize the desired functions for the inputs and outputs (see Function Diagrams, Section 8).  
If you wish to operate a bidirectional binary input/output on an EB1 as an input, please note that the output circuit must be deactivated in the corresponding parameter (e.g. U769.01=0). A short circuit will otherwise occur if the signal levels of the external input and output signals are opposed.  
Switch off the device.
- 4 With the power supply disconnected, insert the adapter board with expansion board in a location. Please remember to insert a board in location 2 before you use location 3.
- 5 EB1 boards only: Plug connector X480 back into board.

Expansion boards EB1 and EB2 expand the range of terminals on the basic converter. A total of 2 EB1 boards and 2 EB2 boards may be installed in one SIMOREG CM 6RA70. The EB1 and/or EB2 are plugged into adapter (carrier) boards (ADB). 2 boards may be mounted on each ADB.

The EB1 provides the following expansion terminals:

- 3 binary inputs
- 4 bidirectional binary inputs/outputs
- 1 analog input for differential signal (current or voltage input)
- 2 analog inputs (single ended), can also be used as binary inputs
- 2 analog outputs
- 1 connector for external 24 V voltage supply to binary outputs

The EB2 provides the following expansion terminals:

- 2 binary inputs
- 1 connector for external 24 V voltage supply to binary outputs
- 1 relay output with changeover contacts
- 3 relay outputs with NO contacts
- 1 analog input for differential signal (current or voltage input)
- 1 analog output (current or voltage output)

For further details, see Section 8, function diagrams for expansion boards EB1 and EB2.

### 7.7.6 Procedure for starting up the pulse encoder board (SBP)



Set the switches (for encoder supply and bus terminating resistors) on the SBP board:  
If one pulse encoder is connected to one SBP board, then the three switches for bus terminating resistors must be switched to ON.

If one pulse encoder is connected to several SBP boards, then the three switches for bus terminating resistors must be switched to ON only on the last SBP.

The fourth switch connects and disconnects the supply voltage for the encoder.

**(Caution: Switch open means supply voltage connected)**



Disconnect power supply and insert adapter with board into location. Please remember to insert a board in location 2 before you use location 3.



Connect the terminals on strips X400, X401 on the pulse encoder board to the appropriate terminals on the encoder (for circuit example, refer to operating instructions for pulse encoder board). If you connect unipolar signals, a ground connection for all signals to terminal 75 (CTRL-) is sufficient. For very long lines or high interference irradiation, we recommend jumpering terminals 69, 71, and 75 (A-, B-, and CTRL-) and connecting to encoder ground. The zero track of the pulse encoder is not evaluated by SIMOREG and need not therefore be connected.

The terminals designated coarse pulse1, coarse pulse2 and fine pulse2 can be used as digital inputs for any function (see Function Diagrams in Section 8)



Please make the following settings:

- U790 Voltage level of inputs

- 0: HTL unipolar
- 1: TTL unipolar
- 2: HTL differential input
- 3: TTL/RS422 differential input

- U791 Level of encoder supply

- 0: 5V voltage supply
- 1: 15V voltage supply

- U792 Pulse encoder resolution

- U793 Type of pulse encoder

- 0: Encoder with A/B track (two tracks displaced by 90 degrees)
- 1: Encoder with separate forward and reverse track

- U794 Reference speed

(For further details, see Section 11, description of parameters U790- U794)

The pulse encoder board SBP (**S**ensor **B**oard **P**ulse) supports commercially available pulse encoders with pulse frequencies up to 410kHz. The voltage level of the encoder signals can be parameterized. TTL or HTL level pulses, bipolar or unipolar, can be used.

A voltage supply for 5V and 15V encoders is provided on the board.

Evaluation of a temperature sensor is not supported on SIMOREG CM 6RA70 converters.



### 7.7.7 Sequence of operations for starting up DeviceNet boards (CBD):



1 With the power supply switched off, insert the board or adapter board with board in the slot. Please note that slot 2 (on right) must always be occupied before slot 3 (in center) can be used.



2 Wire up the DeviceNet using appropriate cabling (see below for details of cables).



3 The following parameters are relevant with respect to communications. Index 1 of the relevant parameter applies to the 1<sup>st</sup> communication board (1<sup>st</sup> CBx) and index 2 to the 2<sup>nd</sup> communication board (2<sup>nd</sup> CBx):

- U711 CB parameter1  
Definition of number of words in the process data area that the SIMOREG sends as a response to a request by the master (produced data). The following options can be selected:  
U711 = 170 ... 4 PZD (status word and actual values)  
U711 = 171 ... 8 PZD (status word and actual values)  
U711 = 172 ... 16 PZD (status word and actual values)
  - -U712 CB parameter2  
Definition of number of words in the process data area that SIMOREG expects to receive after a request from the master (consumed data). The following options can be selected:  
U712 = 120 ... 4 PZD (control word and setpoints)  
U712 = 121 ... 8 PZD (control word and setpoints)  
U712 = 122 ... 16 PZD (control word and setpoints)
- U711 and U712 can be parameterized independently of one another. The first 4 PZD words (produced data) are always sent after a request from the master.
- -U720 CB parameter10  
Definition of the DeviceNet transmission rate. The following options can be selected:  
U720 = 0 ..... 125kbaud  
U720 = 1 ..... 250kbaud  
U720 = 2 ..... 500kbaud
  - U722 CB/TB telegram failure time  
Definition of the time period within which at least 1 telegram with PZDs must be exchanged before a fault message is generated.  
This parameter should be set to "0" first (monitoring function deactivated). Once the network is operating correctly, a time value can be set within which PZDs are normally exchanged.
  - P918 Bus address  
Definition of DeviceNet MAC ID for the CBD in the 0 to 63 range.
  - P927 Parameterizing enable (necessary only if parameter values need to be altered via DeviceNet)
  - The process data of the 1<sup>st</sup> or 2<sup>nd</sup> communication board are wired up by means of the appropriate connectors or binectors (see Section 8, function diagrams Z110 and Z111). For meaning of the control and status word bits, see Section 8, Sheets G180 to G183.



4 Switch the electronics power supply off and on again or set U710.001 or U710.002 to "0" to transfer the values of parameters U712, U720, U722 and P918 to the supplementary board.

|                                                                                   |                                                                                                                           |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|  | <b>WARNING</b>                                                                                                            |
|                                                                                   | This initialization process will interrupt the communication of any supplementary board that has already been started up. |

The CBD board supports "DeviceNet Explicit Messages" for the transfer of process data, as well as "DeviceNet I/O Messages" for the transmission of parameter data. The meaning of the data within an I/O message is determined by the corresponding "Connection ID".

The CBD supports the "Predefined Master/Slave Connection Set" defined in the DeviceNet Specification. Both "poll" and "bit strobe I/O messages" are supported.

The CBD adheres to the "DeviceNet Device Profile for Communication Adapter" (Device Type 12). This profile has been selected to allow the DeviceNetMaster to utilize all the options and extended functions provided by the SIMOREG.

DeviceNet messages can be divided roughly into 3 groups:

- DeviceNet configuration data, e.g. channel assignment, timeouts and I/O messages, for which explicit messages are used
- Process data, e.g. control/status word and setpoints/actual values, for which I/O messages are used
- Parameter data, for which manufacturer-specific PKW objects and explicit messages are used, to read or modify drive parameter settings

The drive is controlled by process data. The number of process data words is determined either by the value of particular CB parameters (U711 and U712) after booting, or dynamically by the DeviceNet.

The master uses a manufacturer-specific PKW object to read or modify drive parameters via DeviceNet, utilizing the explicit messaging channel. The user thus has access via DeviceNet to all SIMOREG parameters and any installed technology board (e.g. detailed diagnostic information and fault messages).

DeviceNet specifies a shielded cable with 2 individually screened two-wire conductors for signal transmission and power supply. 2 types of different cross-sections may be used, i.e. "Thin Cable" and "Thick Cable".

Thick cables are used in networks of >100m in length and thin cables for spur lines and networks of <100m.

The following cable types are recommended for use as DeviceNet bus cables:

Thin cable: Belden 3084A

Thick cable: Belden 3082A, 3083A or 3085A

Pin assignment and color coding are defined as follows:

| Pin    | Function | Color of wire in DeviceNet cable |
|--------|----------|----------------------------------|
| X438.1 | V-       | Black (power supply ground)      |
| X438.2 | CAN-     | Blue                             |
| X438.3 | Shield   |                                  |
| X438.4 | CAN+     | White                            |
| X438.5 | V+       | Red ( +24V supply +/- 1% )       |

Recommended bus connector: Phoenix Combicon MSTB 2.5/5-ST-5.08-AU

Transmission rates and bus cable lengths:

| Transmission rate | Max. cable length<br>(thick cable) | Spur line length (thin cable) |            |
|-------------------|------------------------------------|-------------------------------|------------|
|                   |                                    | Maximum                       | Cumulative |
| 125kbaud          | 500m                               | 6m                            | 156m       |
| 250kbaud          | 250m                               | 6m                            | 78m        |
| 500kbaud          | 100m                               | 6m                            | 39m        |

To ensure proper functioning, both ends of the bus cable must be terminated by a terminating resistor (121Ω metal film resistor, +/- 1%, 0.25W).

The DeviceNet cable screen should be earthed at ONE point (e.g. at the power supply). Earthing the screen at several locations can produce ground loops and cause malfunctions.

Telegrams transmitted via DeviceNet have the same useful data structure as those used in **CAN Bus** communication.

A CAN telegram comprises the protocol header, CAN identifier, up to 8 bytes of useful data and the protocol trailer.

The methods applied for DeviceNet transmissions allow useful data of any length to be transferred. Data which are longer than 8 bytes can be transmitted in fragmented form (in several consecutive telegrams).

### PZD object (process data)

Both control words and setpoints as well as status words and actual values (process data) are transmitted by means of DeviceNet I/O message connections. The number of process data to be transferred (4, 8 or 16) depends on which DeviceNet I/O assembly instance has been selected. The quantity of process data transmitted by the drive can differ from the quantity received.

Options for defining the number of PZD:

- "Consumed Connection Path" with "Poll I/O" (direction: Master -> drive)
  - U712 = 120 ... 4 PZD (control word and setpoints)
  - U712 = 121 ... 8 PZD (control word and setpoints)
  - U712 = 122 ... 16 PZD (control word and setpoints)
- "Produced Connection Path" with "Poll I/O" (direction: Drive -> master)
  - U711 = 170 ... 4 PZD (status word and actual values)
  - U711 = 171 ... 8 PZD (status word and actual values)
  - U711 = 172 ... 16 PZD (status word and actual values)
- "Produced Connection Path" with "Bit Strobe I/O"
  - U711 = 170 ... 4 PZD (status word and actual values); cannot be changed

The meaning of each process data word is determined by the assignment of connectors parameterized in the drive (see function diagrams in Section 8, particularly "Data exchange with 1<sup>st</sup> and 2<sup>nd</sup> CB"). Process data can be exchanged between the SIMOREG and CBD 6x per line period, i.e. every 3.3ms at 50Hz, but is dependent on the data exchange mode via DeviceNet. For further details, see also "Information about PZD transmission" in Section 7, "Sequence of operations for starting up CAN Bus boards".

### Information about PZD transmission:

The low-order byte or word is always transferred before the high-order byte or word.

**Control word 1** must always be sent as the first PZD word. If control word 2 is also used, this must always be sent as the 4<sup>th</sup> PZD word.

Bit10 in control word 1 ("control requested") must always be set or else no new setpoints will be accepted from the drive.

The second PZD word should normally contain the main setpoint.

The consistency of a block of data words is guaranteed within a DeviceNet I/O message connection even in cases where more than 4 PZD words are used and the transmission data is distributed among several telegrams. The data are not transferred from the CBD to the drive until all data words have been received.

### PKW object (parameter data)

The manufacturer-specific PKW object (class 100) is used to read and modify parameters of the drive or a technology board by means of the DeviceNet master (PKW = parameter identifier value). Explicit messaging mode is used for this purpose.

Only two instances are implemented for the PKW object: Instance 0 permits access to class attributes and instance 1 (always set to "1") access to all parameter numbers (see DeviceNet objects below).

Apart from the protocol header and trailer specific to DeviceNet, the structure of a telegram is follows:

|                             |                        |                          |                          |
|-----------------------------|------------------------|--------------------------|--------------------------|
| Parameter identifier<br>PKE | Parameter index<br>IND | Parameter value1<br>PWE1 | Parameter value2<br>PWE2 |
|-----------------------------|------------------------|--------------------------|--------------------------|

For details about this telegram area, see also Section 7.7.9, Structure of request/response telegrams. The useful data area of PROFIBUS, CAN Bus and DeviceNet telegrams is structured identically.

### DeviceNet GET Single

This object is used to read parameter values and 9 bytes in length.

| Byte | DeviceNet identification      |                         |                                    |
|------|-------------------------------|-------------------------|------------------------------------|
| 1    | [FRAG] [XID] [SRC/DST MAC ID] |                         |                                    |
| 2    | [R/R] [Service]               | 0x0E                    | [Get_Attribute_Single]             |
| 3    | Class                         | 100                     | [PKW object] manufacturer-specific |
| 4    | Instance                      | 1                       | [Instance number] always set to 1  |
| 5    | Attribute                     | 1                       | [Attribute number] always set to 1 |
| 6    | PKE                           | Parameter ID, L byte    |                                    |
| 7    |                               | Parameter ID, H byte    |                                    |
| 8    |                               | Parameter index, L byte |                                    |
| 9    | IND                           | Parameter index, H byte |                                    |

### DeviceNet SET Single

This object is used to modify parameter values and 14 bytes in length

| Byte | DeviceNet identification      |                                 |                                    |
|------|-------------------------------|---------------------------------|------------------------------------|
| 1    | [FRAG] [XID] [SRC/DST MAC ID] |                                 |                                    |
| 2    | [Fragmentation Protocol]      |                                 |                                    |
| 3    | [R/R] [Service]               | 0x10                            | [Set_Attribute_Single]             |
| 4    | Class                         | 100                             | [PKW object] manufacturer-specific |
| 5    | Instance                      | 1                               | [Instance number] always set to 1  |
| 6    | Attribute                     | 1                               | [Attribute number] always set to 1 |
| 7    | PKE                           | Parameter ID, L byte            |                                    |
| 8    |                               | Parameter ID, H byte            |                                    |
| 9    | IND                           | Parameter index, L byte         |                                    |
| 10   |                               | Parameter index, H byte         |                                    |
| 11   | PWE1                          | Parameter value, L word, L byte |                                    |
| 12   |                               | Parameter value, L word, H byte |                                    |
| 13   | PWE2                          | Parameter value, H word, L byte |                                    |
| 14   |                               | Parameter value, H word, H byte |                                    |

## DeviceNet Response

This object is used to respond to requests of the above type and 8 bytes in length.

| Byte | DeviceNet identification      |      |                                 |
|------|-------------------------------|------|---------------------------------|
| 1    | [FRAG] [XID] [SRC/DST MAC ID] |      |                                 |
| 2    | [R/R] [Service]               |      |                                 |
|      |                               | 0x8E | [Get/Set_Attribute_Single]      |
|      |                               | 0x90 |                                 |
| 3    | PKE                           |      | Parameter ID, L byte            |
| 4    |                               |      | Parameter ID, H byte            |
| 5    |                               |      | Parameter value, L word, L byte |
| 6    |                               |      | Parameter value, L word, H byte |
| 7    | PWE1                          |      | Parameter value, H word, L byte |
| 8    | PWE2                          |      | Parameter value, H word, H byte |

## Examples

Read parameter P101.004 using GET Single (for details in the shaded data area, see also Section 7, Starting up PROFIBUS boards):

| Byte | DeviceNet identification      |      |                                    |
|------|-------------------------------|------|------------------------------------|
| 1    | [FRAG] [XID] [SRC/DST MAC ID] |      |                                    |
| 2    | [R/R] [Service]               |      |                                    |
|      |                               | 0x0E | [Get_Attribute_Single]             |
| 3    | Class                         | 100  | [PKW object] manufacturer-specific |
| 4    | Instance                      | 1    | [Instance number] always set to 1  |
| 5    | Attribute                     | 1    | [Attribute number] always set to 1 |
| 6    | PKE                           | 0x65 | Parameter ID, L byte               |
| 7    |                               | 0x60 | Parameter ID, H byte               |
| 8    | IND                           | 4    | Parameter index, L byte            |
| 9    |                               | 0    | Parameter index, H byte            |

Request identifier = 0x6065 (request parameter value (array) P101), Index = 0004h = 4d

Response by SIMOREG:

| Byte | DeviceNet identification      |      |                                 |
|------|-------------------------------|------|---------------------------------|
| 1    | [FRAG] [XID] [SRC/DST MAC ID] |      |                                 |
| 2    | [R/R] [Service]               |      |                                 |
|      |                               | 0x8E | [Get_Attribute_Single]          |
| 3    | PKE                           | 0x65 | Parameter ID, L byte            |
| 4    |                               | 0x40 | Parameter ID, H byte            |
| 5    | PWE1                          | 0x90 | Parameter value, L word, L byte |
| 6    |                               | 0x01 | Parameter value, L word, H byte |
| 7    | PWE2                          | 0x00 | Parameter value, H word, L byte |
| 8    |                               | 0x00 | Parameter value, H word, H byte |

Response identifier = 0x4065, value of P101.004 = 0190h = 400d (PWE2 remains unused because it is not a double word parameter)

Modify parameter U099.001 using SET Single (for details in the shaded data area, see also Section 7, Starting up PROFIBUS boards):

| Byte | DeviceNet identification      |      |                                    |
|------|-------------------------------|------|------------------------------------|
| 1    | [FRAG] [XID] [SRC/DST MAC ID] |      |                                    |
| 2    | [Fragmentation Protocol]      |      |                                    |
| 3    | [R/R] [Service]               | 0x10 | [Set_Attribute_Single]             |
| 4    | Class                         | 100  | [PKW object] manufacturer-specific |
| 5    | Instance                      | 1    | [Instance number] always set to 1  |
| 6    | Attribute                     | 1    | [Attribute number] always set to 1 |
| 7    | PKE                           | 0x63 | Parameter ID, L byte               |
| 8    |                               | 0x70 | Parameter ID, H byte               |
| 9    | IND                           | 0x01 | Parameter Index, L byte            |
| 10   |                               | 0x80 | Parameter Index, H byte            |
| 11   | PWE1                          | 0xC8 | Parameter value, L word, L byte    |
| 12   |                               | 0x00 | Parameter value, L word, H byte    |
| 13   | PWE2                          | 0x00 | Parameter value, H word, L byte    |
| 14   |                               | 0x00 | Parameter value, H word, H byte    |

Request identifier = 7063h (modify parameter value (array) U099), index = 0001h = 1d (bit 15 is also set in the H byte in order to address the parameter number range from 2000 to 4000), value = 00C8h = 200d

Response by SIMOREG:

| Byte | DeviceNet identification      |      |                                 |
|------|-------------------------------|------|---------------------------------|
| 1    | [FRAG] [XID] [SRC/DST MAC ID] |      |                                 |
| 2    | [R/R] [Service]               |      |                                 |
| 3    | PKE                           | 0x90 | [Set_Attribute_Single]          |
| 4    |                               | 0x63 | Parameter ID, L byte            |
| 5    | PWE1                          | 0x40 | Parameter ID, H byte            |
| 6    |                               | 0xC8 | Parameter value, L word, L byte |
| 7    | PWE2                          | 0x00 | Parameter value, L word, H byte |
| 8    |                               | 0x00 | Parameter value, H word, L byte |

Response identifier = 0x4063, value of U099.001 = 00C8h = 200d (PWE2 remains unused because SIMOREG 6RA70 has no double word parameters)

#### Information about PKW transmission:

The length of a request from the master is two words (for GET Single) or 4 words (SET Single). The length of a SIMOREG response is always 3 words.

The low-order byte or word is always sent before the high-order byte or word.

The master may generate a new PKW request only after it has received a response from the slave to the previous request.

The master identifies the response to the transmitted request by

- evaluating the response identifier
- evaluating the parameter number
- evaluating the parameter value (if further identification is needed)

The CBD slave does not respond to a parameter request until it has received the relevant data from the drive. The time delay depends on the type of request, but is at least 20 ms. During the initialization phase after Power ON or a re-initialization operation due to a change in a CB parameter setting, requests may not be processed at all, in which case the ensuing delay could be as much as 40 s.

**7.7.7.1 Diagnostic tools:**

LED displays on the CBD (steadily flashing LEDs indicate normal operation):

|        |                                             |
|--------|---------------------------------------------|
| Red    | Status of CBD (software working correctly)  |
| Yellow | Communication between SIMOREG and CBD       |
| Green  | PZD data exchange between CBD and DeviceNet |

| LED      |          |          | Status                                                    |
|----------|----------|----------|-----------------------------------------------------------|
| red      | yellow   | green    |                                                           |
| flashing | flashing | flashing | Normal operation                                          |
| flashing | off      | on       | CBD waiting for commencement of initialization by SIMOREG |
| flashing | on       | off      | CBD waiting for end of initialization by SIMOREG          |
| flashing | flashing | off      | No PZD data exchange via DeviceNet                        |
| flashing | on       | on       | CBD defective                                             |

Diagnostic parameter n732:

Indices i001 to i032 apply to a CBD as the first communication board, while indices i033 to i064 apply to a CBD as the second communication board.

|                                                                                                                                                                                                                                                        | Value                                                                                                                                                                                                                                                           | Meaning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                         |  |  |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n732.001<br>or<br>n732.033                                                                                                                                                                                                                             | 0<br><br>1<br>2<br>3<br>17                                                                                                                                                                                                                                      | Ok<br><br>Fault F080/fault value 5 is displayed under fault conditions:<br>DeviceNet MAC ID (P918 / slave address) incorrect<br>DeviceNet polled I/O produced connection path (U711) incorrect<br>DeviceNet polled I/O produced consumed path (U712) incorrect<br>Baud rate (U720) incorrect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                         |  |  |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                                                                                                                                         |
| n732.002<br>or<br>n732.034                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                 | The displayed decimal values must be converted to hexadecimal values. In hexadecimal notation, every digit of the 16-bit data word has a meaning:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                         |  |  |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 | <table><tr><td>Thousands place</td><td>Bit11, Bit10, Bit9, Bit8</td><td>Tens place</td><td>Units place</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                         |  |  | Thousands place                                                                                                                                                                                                                                        | Bit11, Bit10, Bit9, Bit8                                                                                                                                                                                                                                        | Tens place              | Units place                                                                                                                                                                                                                                                                             |
| Thousands place                                                                                                                                                                                                                                        | Bit11, Bit10, Bit9, Bit8                                                                                                                                                                                                                                        | Tens place                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Units place                                                                                                                                                                                                                                                                             |  |  |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 | <table><tr><td>Thousands place:<br/>(Idle Indicator)<br/>0 = device not idle;<br/>A poll or bit strobe<br/>request with length<br/>other than 0 was last<br/>received<br/>1 = device idle; A<br/>poll or bit strobe<br/>request with length<br/>equal to 0 was last<br/>received</td><td>Hundreds place:<br/>(Channel Allocation)<br/>The meaning of<br/>individual bits is as<br/>follows<br/>Bit8: 1 = Explicit<br/>Channel allocated<br/>Bit9: 1 = I/O Poll<br/>Channel allocated<br/>Bit10: 1 = I/O Bit<br/>Strobe Channel<br/>allocated<br/>Bit11: 1 = Reserved</td><td>Tens place:<br/>Reserved</td><td>Units place:<br/>(network status)<br/>0 = CBD not online<br/>(Dup_MAC_ID test<br/>not yet complete)<br/>1 = CBD online, but<br/>not assigned to a<br/>master<br/>2 = CBD online and<br/>assigned to the<br/>master<br/>3 = data cannot be<br/>exchanged via bus<br/>(multiple MAC IDs or<br/>Bus Off)</td></tr></table> |                                                                                                                                                                                                                                                                                         |  |  | Thousands place:<br>(Idle Indicator)<br>0 = device not idle;<br>A poll or bit strobe<br>request with length<br>other than 0 was last<br>received<br>1 = device idle; A<br>poll or bit strobe<br>request with length<br>equal to 0 was last<br>received | Hundreds place:<br>(Channel Allocation)<br>The meaning of<br>individual bits is as<br>follows<br>Bit8: 1 = Explicit<br>Channel allocated<br>Bit9: 1 = I/O Poll<br>Channel allocated<br>Bit10: 1 = I/O Bit<br>Strobe Channel<br>allocated<br>Bit11: 1 = Reserved | Tens place:<br>Reserved | Units place:<br>(network status)<br>0 = CBD not online<br>(Dup_MAC_ID test<br>not yet complete)<br>1 = CBD online, but<br>not assigned to a<br>master<br>2 = CBD online and<br>assigned to the<br>master<br>3 = data cannot be<br>exchanged via bus<br>(multiple MAC IDs or<br>Bus Off) |
| Thousands place:<br>(Idle Indicator)<br>0 = device not idle;<br>A poll or bit strobe<br>request with length<br>other than 0 was last<br>received<br>1 = device idle; A<br>poll or bit strobe<br>request with length<br>equal to 0 was last<br>received | Hundreds place:<br>(Channel Allocation)<br>The meaning of<br>individual bits is as<br>follows<br>Bit8: 1 = Explicit<br>Channel allocated<br>Bit9: 1 = I/O Poll<br>Channel allocated<br>Bit10: 1 = I/O Bit<br>Strobe Channel<br>allocated<br>Bit11: 1 = Reserved | Tens place:<br>Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Units place:<br>(network status)<br>0 = CBD not online<br>(Dup_MAC_ID test<br>not yet complete)<br>1 = CBD online, but<br>not assigned to a<br>master<br>2 = CBD online and<br>assigned to the<br>master<br>3 = data cannot be<br>exchanged via bus<br>(multiple MAC IDs or<br>Bus Off) |  |  |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                                                                                                                                         |
| n732.003<br>or<br>n732.035                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                 | Number of correctly received telegrams since Power ON. The value contains all Group2 DeviceNet messages including those that are not addressed to this CBD.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                         |  |  |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                                                                                                                                         |
| n732.008<br>or<br>n732.040                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                 | Number of correctly received PZD telegrams since Power ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                         |  |  |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                                                                                                                                         |
| n732.009<br>or<br>n732.041                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                 | Number of Bus Off states since Power ON (alarm A084)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                         |  |  |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                                                                                                                                         |
| n732.019<br>or<br>n732.051                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                 | Number of correctly transmitted telegrams since Power ON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                         |  |  |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                                                                                                                                         |
| n732.026<br>or<br>n732.058                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                 | Software version of CBDs<br>( e.g. "12" = Version 1.2, see also r060)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                         |  |  |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                 |                         |                                                                                                                                                                                                                                                                                         |

|                            | Value | Meaning                                                                                       |
|----------------------------|-------|-----------------------------------------------------------------------------------------------|
| n732.027<br>or<br>n732.059 |       | Software identifier<br>(extended software version identifier, see also r065)                  |
| n732.028<br>or<br>n732.060 |       | Date of generation of CBD software (day and month)<br>(e.g. "2508" = 25 <sup>th</sup> August) |
| n732.029<br>or<br>n732.061 |       | Date of generation of CBD software (year)                                                     |

### Fault and alarm messages:

For details about fault messages, see Section 10.

#### Fault F080

An error occurred as board CBD was being initialized, e.g. incorrect value of a CB parameter, incorrect bus address or defective board.

#### Fault F081

The heartbeat counter (counter on CBD) which is monitored by SIMOREG for "signs of life" from the board has not changed for at least 800 ms.

#### Fault F082

Failure of PZD telegrams or a fault in the transmission channel.

#### Alarm A081

Idle condition alarm; a PZD telegram of length = 0 has been received either in the "poll" or "bit strobe I/O message channel". The alarm is reset when a PZD telegram of normal length is received.

Faulty CAN messages of this type are ignored. The last transmitted data remain valid.

#### Alarm A083 (error alarm)

Telegrams containing errors are being received or transmitted and the error counter on the supplementary board has exceeded the alarm limit.

The faulty telegrams are ignored. The last transmitted data remain valid. If the faulty telegrams contain process data, fault message F082 with fault value 10 may be generated as a function of the telegram failure time set in U722.

#### Alarm A084

Faulty DeviceNet CAN telegrams have been received or transmitted, causing the internal error counter to overrun.

Faulty CAN messages of this type are ignored. The last transmitted data remain valid.



### 7.7.8 Sequence of operations for starting up the serial I/O board (SCB1):



With the power supply disconnected, insert the SCB1 board into slot 2 (or, if you have installed a technology board, into slot 3).



Set bus address on SCI using DIP-Fix switch S1 (each SCI slave requires its own address number):

|                   | Slave 1 | Slave 2 |
|-------------------|---------|---------|
| Address number    | 1       | 2       |
| Switch setting S1 | open    | closed  |



Mount the interface board(s) on the rail, make the connection to the 24 V power supply and the fiber optic connection between SCB1 and SCI.



The SCB1 board is used in conjunction with the SIMOREG CM only as the master for SCI slaves.

Depending on the type of SCI slaves used and the functions required, the following parameters are relevant with respect to board operation (for details, see function diagrams in Section 7, and parameter list in Section 11):

- U690 Configuration of analog inputs of SCI1  
The type of input signal for each input is parameterized via the indices.
- U691 Smoothing time constant of analog inputs of SCI1  
Filtering of the input signal for each input is parameterized via the indices.
- U692 Zero calibration of analog inputs of SCI1  
The input signal for each input is zero calibrated via the indices.
- U693 Actual value output via analog outputs of SCI1  
A connector number is selected via the indices to define the output quantity at each output.
- U694 Gain of analog outputs of SCI1  
The gain for each output is parameterized via the indices.
- U695 Zero calibration of analog outputs of SCI1  
The output signal for each output is zero calibrated via the indices.
- U698 Binector selection for binary outputs of SCI1  
Selection of binectors whose states are output via the binary outputs of the SCIs.
- Display parameters n697 (diagnostic information) and n699 (display of input/output data) facilitate troubleshooting during start-up.



Switch the electronics power supply off and on again or set U710.001 or U710.002 to "0" to transfer the values of parameters U690 to U698 to the supplementary board.  
Note: This initialization process will interrupt the communication of any supplementary board that has already been started up.

Option board **SCB1** (Serial Communication Board 1) is used to link the 6RA70 SIMOREG CM to board **SCI1** or **SCI2** (Serial Communication Interface) using a fiber optic connection (recommendation: Siemens plastic fiber optic cable, CA-1V2YP980/1000,200A or Siemens glass-fiber cable, CLY-1V01S200/230,10A). These boards can be used if the CUD2 terminal expansion module is not large enough or safe electrical isolation via fiber optics is an absolute necessity. This board only allows the SCB1 master to exchange data with the SCI slaves. Data cannot be exchanged between the SCI slaves themselves.

A maximum of 2 SCIs, of either the same or different types, can be connected to the SCB1.

SCI1 or SCI2 are terminal expansion boards which are mounted on a rail outside the SIMOREG CM and supplied with 24 V DC voltage (-17% +25%, 1A) from an external source.

The interface boards extend the converter by the following additional inputs/outputs:

| SCI1             | SCI2              |
|------------------|-------------------|
| 10 binary inputs | 16 binary inputs  |
| 8 binary outputs | 12 binary outputs |
| 3 analog inputs  |                   |
| 3 analog outputs |                   |

Reception of SCI data by the SCB1 or transmission to the SCIs is synchronized, i.e. the data of two slaves is received simultaneously or transmitted simultaneously.

Details about the functions and connections of inputs and outputs are shown in the function diagrams in Section 8.



## CAUTION

SCI boards have no external enclosure to protect them against direct contact or ingress of pollutants. To protect them against damage, they must be installed in a housing or in the control cabinet of a higher-level system.

The maximum permissible length of fiber optic cables is 10m.

An input filter must be fitted for the external power supply of the interface boards.

Ground SCI at X80 using a short lead.

Analog inputs on SCI1: Only the voltage input or the current input may be used for each channel.

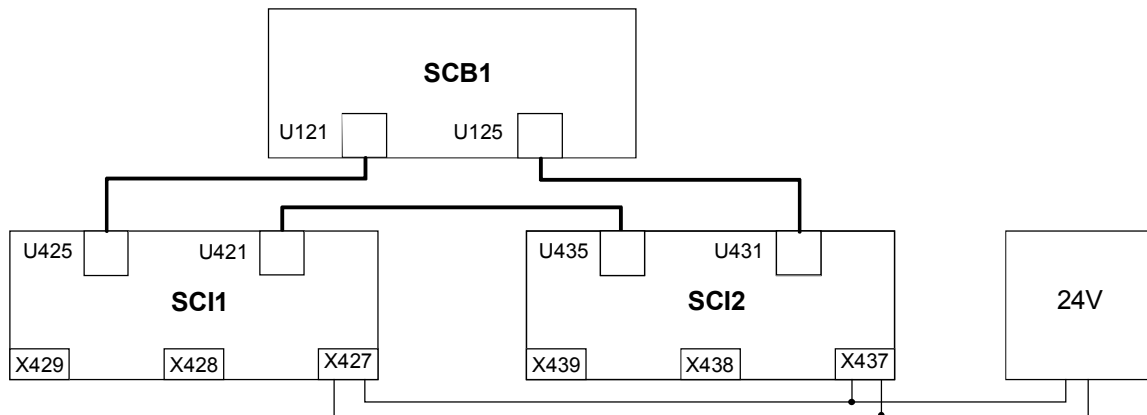
Analog outputs on SCI1: Only the voltage input or the current input may be used for each channel. The outputs are short-circuit-proof.

The binary driver outputs are short-circuit-proof. Relays may only be connected to these outputs in conjunction with an external power supply.

The binary relay outputs are not designed for protective separation.

To protect them against static discharge, the boards may only be placed on conductive surfaces.

Recommended circuit for connecting SCB1 to SCI1 and SCI2 using fiber optic cables:



## WARNING



If the 24 V voltage supply for an SCI slave fails which data are being exchanged between the SCB1 and an SCI, then the "1" signal applied at a binary input is sent to the SCB1 or SIMOREG as an "0" shortly before the power finally fails. In contrast, the "1" remains applied in the SIMOREG in the event of an interruption in the fiber optic connection.

If an external voltage (logical "1") has already been applied to a binary input when the electronics supply voltage is switched on, this status will not be registered until the external voltage is disconnected and reconnected again.

### 7.7.8.1 Diagnostic tools:

LED display on SCB1:

|              |                  |
|--------------|------------------|
| LED on       | Reset state      |
| LED flashing | Normal operation |
| LED off      | Error            |

LED display on SCI1 or SCI2 slave:

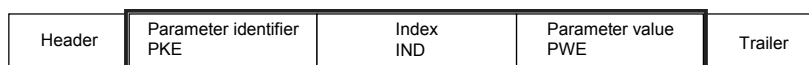
|              |                 |                                                                                                  |
|--------------|-----------------|--------------------------------------------------------------------------------------------------|
| LED on       | Reset state     |                                                                                                  |
| LED flashing | 12Hz frequency  | No telegram traffic (e.g. fiber optic cable not connected)                                       |
|              | 5Hz frequency   | Faulty telegram traffic (e.g. fiber optic ring interrupted or other slave has no supply voltage) |
|              | 0.5Hz frequency | Normal operation                                                                                 |
| LED off      | Error           |                                                                                                  |

Details about fault or alarm messages which may occur in relation to SCB1 or SCI (F070 to F079 and A049 and A050) can be found in Section 10.

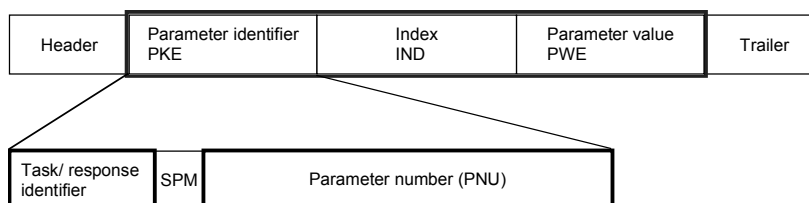
### 7.7.9 Structure of request/response telegrams

There is no basic difference between the useful data area in the request and response telegrams for PROFIBUS and CAN Bus. There are differences, for example, in the protocol frame and in the sequence in which H and L bytes are transmitted. The structures shown here are those of a SIMOREG CM, i.e. the values are displayed in the same way as they would be for parameters n733 and n735, for example. The structure of the protocol frame and the transmission sequence of bytes are therefore described where necessary in the sections containing the start-up description for the appropriate board.

Each request and each response basically comprises three areas apart from the telegram frame with header and trailer:



The **parameter identifier** (PKE) contains a request or response identifier (i.e. type of request or response) and the number of the addressed parameter. The spontaneous signaling bit SPM (bit11) is not used on the SIMOREG CM.



Bits 0 to 10 contain the number of the parameter specified in the request.

Owing to the length restriction of the bit field (11 bits), a **parameter number** (PNU) higher than 1999 must be converted to another code for use in the parameter identifier; the **Page Select Bit** in the index is used for this purpose:

| Parameter area   | Displayed number           | Input on OP1S | PNU in parameter identifier | Page Select Bit (index bit 15) |
|------------------|----------------------------|---------------|-----------------------------|--------------------------------|
| Basic unit       | <b>P</b> xxx, <b>r</b> xxx | 0 - 999       | 0 - 999                     | 0                              |
|                  | <b>U</b> xxx, <b>n</b> xxx | 2000 - 2999   | 0 - 999                     | 1                              |
| Technology board | <b>H</b> xxx, <b>d</b> xxx | 1000 - 1999   | 1000 - 1999                 | 0                              |
|                  | <b>L</b> xxx, <b>c</b> xxx | 3000 - 3999   | 1000 - 1999                 | 1                              |

In the case of a request, for example, which specifies parameter U280 (2280), therefore, PNU = 280 must be entered in the parameter identifier and bit 15 set in the index.

Bits 12 to 15 contain the **request identifier** or the associated **response identifier** as shown in the following list:

| Request identifier | Meaning                                                        | Response identifier |          |
|--------------------|----------------------------------------------------------------|---------------------|----------|
|                    |                                                                | positive            | negative |
| 0                  | No request                                                     | 0                   | 7 or 8   |
| 1                  | Request parameter value (word or double word)                  | 1 or 2              |          |
| 2                  | Modify parameter value (word)                                  | 1                   |          |
| 3                  | Modify parameter value (double word)                           | 2                   |          |
| 4                  | Request descriptive element                                    | 3                   |          |
| 5                  | Reserved                                                       | -                   |          |
| 6                  | Request parameter value (array) (word or double word)          | 4 or 5              |          |
| 7                  | Modify parameter value (array - word)                          | 4                   |          |
| 8                  | Modify parameter value (array-double word)                     | 5                   |          |
| 9                  | Request number of array elements                               | 6                   |          |
| 10                 | Reserved                                                       | -                   |          |
| 11                 | Modify parameter value (array-double word) and store in EEPROM | 5                   |          |
| 12                 | Modify parameter value (array-word) and store in EEPROM        | 4                   |          |
| 13                 | Modify parameter value (double word) and store in EEPROM       | 2                   |          |
| 14                 | Modify parameter value (word) and store in EEPROM              | 1                   |          |
| 15                 | Request text                                                   | 15                  |          |

If the drive has been unable to process the request, it does not return the associated response identifier, but **error identifier 7 (or 8)** instead.

In this case, an error code defining the error in more detail as shown in the following list is returned as a parameter value:

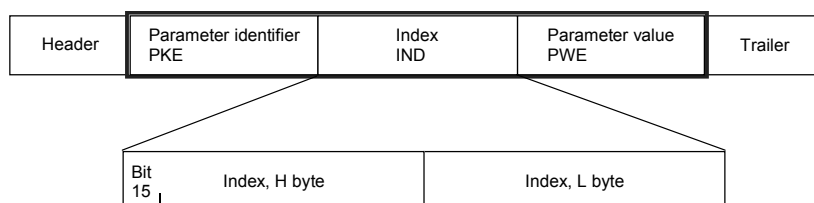
| Error code | Meaning                                                   |                                    |
|------------|-----------------------------------------------------------|------------------------------------|
| 0          | Illegal parameter number (PNU)                            | No PNU specified                   |
| 1          | Parameter value cannot be modified                        | Visualization parameter            |
| 2          | Lower or upper value limit violated                       |                                    |
| 3          | Faulty subindex                                           |                                    |
| 4          | Parameter is not indexed (no array)                       |                                    |
| 5          | Incorrect data type                                       |                                    |
| 6          | Parameter value can only be reset                         |                                    |
| 7          | Descriptive element cannot be modified                    |                                    |
| 8          | PPO Write (acc. to "Information Report") is not available |                                    |
| 9          | Parameter description is not available                    |                                    |
| 10         | Incorrect access level                                    |                                    |
| 11         | No parameterizing enable (P927)                           |                                    |
| 12         | Keyword missing                                           | Key parameter P051 incorrectly set |
| 13         | Text cannot be read cyclically                            |                                    |
| 15         | No text                                                   |                                    |
| 16         | PPO Write missing                                         |                                    |
| 17         | Incorrect operating state                                 |                                    |
| 19         | Value cannot be read cyclically                           |                                    |
| 101        | Parameter number currently deactivated                    |                                    |
| 102        | Channel not wide enough                                   |                                    |

| Error code | Meaning                              |                                         |
|------------|--------------------------------------|-----------------------------------------|
| 103        | PKW number incorrect                 | Applies only to serial interfaces       |
| 104        | Illegal parameter value              | Applies to BiCo selection parameters    |
| 105        | Indexed parameter                    |                                         |
| 106        | Request not implemented in drive     |                                         |
| 107        | Text cannot be modified              |                                         |
| 108        | Incorrect number of parameter values | Applies to "Change all indices" request |

The **index** IND contains a "0" for non-indexed parameters; a 8-bit long index value is entered (in the low-order byte) for indexed parameters.

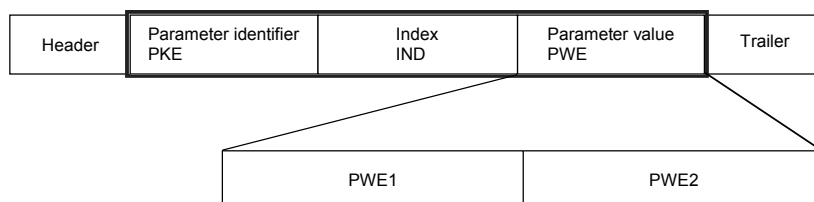
Bit 15 (Page Select bit) has a special function. This is used to identify parameter numbers higher than 1999 (see above for details of recoding parameter numbers).

Exception: In the case of cyclical PROFIBUS services, the L and H byte sequence is reversed (see "Start-up of PROFIBUS boards").



An index value of 255 means that the request applies to all indices of the relevant parameter. In the case of a modification request, the parameter values for all indices of the parameter must be transferred. Conversely, the drive supplies all index values in its response to a read request.

The **parameter value** PWE is treated like a double word (PWE1 and PWE2). The high word is set to 0 when a single word is transferred.

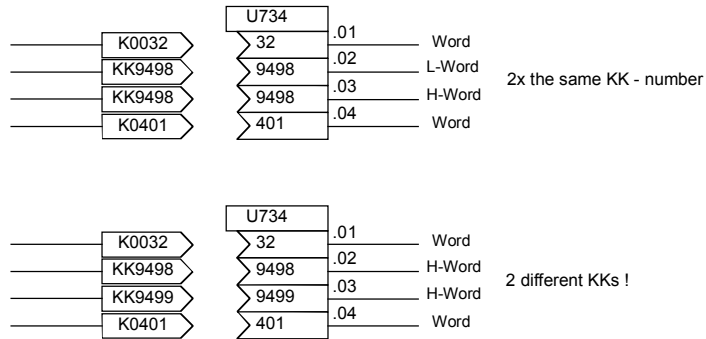


### 7.7.10 Transmission of double-word connectors for technology and communication modules

In the receive direction, the values of two adjacent connectors (K) are combined to form a single double-word connector (KK) (e.g. K3002 and K3003 to KK3032). These double-word connectors can themselves be connected to other function blocks in the usual way. For details of how to connect double-word connectors, see Section 9.1, subsection, "The following rules apply to the selection of double-word connectors".

In the transmit direction, a double-word connector is applied by entering the same double-word connector in two contiguous indices of the selection parameter.

Example:



## 8 Function diagrams

### General

Page

|                      |     |
|----------------------|-----|
| Key to symbols ..... | 8-5 |
|----------------------|-----|

### Basic functions

|                                   |     |
|-----------------------------------|-----|
| G100 Overview .....               | 8-6 |
| G101 Hardware configuration ..... | 8-7 |

### Inputs and outputs

|                                                                                     |      |
|-------------------------------------------------------------------------------------|------|
| G110 Binary inputs terminals 36 to 39 (CUD1) .....                                  | 8-8  |
| Binary inputs terminals 122/123 and 124/125 (power interface) .....                 | 8-8  |
| G111 Binary inputs terminals 40 to 43 (CUD2) .....                                  | 8-9  |
| G112 Binary outputs terminals 46/47 and 48/54 (CUD1) .....                          | 8-10 |
| Binary outputs terminals 50/51 and 52/53 (CUD2) .....                               | 8-10 |
| G113 Analog inputs terminals 4/5, 6/7 (CUD1), and 103/104 (power interface) .....   | 8-11 |
| G114 Analog inputs terminals 8/9 and 10/11 (CUD2) and X6/X7 (power interface) ..... | 8-12 |
| G115 Analog outputs terminals 12/13, 14/15, and 16/17 (CUD1) .....                  | 8-13 |
| G116 Analog outputs terminals 18/19 and 20/21 (CUD2) .....                          | 8-14 |
| G117 E-Stop, relay outputs line contactor and fan ON (power interface) .....        | 8-15 |

### Setpoint generation

|                                                 |      |
|-------------------------------------------------|------|
| G120 Fixed values .....                         | 8-16 |
| Fixed control bits .....                        | 8-16 |
| Constant fixed values and control bits .....    | 8-16 |
| G121 Connector and binector displays .....      | 8-17 |
| G124 Connector selector switch .....            | 8-18 |
| G125 Evaluation of a 4-step master switch ..... | 8-19 |
| G126 Motorized potentiometer .....              | 8-20 |
| G127 Fixed setpoint .....                       | 8-21 |
| G128 Oscillation / square-wave generator .....  | 8-22 |
| G129 Inching setpoint .....                     | 8-23 |
| G130 Crawling setpoint / terminal 37 .....      | 8-24 |
| G135 Setpoint processing .....                  | 8-25 |
| G136 Ramp-function generator (1) .....          | 8-26 |
| G137 Ramp-function generator (2) .....          | 8-27 |

### Internal control

|                          |      |
|--------------------------|------|
| G140 Brake control ..... | 8-28 |
|--------------------------|------|

### Actual speed value

|                                       |      |
|---------------------------------------|------|
| G145 Pulse generator evaluation ..... | 8-29 |
|---------------------------------------|------|

### Controllers

|                                                                 |      |
|-----------------------------------------------------------------|------|
| G150 Starting pulse - speed controller .....                    | 8-30 |
| G151 Speed controller (1) .....                                 | 8-31 |
| G152 Speed controller (2) .....                                 | 8-32 |
| G153 Friction compensation .....                                | 8-33 |
| Compensation of moment of inertia (dv/dt injection) .....       | 8-33 |
| G160 Torque limitation, speed limit controller .....            | 8-34 |
| G161 Current limitation .....                                   | 8-35 |
| G162 Closed-loop armature current control .....                 | 8-36 |
| G163 Auto-reversing stage, armature gating unit .....           | 8-37 |
| G165 Closed-loop EMF control .....                              | 8-38 |
| G166 Closed-loop field current control, field gating unit ..... | 8-39 |
| G167 Field current monitoring .....                             | 8-40 |



**Serial interfaces**

|      |                                                   |      |
|------|---------------------------------------------------|------|
| G169 | Serial interfaces: connector-type converters..... | 8-41 |
| G170 | USS interface 1 (PMU).....                        | 8-42 |
| G171 | USS interface 2 (CUD1).....                       | 8-43 |
| G172 | USS interface 3 (CUD2).....                       | 8-44 |
| G173 | Peer-to-peer interface 2 (CUD1).....              | 8-45 |
| G174 | Peer-to-peer interface 3 (CUD2).....              | 8-46 |

**Program structure**

|      |                 |      |
|------|-----------------|------|
| G175 | Data sets ..... | 8-47 |
|------|-----------------|------|

**Control words, status words**

|      |                      |      |
|------|----------------------|------|
| G180 | Control word 1 ..... | 8-48 |
| G181 | Control word 2 ..... | 8-49 |
| G182 | Status word 1 .....  | 8-50 |
| G183 | Status word 2 .....  | 8-51 |

**Miscellaneous**

|      |                                                                |      |
|------|----------------------------------------------------------------|------|
| G185 | Motor interface (1).....                                       | 8-52 |
| G186 | Motor interface (2) / binary inputs, terminals 211 to 214..... | 8-53 |
| G187 | Messages (1) .....                                             | 8-54 |
| G188 | Messages (2) .....                                             | 8-55 |
| G189 | Fault memory .....                                             | 8-56 |
| G195 | Paralleling interface.....                                     | 8-57 |
| G200 | Field reversal with SIMOREG single-quadrant device .....       | 8-58 |

## Freely assignable function blocks

(Technology software in the basic converter, S00 option)

|                                                                  |                                                           | Page      |
|------------------------------------------------------------------|-----------------------------------------------------------|-----------|
| B100                                                             | Table of contents .....                                   | 8-60      |
| B101                                                             | Startup of the technology software (option S00) .....     | 8-61      |
| <b>Monitoring</b>                                                |                                                           |           |
| B110                                                             | Voltage monitor for electronics power supply.....         | 8-62      |
| <b>Fixed values</b>                                              |                                                           |           |
| B110                                                             | 100 Fixed values .....                                    | 8-62      |
| <b>Alarm, fault messages</b>                                     |                                                           |           |
| B115                                                             | 32 Fault message triggers .....                           | 8-63      |
|                                                                  | 8 Alarm message triggers .....                            | 8-63      |
| <b>Connector / binector converters</b>                           |                                                           |           |
| B120                                                             | 3 Connector / binector converters .....                   | 8-64      |
| B121                                                             | 3 Binector / connector converters.....                    | 8-65      |
| <b>Mathematical functions</b>                                    |                                                           |           |
| B125                                                             | 15 Adders / subtracters .....                             | 8-66      |
|                                                                  | 4 Sign inverters.....                                     | 8-66      |
|                                                                  | 2 Switchable sign inverters .....                         | 8-66      |
| B130                                                             | 12 Multipliers.....                                       | 8-67      |
| B131                                                             | 6 Dividers.....                                           | 8-68      |
|                                                                  | 3 High-resolution multipliers / dividers .....            | 8-68      |
| B135                                                             | 4 Absolute-value generators with filter .....             | 8-70      |
| <b>Limiters, limit-value monitors</b>                            |                                                           |           |
| B134                                                             | 3 Limiters .....                                          | 8-69      |
| B135                                                             | 3 Limiters .....                                          | 8-70      |
| B136                                                             | 3 Limit-value monitors with filter .....                  | 8-71      |
| B137,B138                                                        | 7 Limit-value monitors without filter .....               | 8- 72,73  |
| <b>Processing of connectors</b>                                  |                                                           |           |
| B139                                                             | 4 Averagers .....                                         | 8-74      |
| B140                                                             | 4 Maximum selections .....                                | 8-75      |
|                                                                  | 4 Minimum selections .....                                | 8-75      |
| B145                                                             | 2 Tracking / storage elements .....                       | 8-76      |
|                                                                  | 2 Connector memories .....                                | 8-76      |
| B150                                                             | 15 Connector changeover switches .....                    | 8-77      |
| <b>High-resolution blocks</b>                                    |                                                           |           |
| B151                                                             | 2 limit-value monitors (for double-word connectors) ..... | 8-78      |
|                                                                  | 2 connector-type converters .....                         | 8-78      |
|                                                                  | 2 adders/subtracters (for double-word connectors).....    | 8-78      |
| <b>Position/positional deviation acquisition, Root extractor</b> |                                                           |           |
| B152                                                             | 1 Position/positional deviation acquisition .....         | 8-79      |
| B153                                                             | 1 Root extractor .....                                    | 8-80      |
| <b>Control elements</b>                                          |                                                           |           |
| B155                                                             | 3 Integrators .....                                       | 8-81      |
|                                                                  | 3 DT1 elements .....                                      | 8-81      |
| B156...                                                          | 10 Derivative / delay elements (LEAD / LAG blocks) .....  | 8-82...84 |
| B158                                                             |                                                           |           |
| <b>Characteristics</b>                                           |                                                           |           |
| B160                                                             | 9 Characteristic blocks .....                             | 8-85      |
| B161                                                             | 3 Dead zones.....                                         | 8-86      |
|                                                                  | 1 Setpoint branching.....                                 | 8-86      |
| <b>Ramp-function generator</b>                                   |                                                           |           |
| B165                                                             | 1 Simple ramp-function generator .....                    | 8-87      |
| <b>Controllers</b>                                               |                                                           |           |
| B170                                                             | 1 Technology controller .....                             | 8-88      |
| B180...                                                          | 10 PI controllers.....                                    | 8-89...98 |
| B189                                                             |                                                           |           |

**Velocity / speed calculators, variable inertia**

|      |   |                                    |       |
|------|---|------------------------------------|-------|
| B190 | 1 | Velocity / speed calculator .....  | 8-99  |
|      | 1 | Speed / velocity calculator .....  | 8-99  |
| B191 | 1 | Calculation variable inertia ..... | 8-100 |

**Multiplexers for connectors**

|      |   |                   |       |
|------|---|-------------------|-------|
| B195 | 3 | Multiplexer ..... | 8-101 |
|------|---|-------------------|-------|

**Counter**

|      |   |                               |       |
|------|---|-------------------------------|-------|
| B196 | 1 | 16-bit software counter ..... | 8-102 |
|------|---|-------------------------------|-------|

**Logical functions**

|      |    |                                                   |       |
|------|----|---------------------------------------------------|-------|
| B200 | 2  | Decoders / demultiplexers, binary to 1 of 8 ..... | 8-103 |
| B205 | 28 | AND elements with 3 inputs each .....             | 8-104 |
| B206 | 20 | OR elements with 3 inputs each .....              | 8-105 |
|      | 4  | EXCLUSIVE OR elements with 2 inputs each .....    | 8-105 |
| B207 | 16 | Inverters .....                                   | 8-106 |
|      | 12 | NAND elements with 3 inputs each .....            | 8-106 |
| B210 | 14 | RS flipflops .....                                | 8-107 |
| B211 | 4  | D flipflops .....                                 | 8-108 |
| B215 | 6  | Timers (0.000...60.000s) .....                    | 8-109 |
| B216 | 4  | Timers (0.00...600.00s) .....                     | 8-110 |
|      | 5  | Binary signal selector switches .....             | 8-110 |

**NOTE**

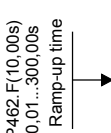
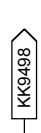
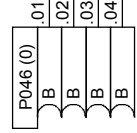
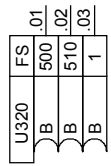
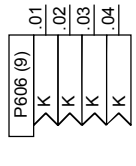
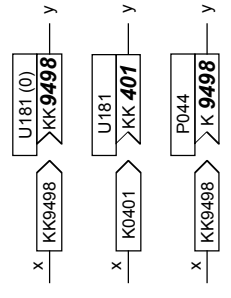
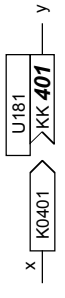
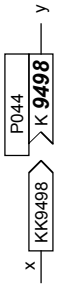
Freely assignable function blocks are enabled in parameter U977.  
For enabling instructions, please refer to Section 11, Parameter List, description of parameters U977 and n978.

**Optional supplementary boards**

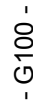
Page

|      |  |                                                                                                   |       |
|------|--|---------------------------------------------------------------------------------------------------|-------|
| Z100 |  | Table of contents .....                                                                           | 8-111 |
| Z110 |  | Data exchange with a technology board (TB) or the 1 <sup>st</sup> communications board (CB) ..... | 8-112 |
| Z111 |  | Data exchange with the 2 <sup>nd</sup> communications board (CB) .....                            | 8-113 |
| Z112 |  | 1 <sup>st</sup> EB1: Analog inputs .....                                                          | 8-114 |
| Z113 |  | 1 <sup>st</sup> EB1: Analog outputs .....                                                         | 8-115 |
| Z114 |  | 1 <sup>st</sup> EB1: 4 bidirectional inputs- / outputs, 3 digital inputs .....                    | 8-116 |
| Z115 |  | 2 <sup>nd</sup> EB1: Analog inputs .....                                                          | 8-117 |
| Z116 |  | 2 <sup>nd</sup> EB1: Analog outputs .....                                                         | 8-118 |
| Z117 |  | 2 <sup>nd</sup> EB1: 4 bidirectional inputs- / outputs, 3 digital inputs .....                    | 8-119 |
| Z118 |  | 1 <sup>st</sup> EB2: Analog input, Analog output, 2 digital inputs, 4 relay outputs .....         | 8-120 |
| Z119 |  | 2 <sup>nd</sup> EB2: Analog input, Analog output, 2 digital inputs, 4 relay outputs .....         | 8-121 |
| Z120 |  | SBP pulse encoder evaluation .....                                                                | 8-122 |
| Z121 |  | SIMOLINK board: Configuration, diagnosis .....                                                    | 8-123 |
| Z122 |  | SIMOLINK board: Receiving, transmitting .....                                                     | 8-124 |
| Z123 |  | OP1S operator panel .....                                                                         | 8-125 |
| Z124 |  | Interfaces: connector-type converters .....                                                       | 8-126 |
| Z130 |  | SCB1 with SCI1 as slave 1: binary inputs .....                                                    | 8-127 |
| Z131 |  | SCB1 with SCI1 as slave 2: binary inputs .....                                                    | 8-128 |
| Z135 |  | SCB1 with SCI1 as slave 1: binary outputs .....                                                   | 8-129 |
| Z136 |  | SCB1 with SCI1 as slave 2: binary outputs .....                                                   | 8-130 |
| Z140 |  | SCB1 with SCI2 as slave 1: binary inputs .....                                                    | 8-131 |
| Z141 |  | SCB1 with SCI2 as slave 2: binary inputs .....                                                    | 8-132 |
| Z145 |  | SCB1 with SCI2 as slave 1: binary outputs .....                                                   | 8-133 |
| Z146 |  | SCB1 with SCI2 as slave 2: binary outputs .....                                                   | 8-134 |
| Z150 |  | SCB1 with SCI1 as slave 1: analog inputs .....                                                    | 8-135 |
| Z151 |  | SCB1 with SCI1 as slave 2: analog inputs .....                                                    | 8-136 |
| Z155 |  | SCB1 with SCI1 as slave 1: analog outputs .....                                                   | 8-137 |
| Z156 |  | SCB1 with SCI1 as slave 2: analog outputs .....                                                   | 8-138 |

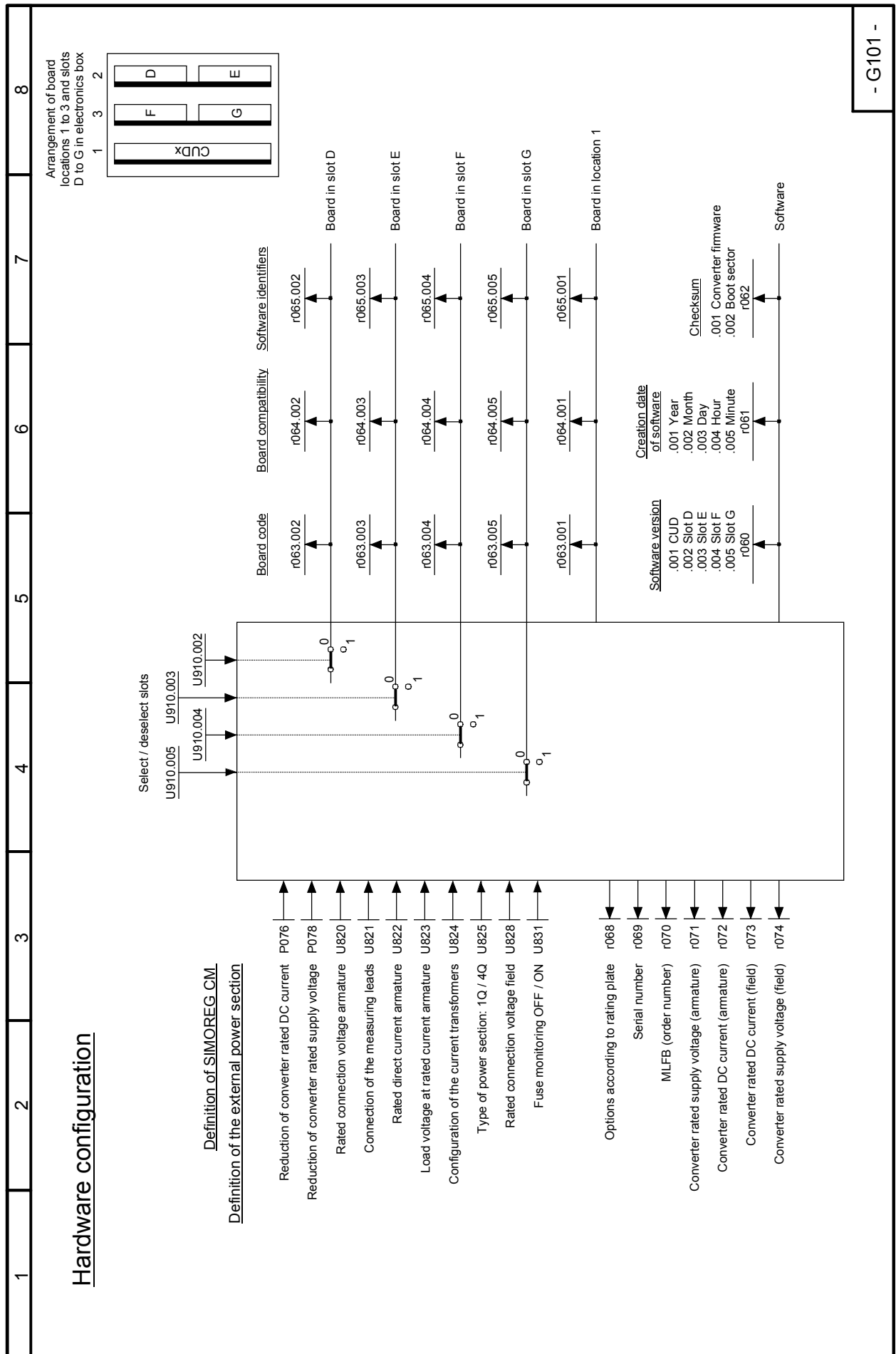
## Key to symbols

| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|
| <p><b>Key to symbols</b> (see also Section 9.1)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |   |   |   |   |   |   |
| <p>Setting parameter<br/>Factory setting in parentheses<br/>"F"= parameter in a function parameter set<br/>0.00...300.00s = setting range</p> <p>  </p> <p>  </p> <p>  </p> <p>  </p> <p>  </p> <p>  </p> <p>  </p> <p>  </p> <p>  </p> <p>  </p> <p>  </p>                                                                                                                                                                                                                                                                                                                                                                                                                              |   |   |   |   |   |   |   |
| <p>Selection of binectors via "indexed" parameter<br/>Factory settings differ for each index<br/>Setting range = all binector numbers<br/>Selected binectors for each index can be specified in symbol</p> <p>  </p> <p>Selection of a connector<br/>Factory setting in parentheses<br/>Setting range = all binector numbers<br/>Selected connector can be specified in symbol</p> <p>  </p> <p>Selection of connectors via "indexed" parameter<br/>Factory setting in parentheses<br/>Setting range = all connector numbers<br/>Selected connectors for each index can be specified in symbol</p> <p>  </p> <p>Selection of connectors via "indexed" parameter<br/>Factory settings differ for each index<br/>Setting range = all connector numbers<br/>Selected connectors for each index can be specified in symbol</p> <p>  </p> <p>Selection of a double-word connector<br/>Factory setting in parentheses<br/>Setting range = all connector numbers<br/>Selected connector can be specified in symbol</p> <p>  </p> <p>Reference to another sheet in function diagrams, destination symbol<br/>[Sheet.Column]</p> <p>  </p> |   |   |   |   |   |   |   |
| <p><b>Selection of double-word connectors:</b></p> <p>  </p> <p>  </p> <p>  </p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |   |   |   |   |   |   |
| <p>- 000 -</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |   |   |   |   |   |   |

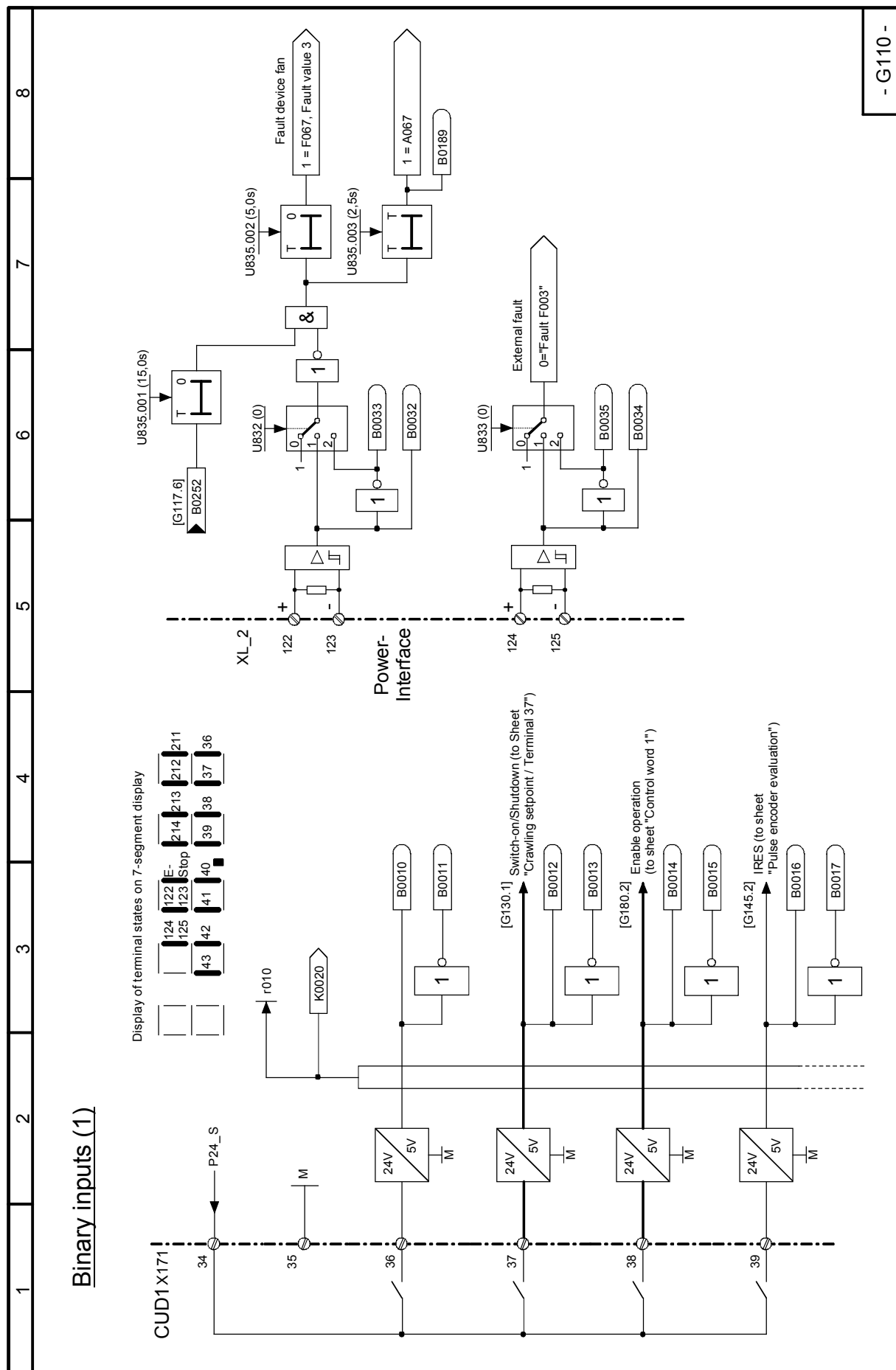
## Sheet G100 Overview



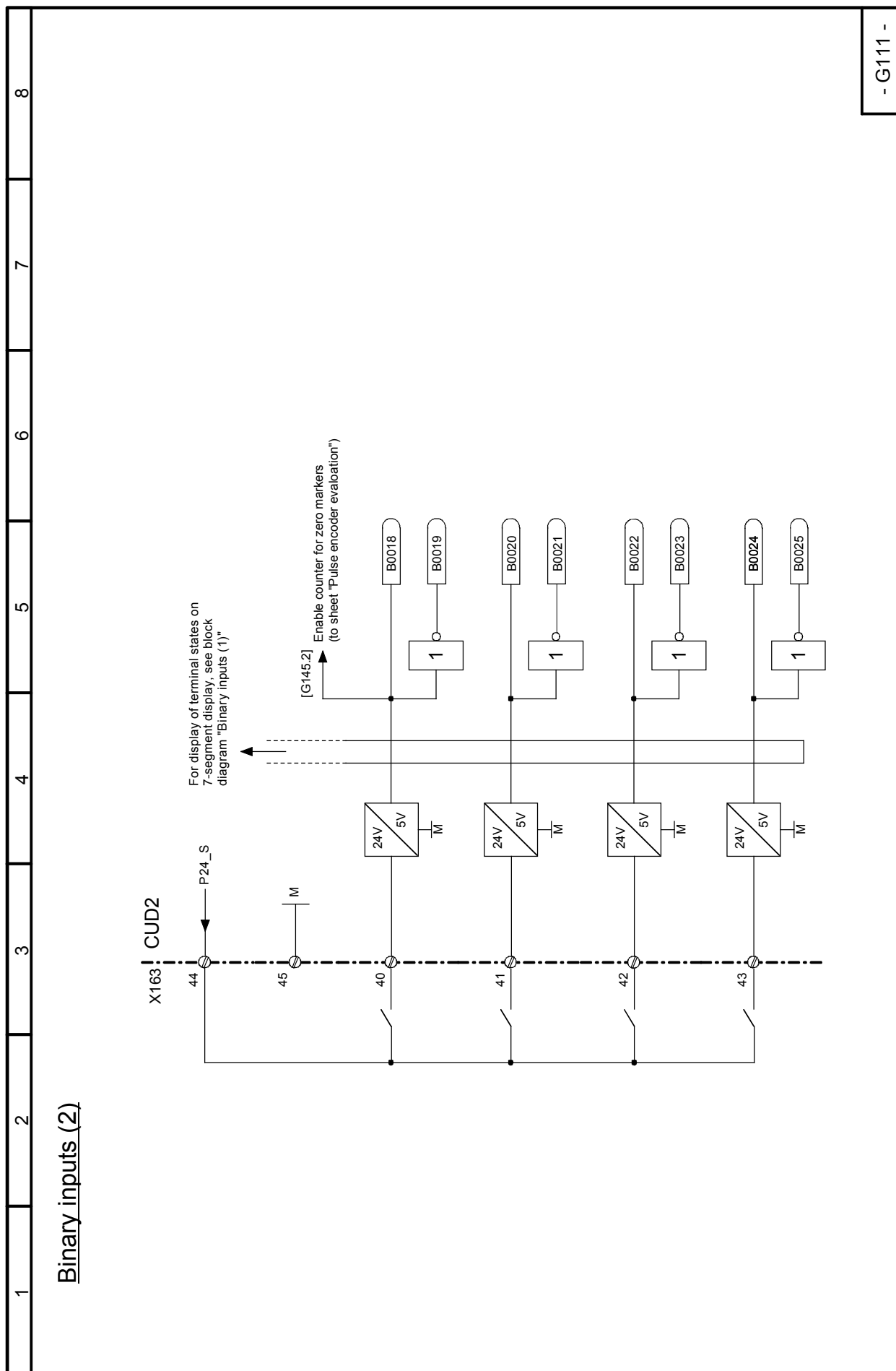
## Sheet G101 Hardware configuration



- G101 -

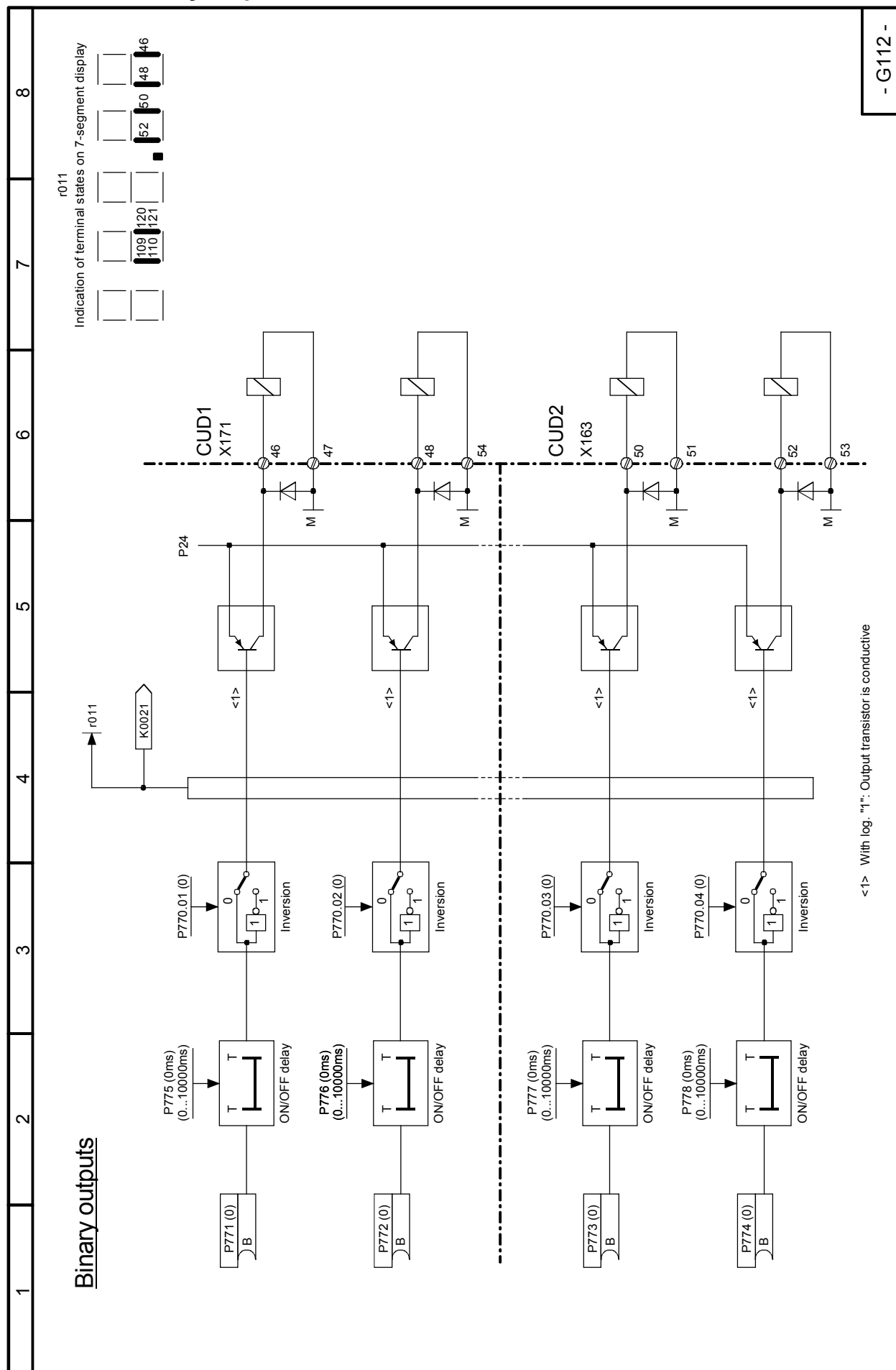


## Sheet G111 Binary inputs terminals 40 to 43

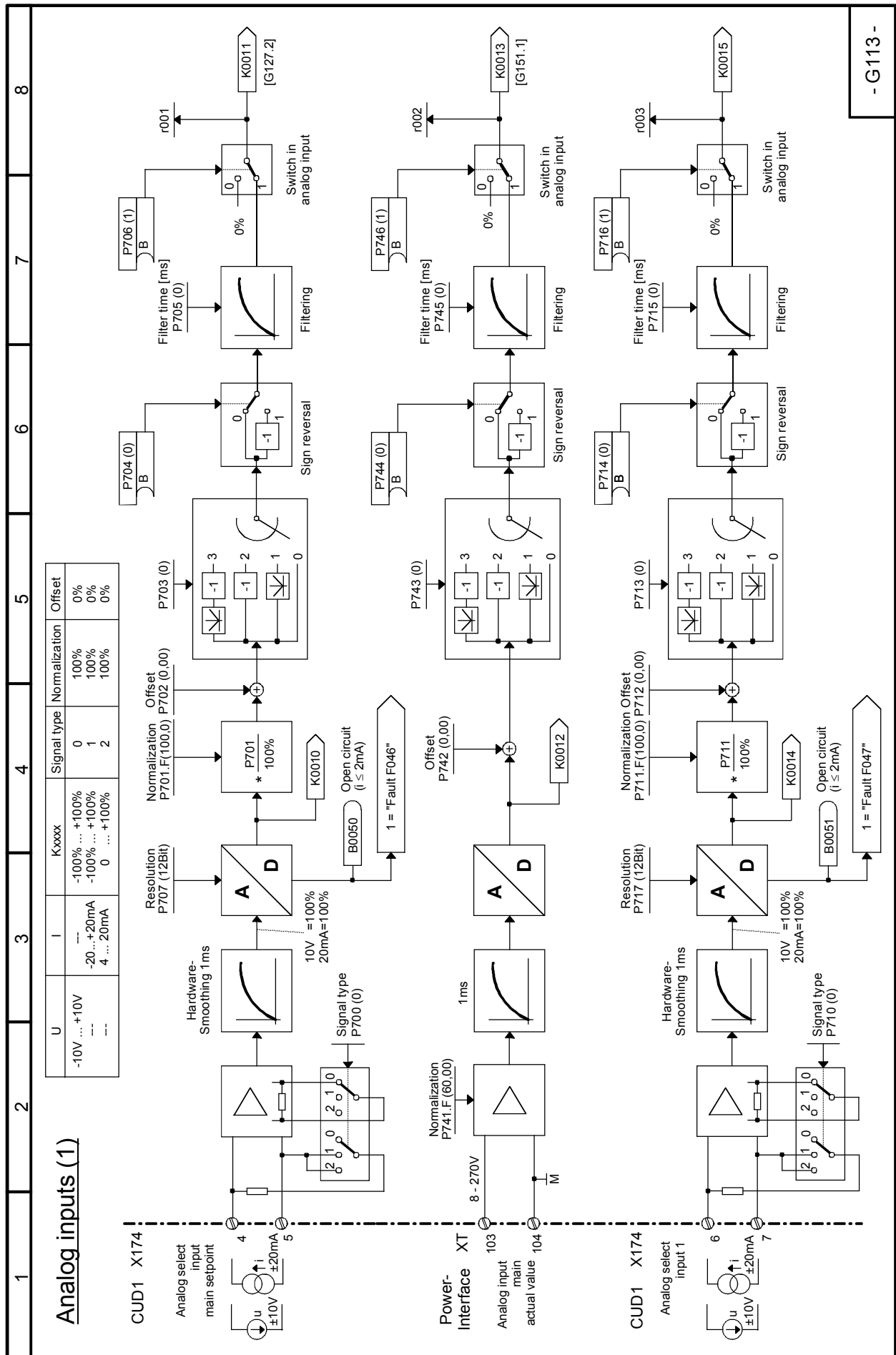




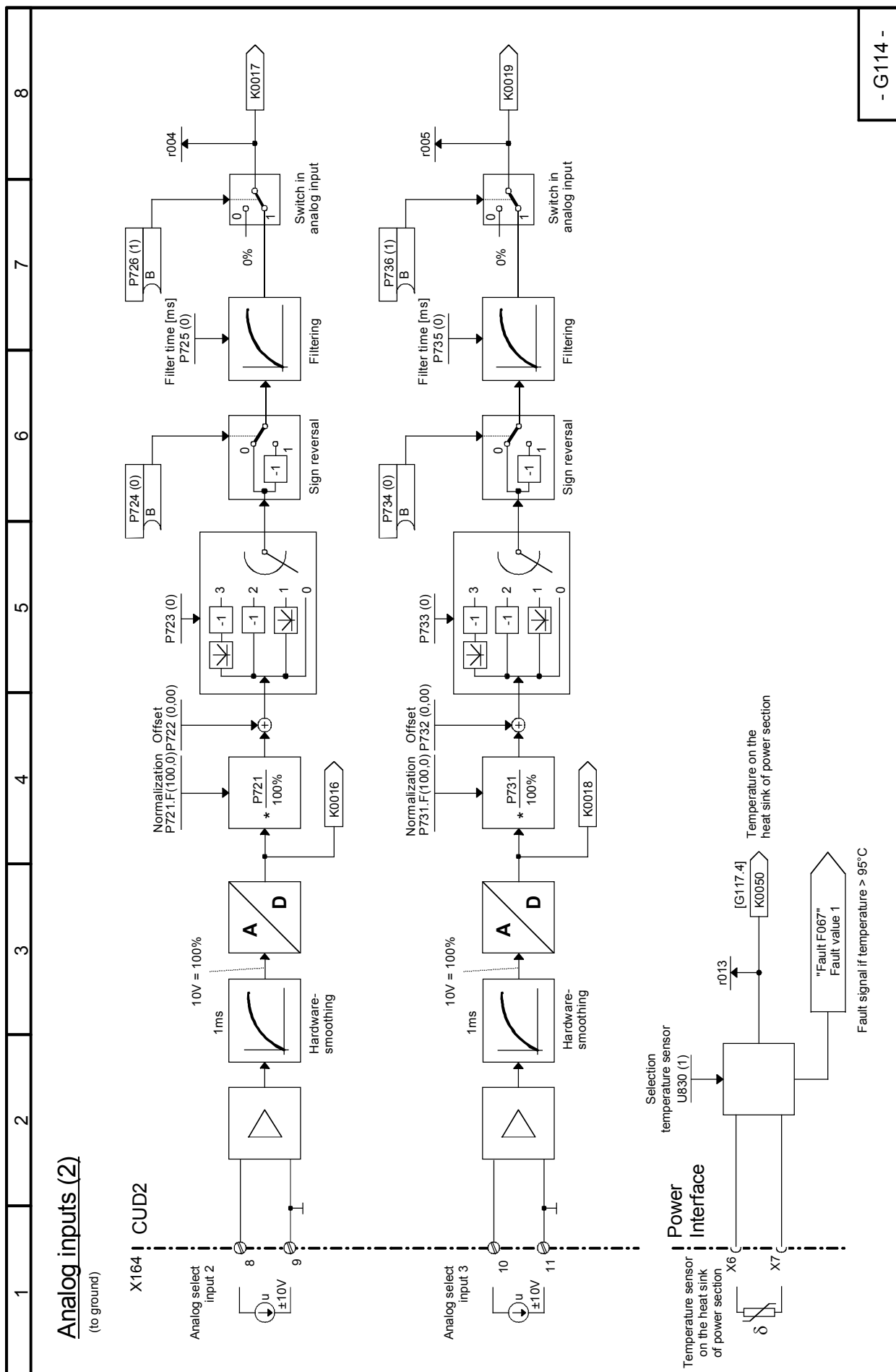
## Sheet G112 Binary outputs terminals 46/47, 48/54, 50/51 and 52/53



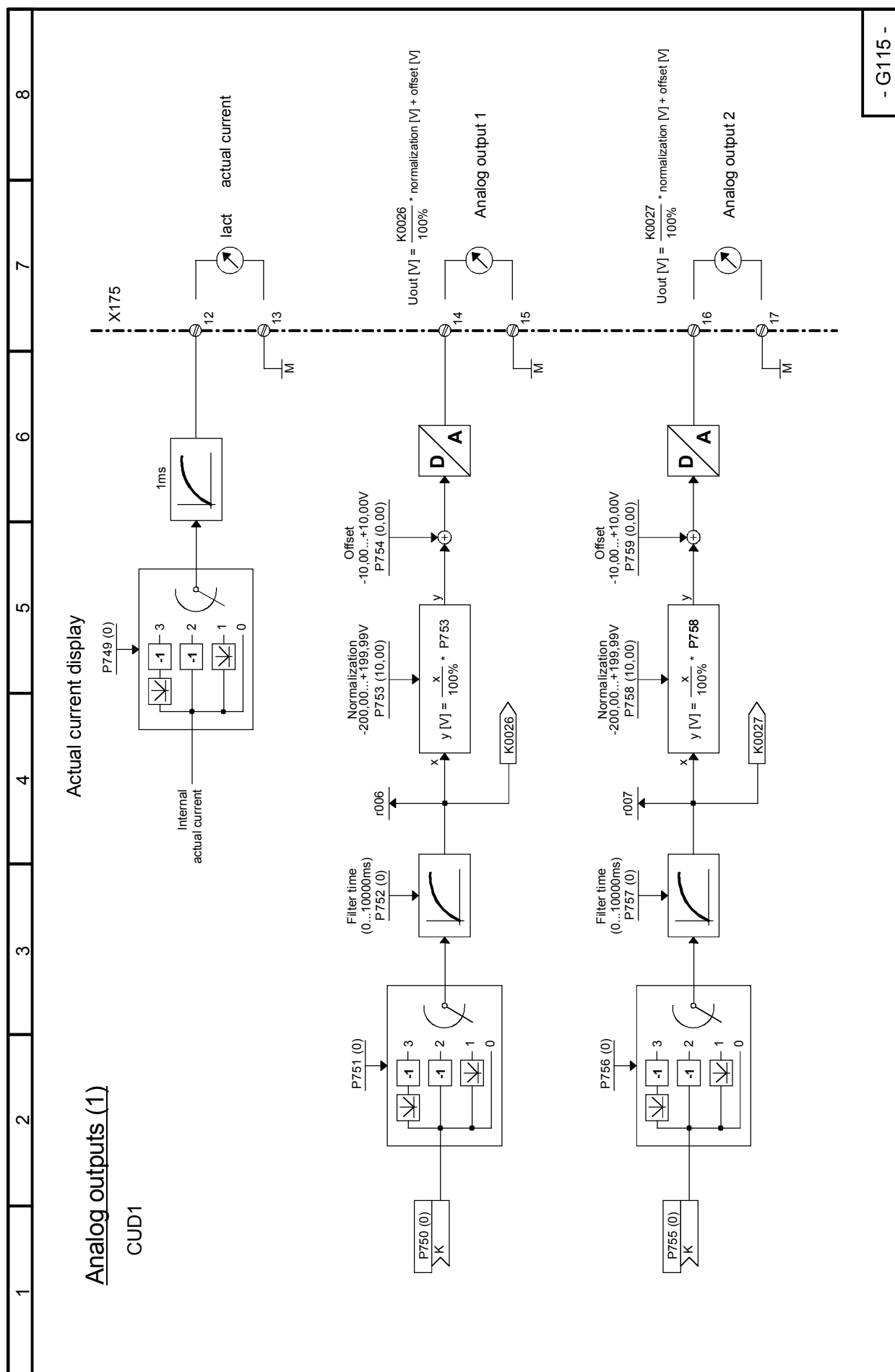
## Sheet G113 Analog inputs terminals 4/5, 6/7, and 103/104



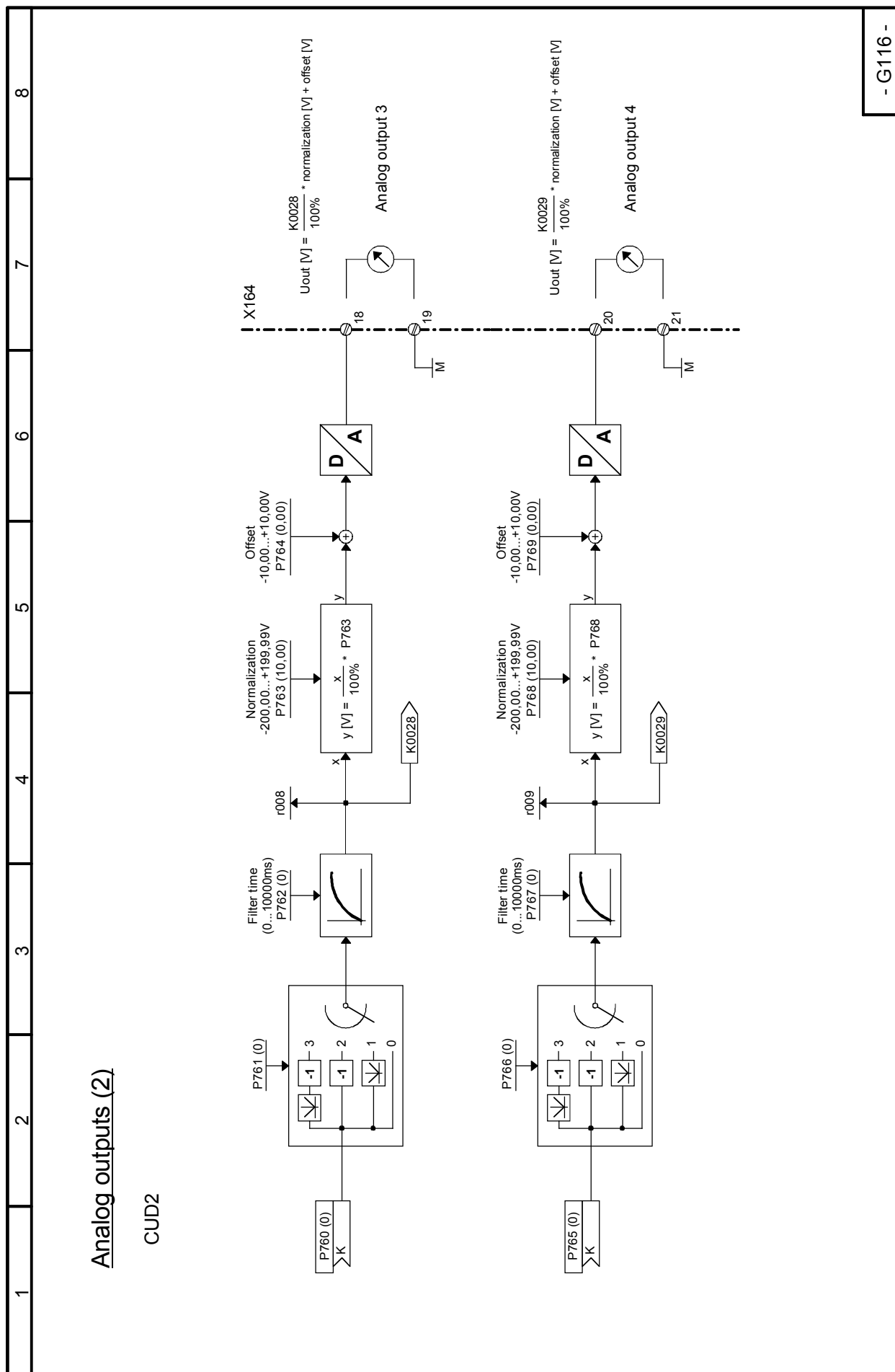
## Sheet G114 Analog inputs terminals 8/9, 10/11 and X6/X7



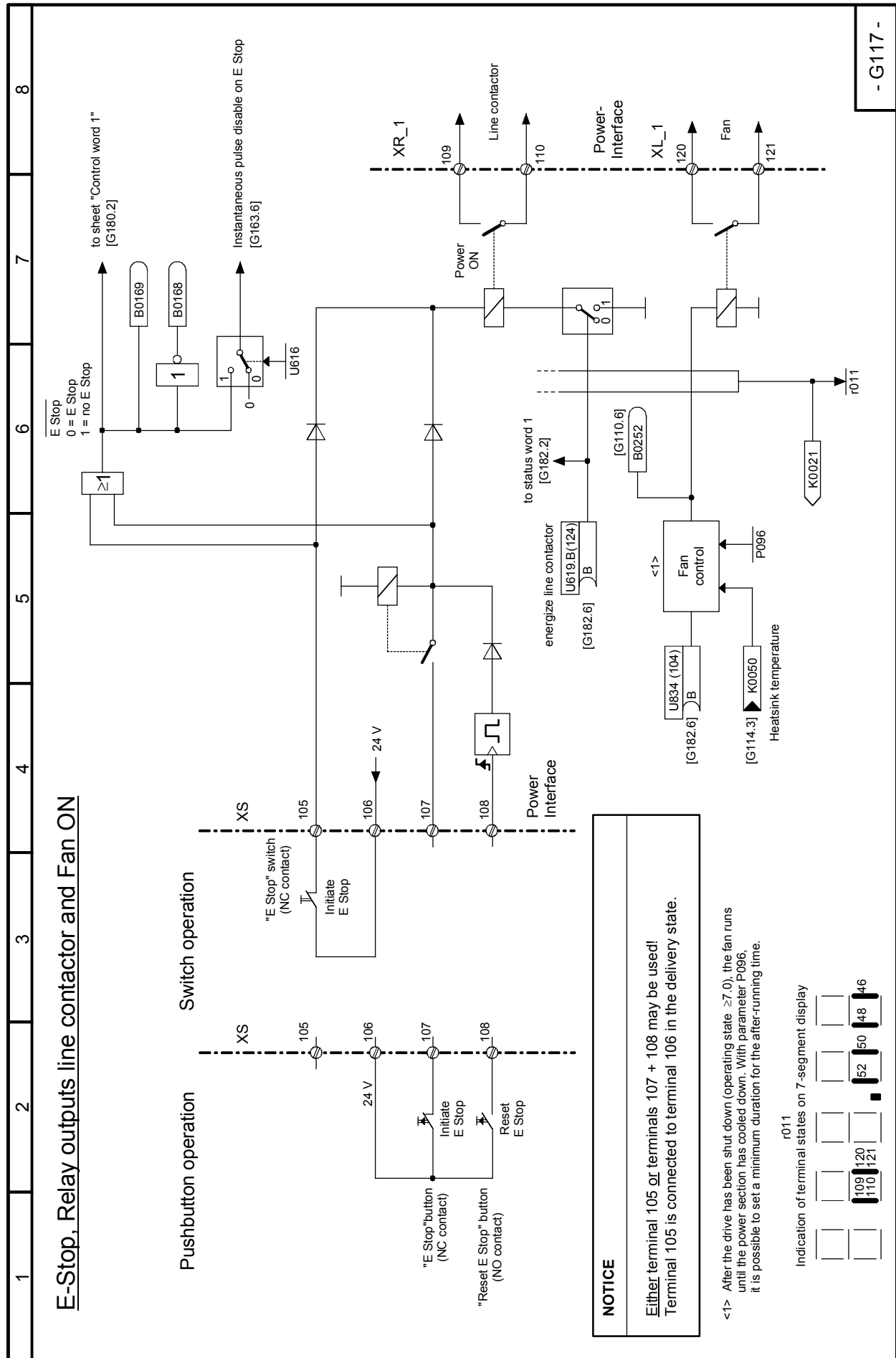
## Sheet G115 Analog outputs terminals 12/13, 14/15, and 16/17



## Sheet G116 Analog outputs terminals 18/19 and 20/21



## Sheet G117 E-Stop, Relay outputs line contactor and fan ON

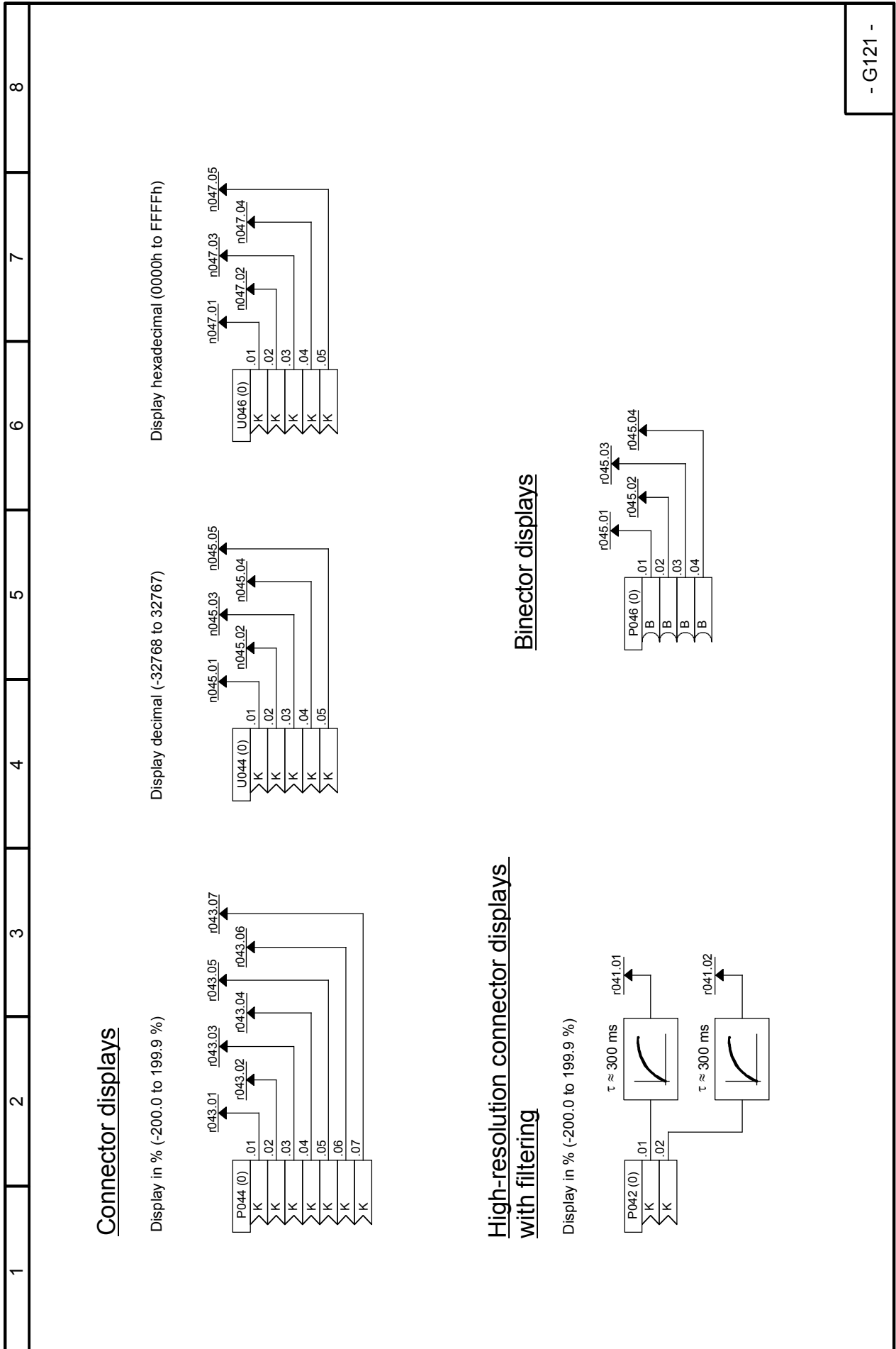


## Sheet G120 Fixed values, fixed control bits, constant fixed values and control bits

| 1                                                              | 2     | 3                                                          | 4     | 5                           | 6     | 7                                             | 8     |
|----------------------------------------------------------------|-------|------------------------------------------------------------|-------|-----------------------------|-------|-----------------------------------------------|-------|
| <b>11 fixed values</b><br>setting range<br>-199.99 to +199.99% |       | <b>5 fixed values</b><br>setting range<br>-32768 to +32767 |       | <b>8 fixed control bits</b> |       | <b>Constant fixed values and control bits</b> |       |
| P401.F (0.00)                                                  | K0401 | P412.F (0)                                                 | K0412 | P421.F (0)                  | B0421 | 0.00 %                                        | K0000 |
| P402.F (0.00)                                                  | K0402 | P413.F (0)                                                 | K0413 | P422.F (0)                  | B0422 | 100.00 %                                      | K0001 |
| P403.F (0.00)                                                  | K0403 | P414.F (0)                                                 | K0414 | P423.F (0)                  | B0423 | 200.00 %                                      | K0002 |
| P404.F (0.00)                                                  | K0404 | P415.F (0)                                                 | K0415 | P424.F (0)                  | B0424 | -100.00 %                                     | K0003 |
| P405.F (0.00)                                                  | K0405 | P416.F (0)                                                 | K0416 | P425.F (0)                  | B0425 | -200.00 %                                     | K0004 |
| P406.F (0.00)                                                  | K0406 |                                                            |       | P426.F (0)                  | B0426 | 50.00 %                                       | K0005 |
| P407.F (0.00)                                                  | K0407 |                                                            |       | P427.F (0)                  | B0427 | 150.00 %                                      | K0006 |
| P408.F (0.00)                                                  | K0408 |                                                            |       | P428.F (0)                  | B0428 | -50.00 %                                      | K0007 |
| P409.F (0.00)                                                  | K0409 |                                                            |       |                             |       | -150.00 %                                     | K0008 |
| P410.F (0.00)                                                  | K0410 |                                                            |       |                             |       | 0                                             | B0000 |
| P411.F (0.00)                                                  | K0411 |                                                            |       |                             |       | 1                                             | B0001 |

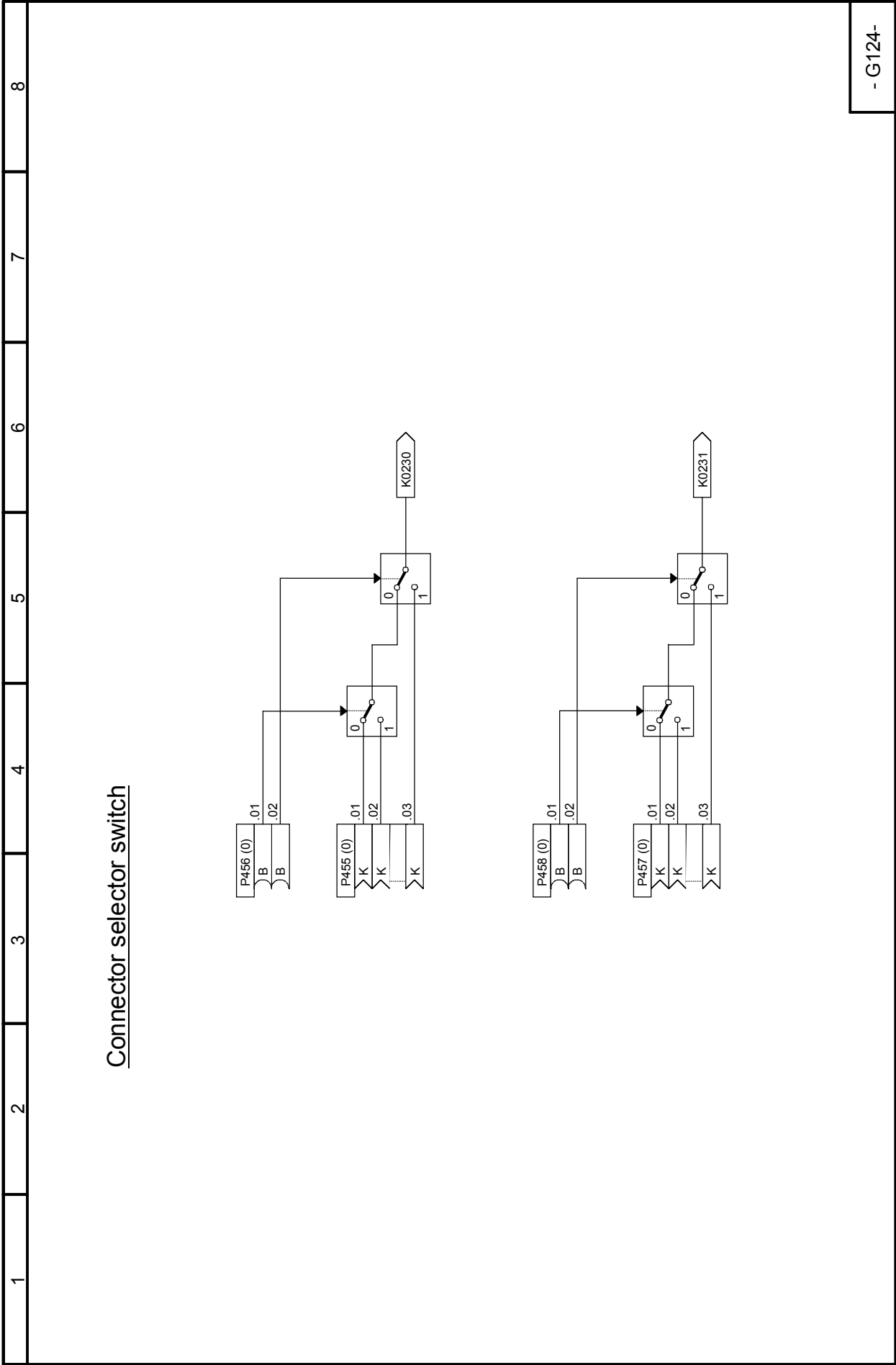
- G120 -

## Sheet G121 Connector and binector displays

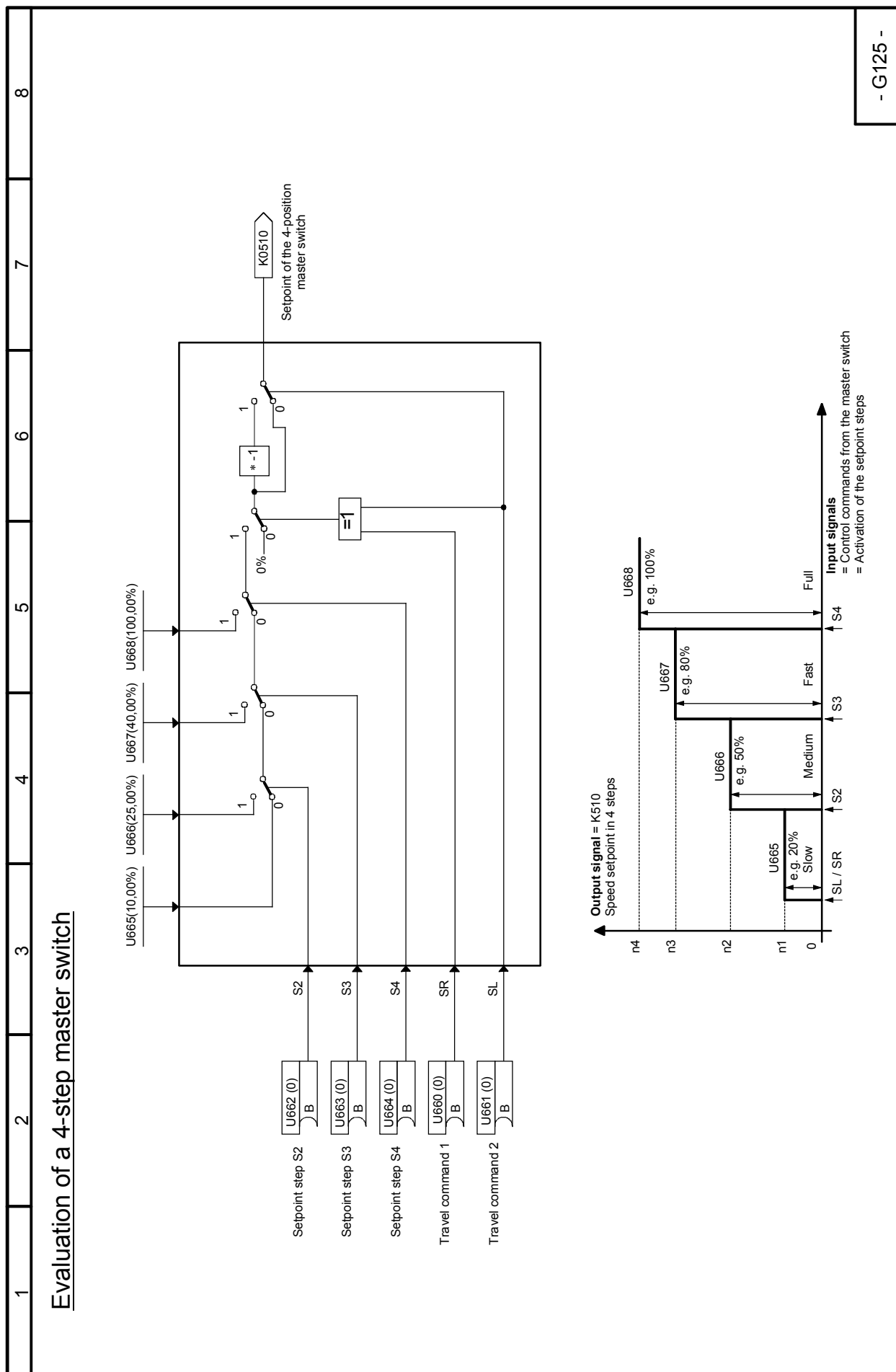


- G121 -

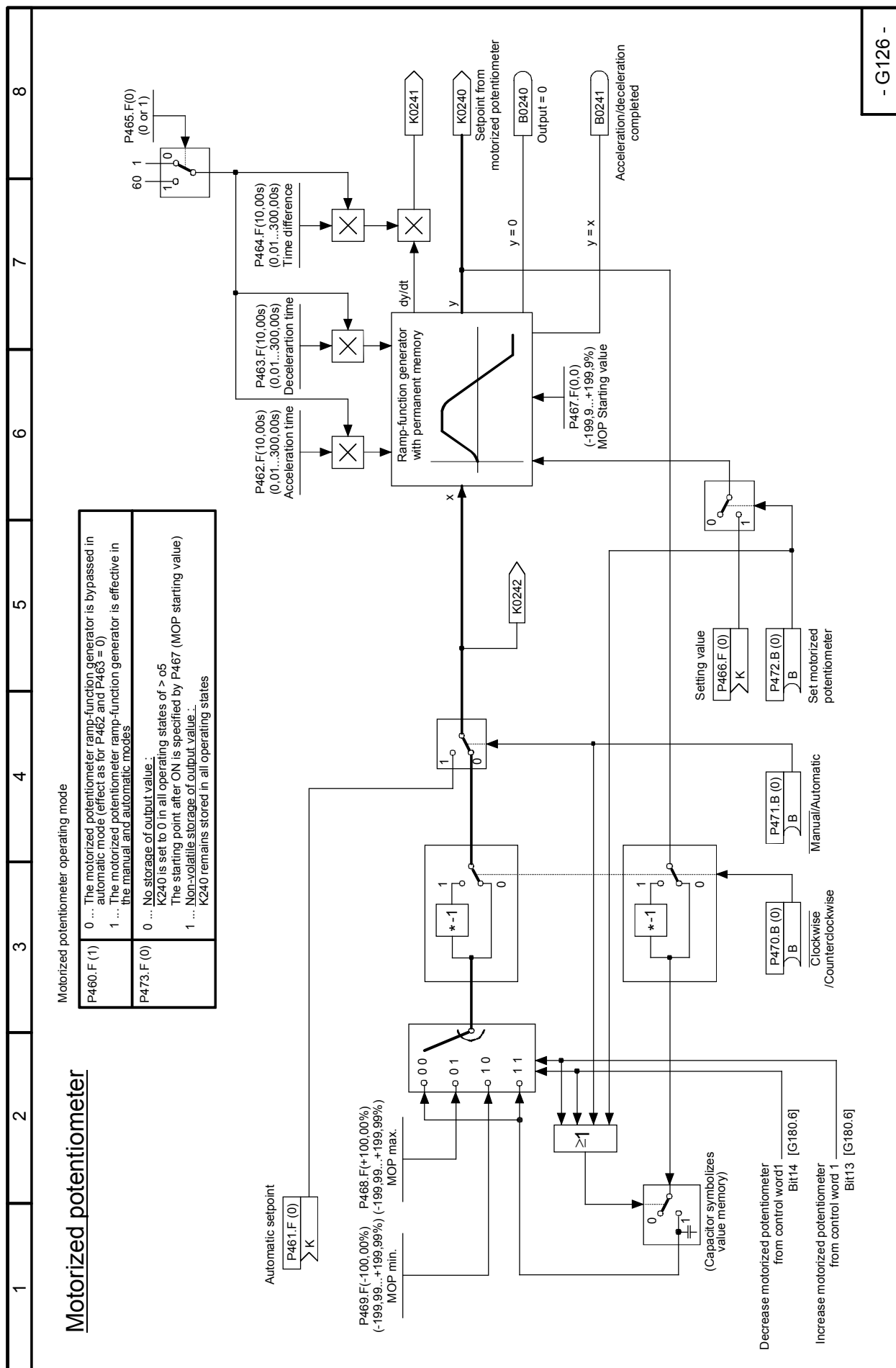




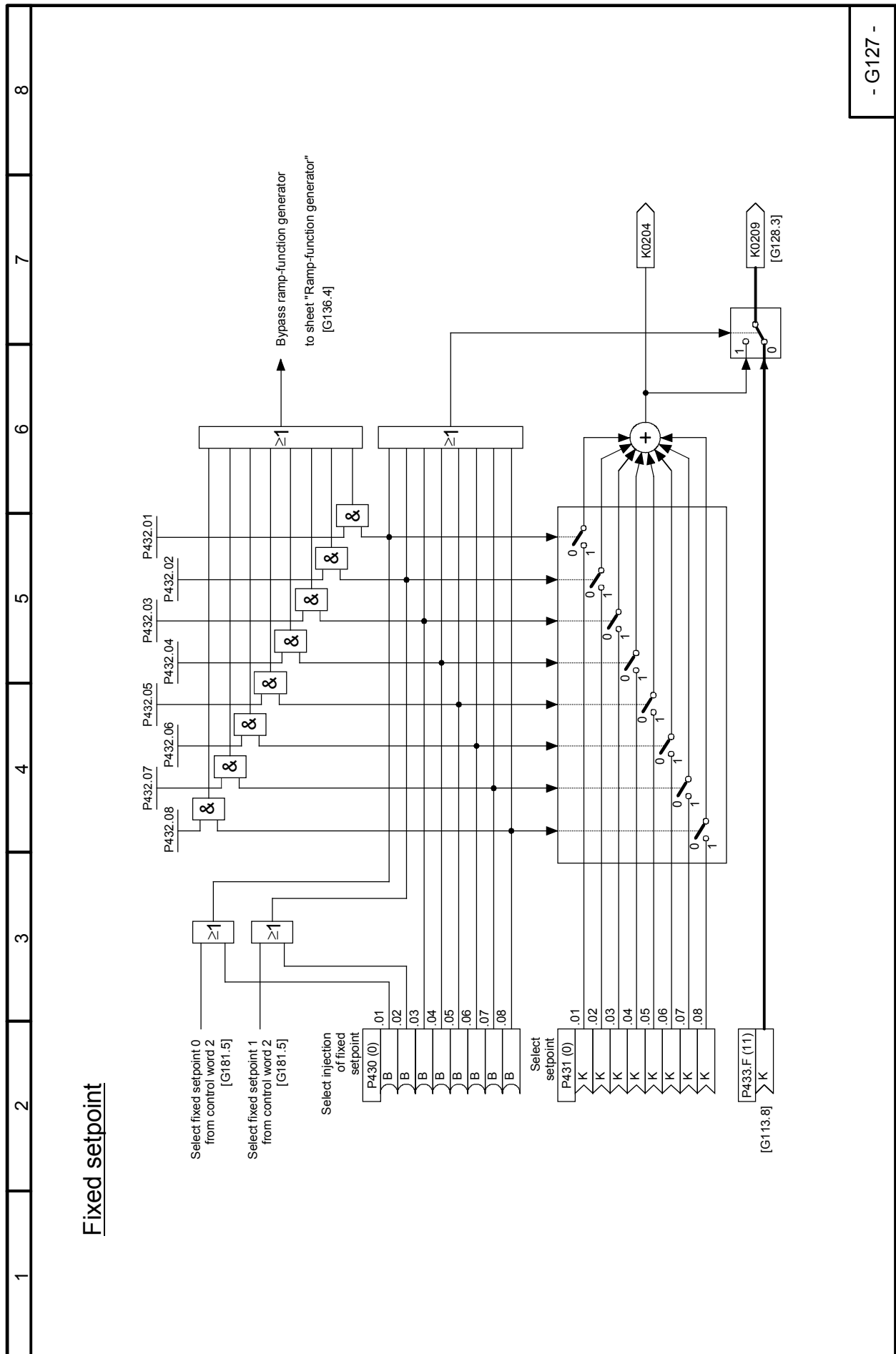
## Sheet G125 Evaluation of a 4-step master switch



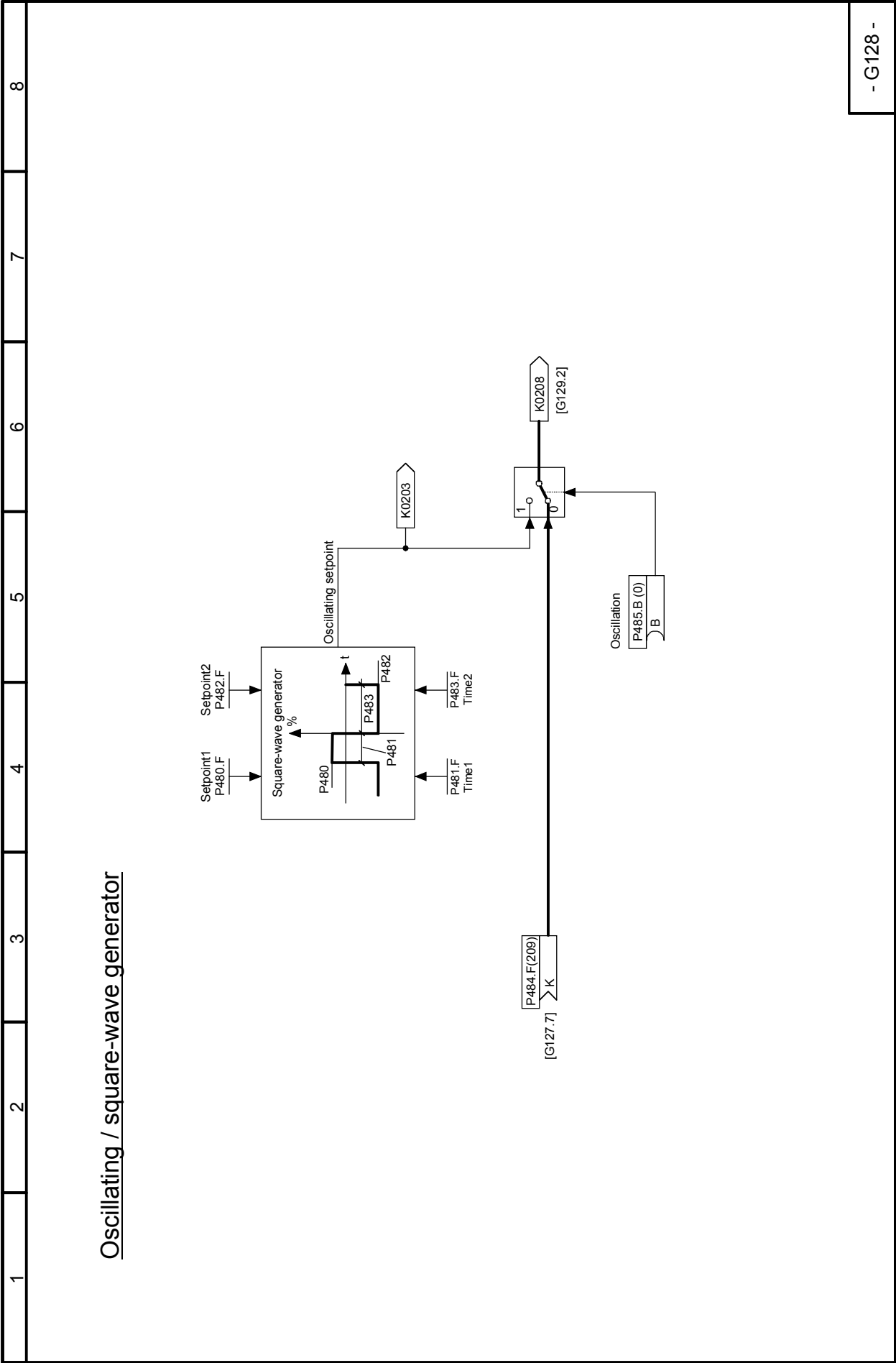
## Sheet G126 Motorized potentiometer



## Sheet G127 Fixed setpoint

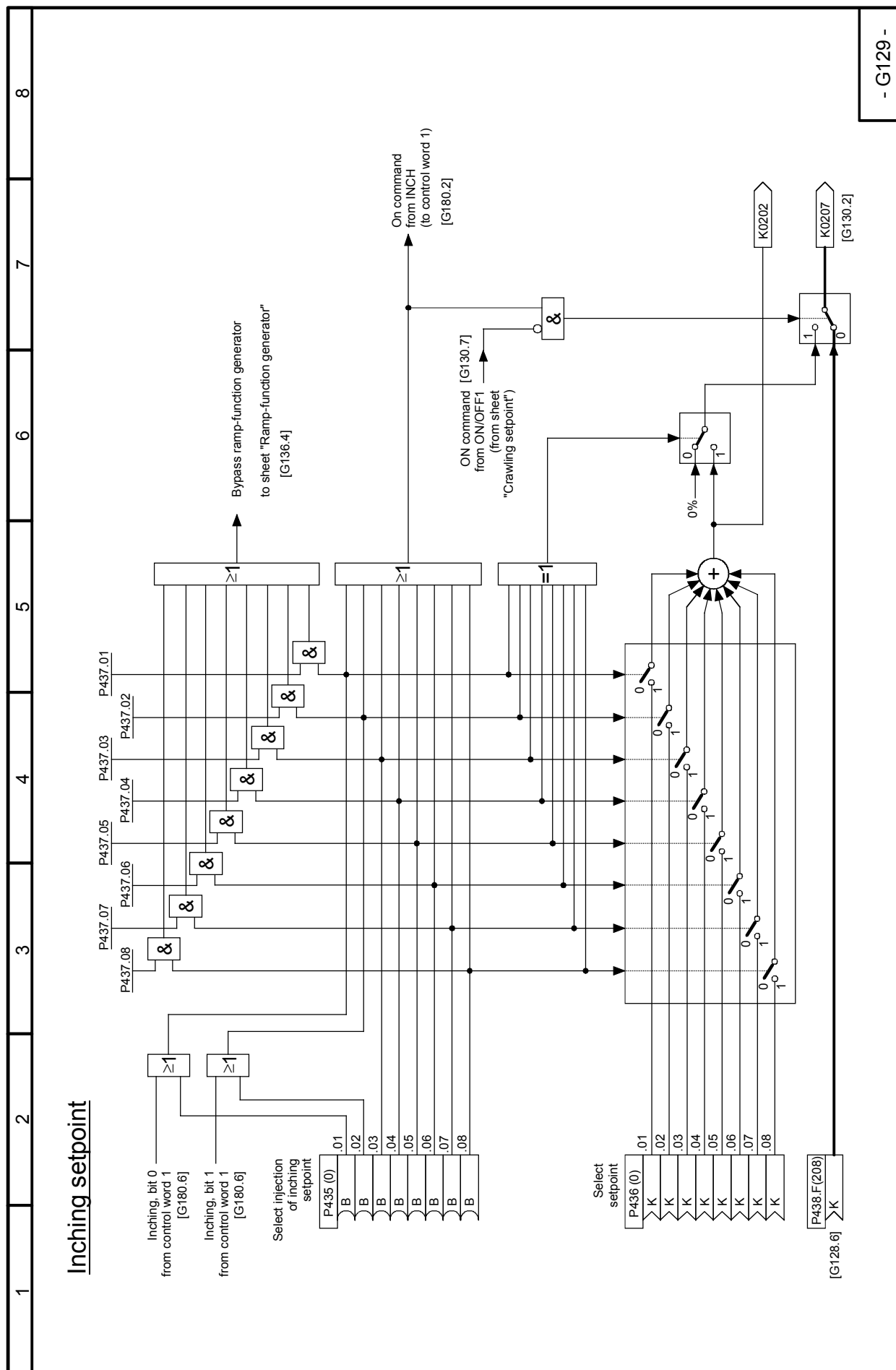


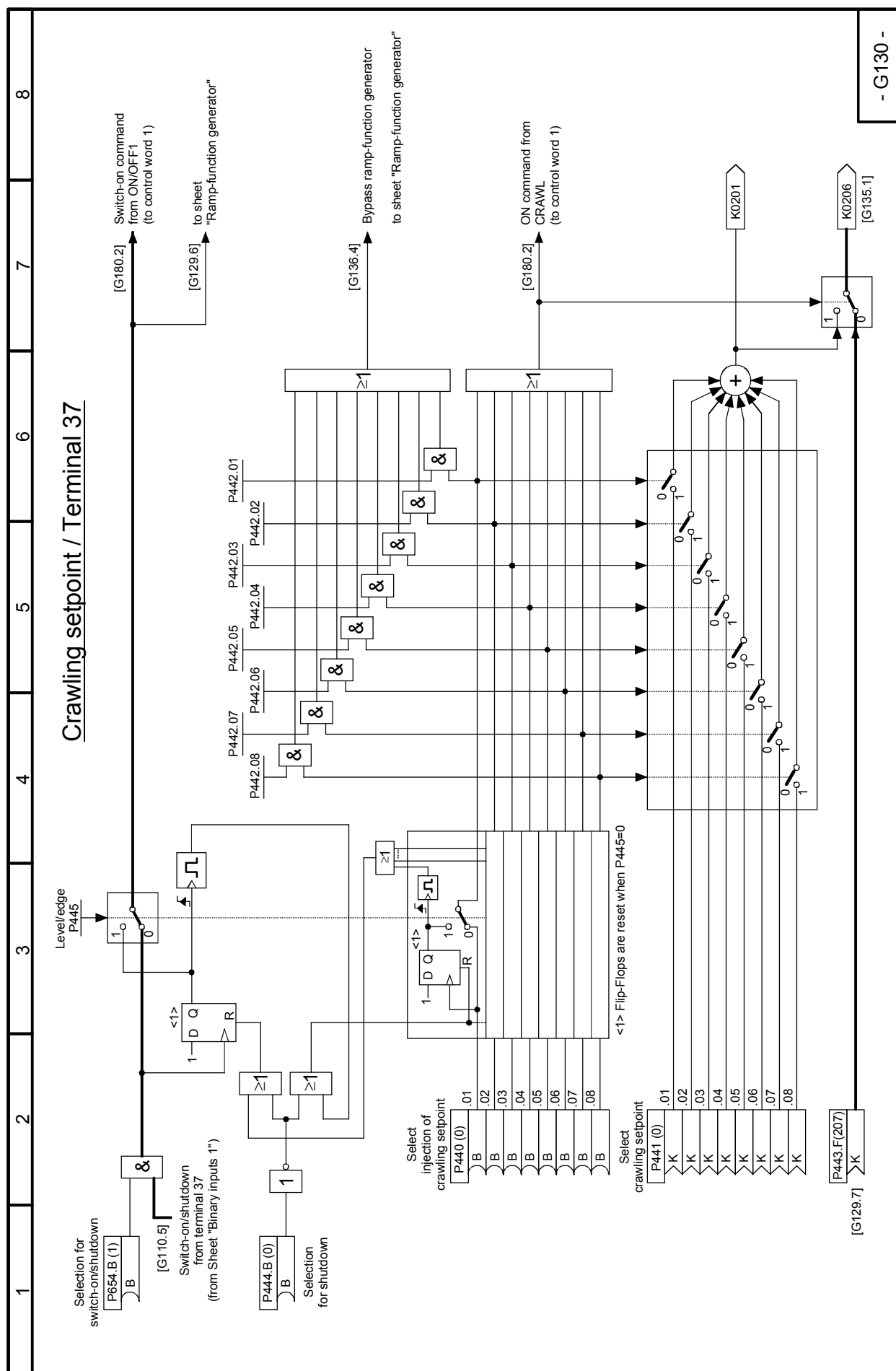
- G127 -



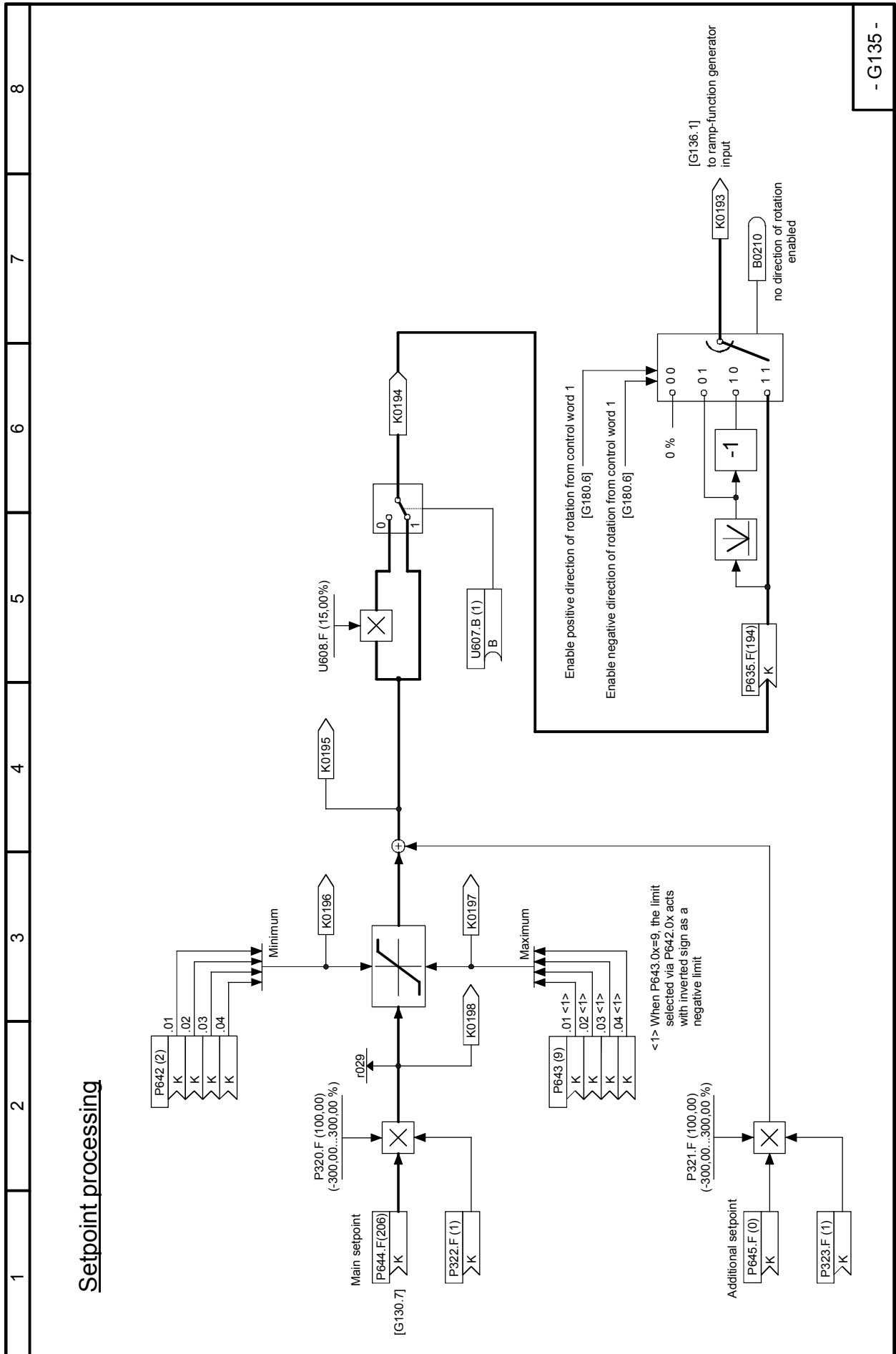
- G128 -

## Sheet G129 Inching setpoint

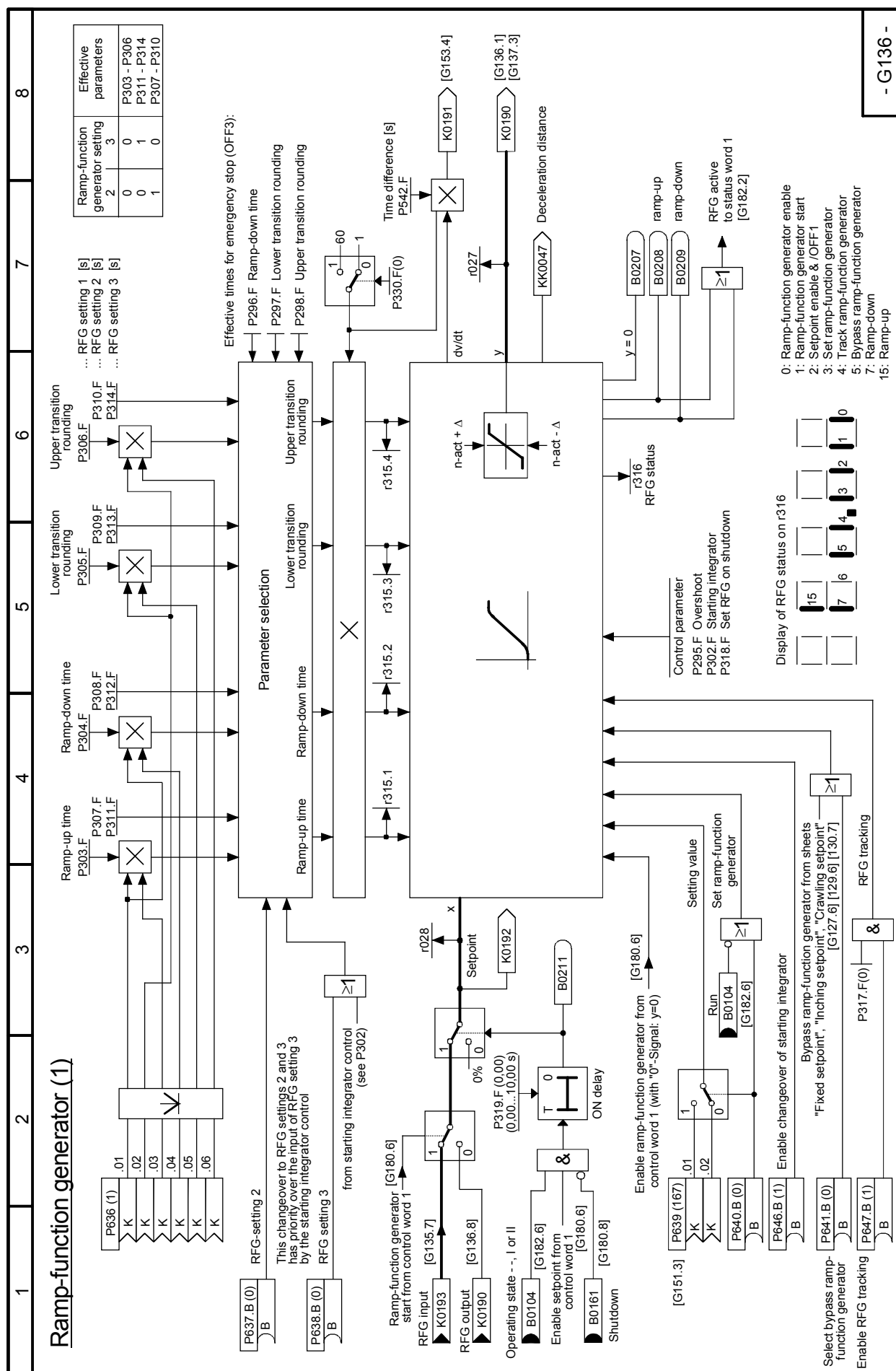




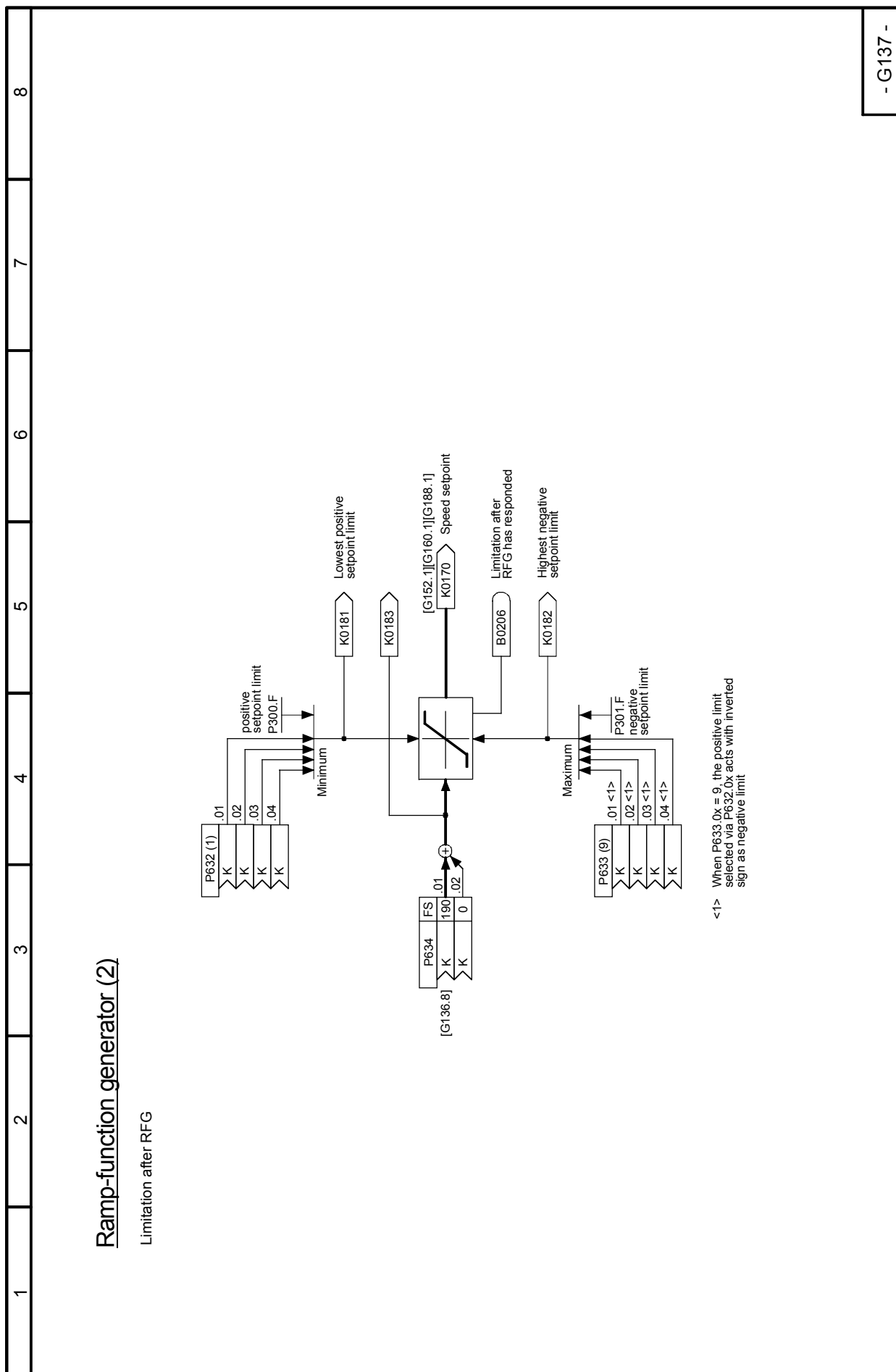
## Sheet G135 Setpoint processing





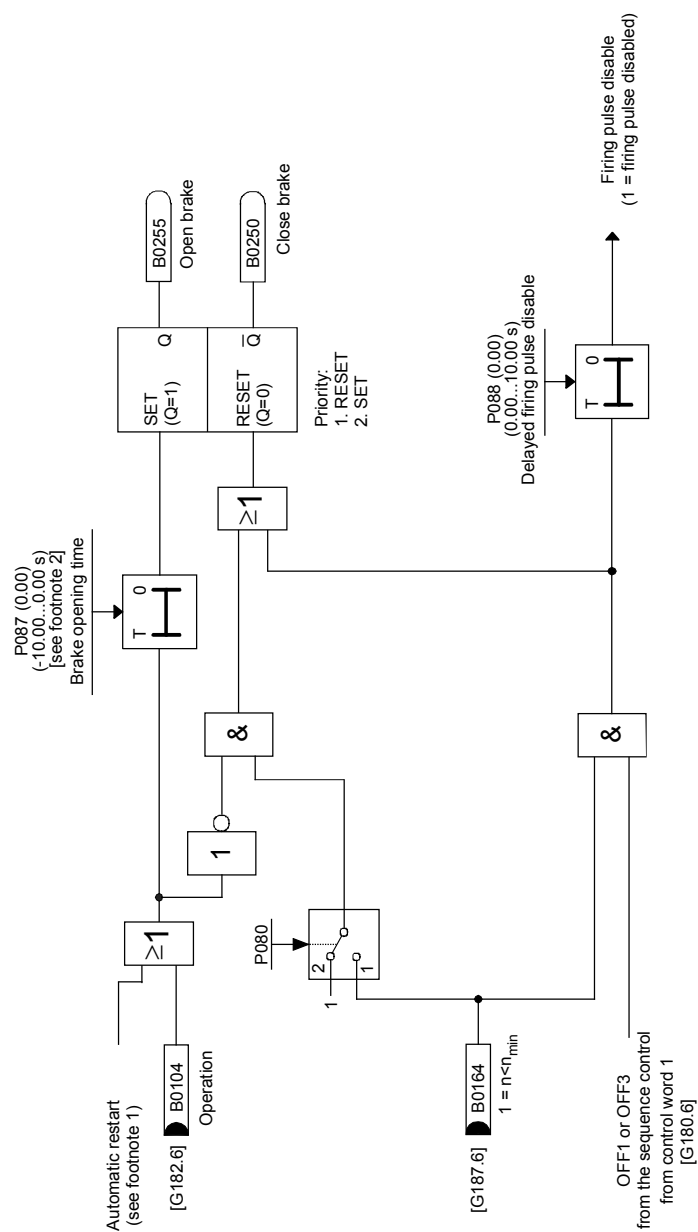


## Sheet G137 Ramp-function generator (2)



- G137 -

## Brake control



Footnote 1:

The signal "automatic restart" is generated by the sequence control.

If the voltage at the power section fails briefly in the "operating" state (see P086)

(and if automatic restart is selected, i.e. P086 > 0), the "operating" signal goes to log. "0" and

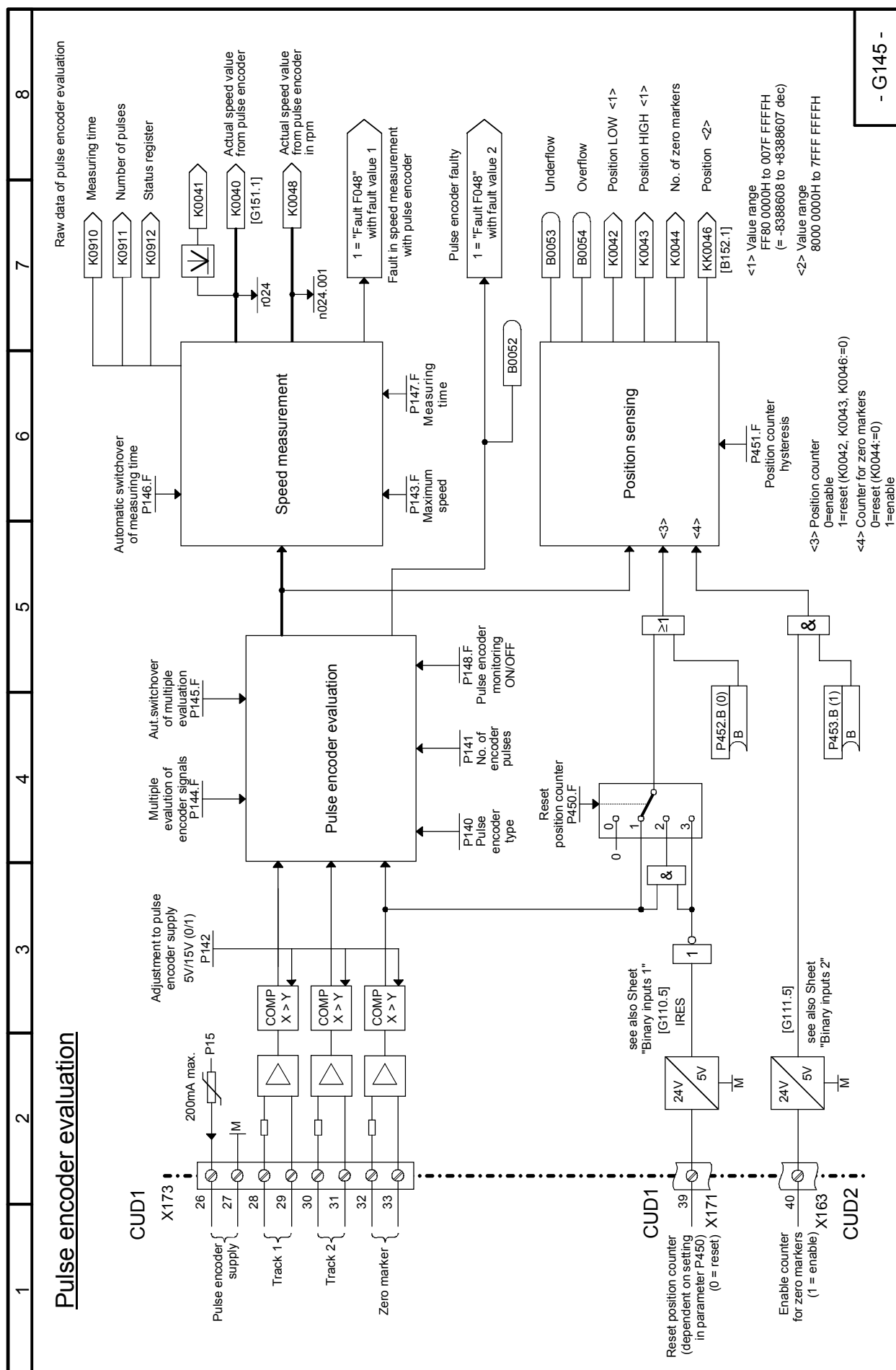
the "automatic restart" signal to log. "1" during this time.

This causes the brake to remain open during this short time without torque.

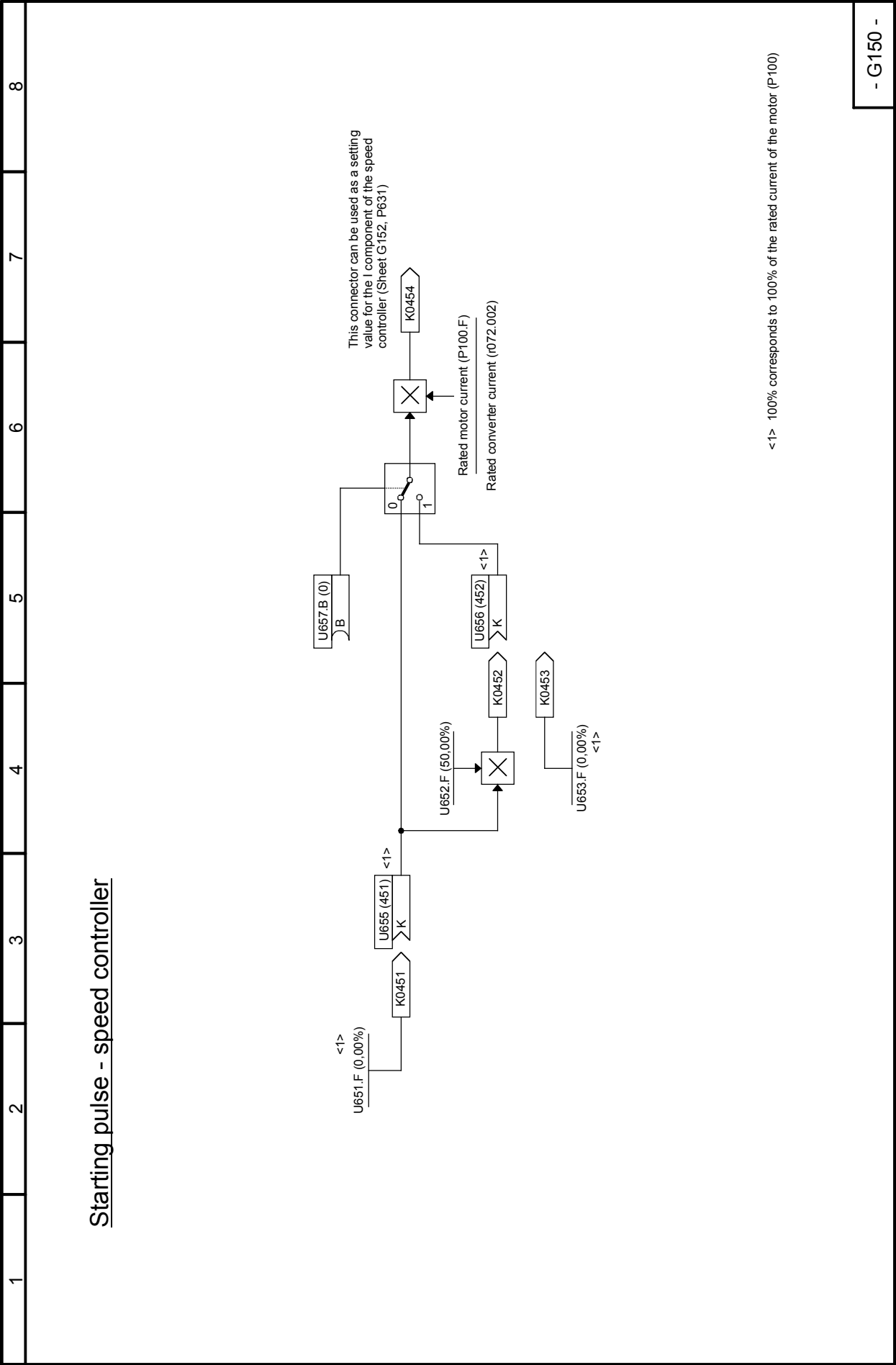
Footnote 2:

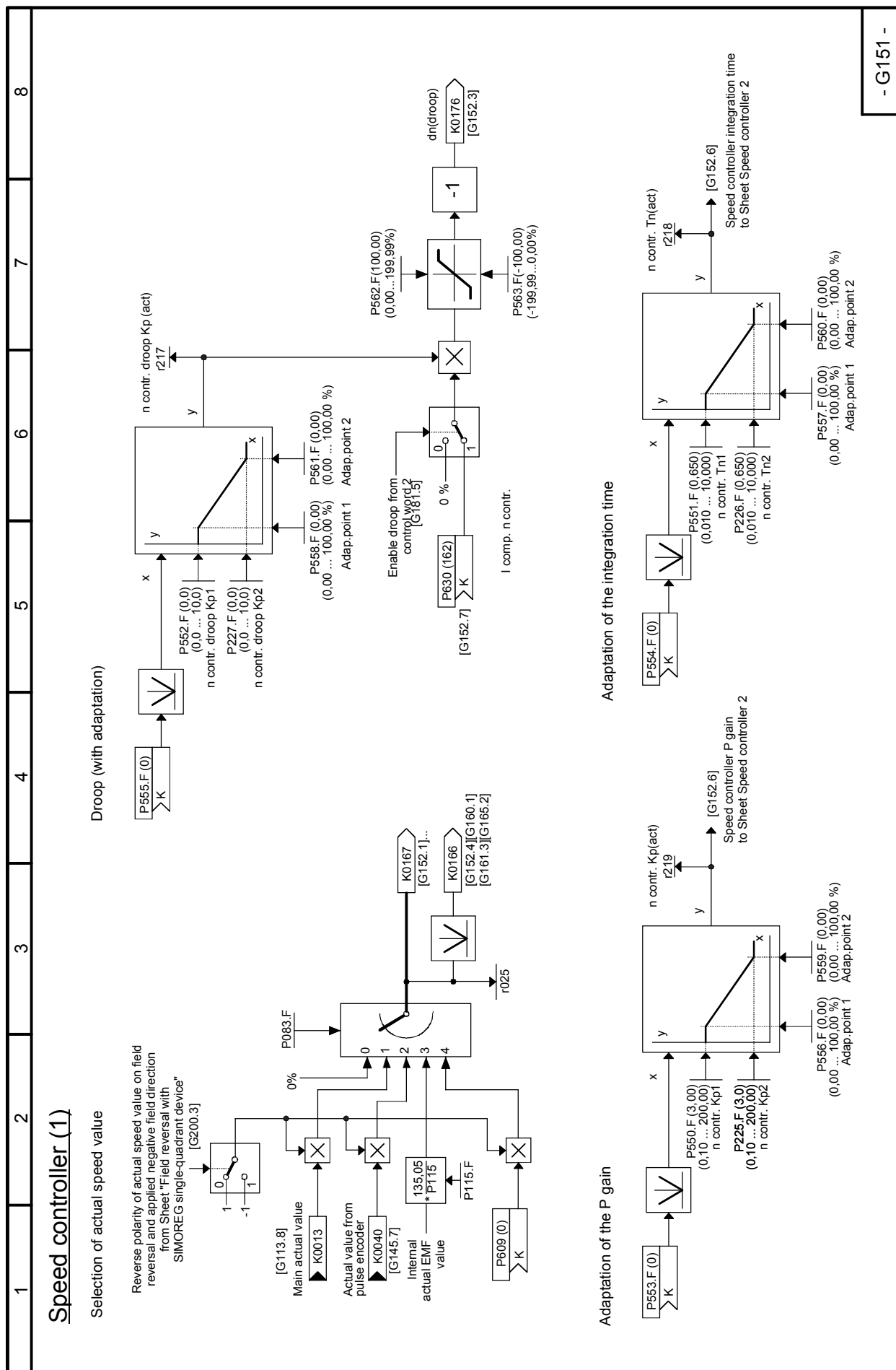
A negative value in P087 means that the signal "Open brake" is delayed with respect to the enable for the firing pulses for the thyristor. Only this case is shown in this function diagram.

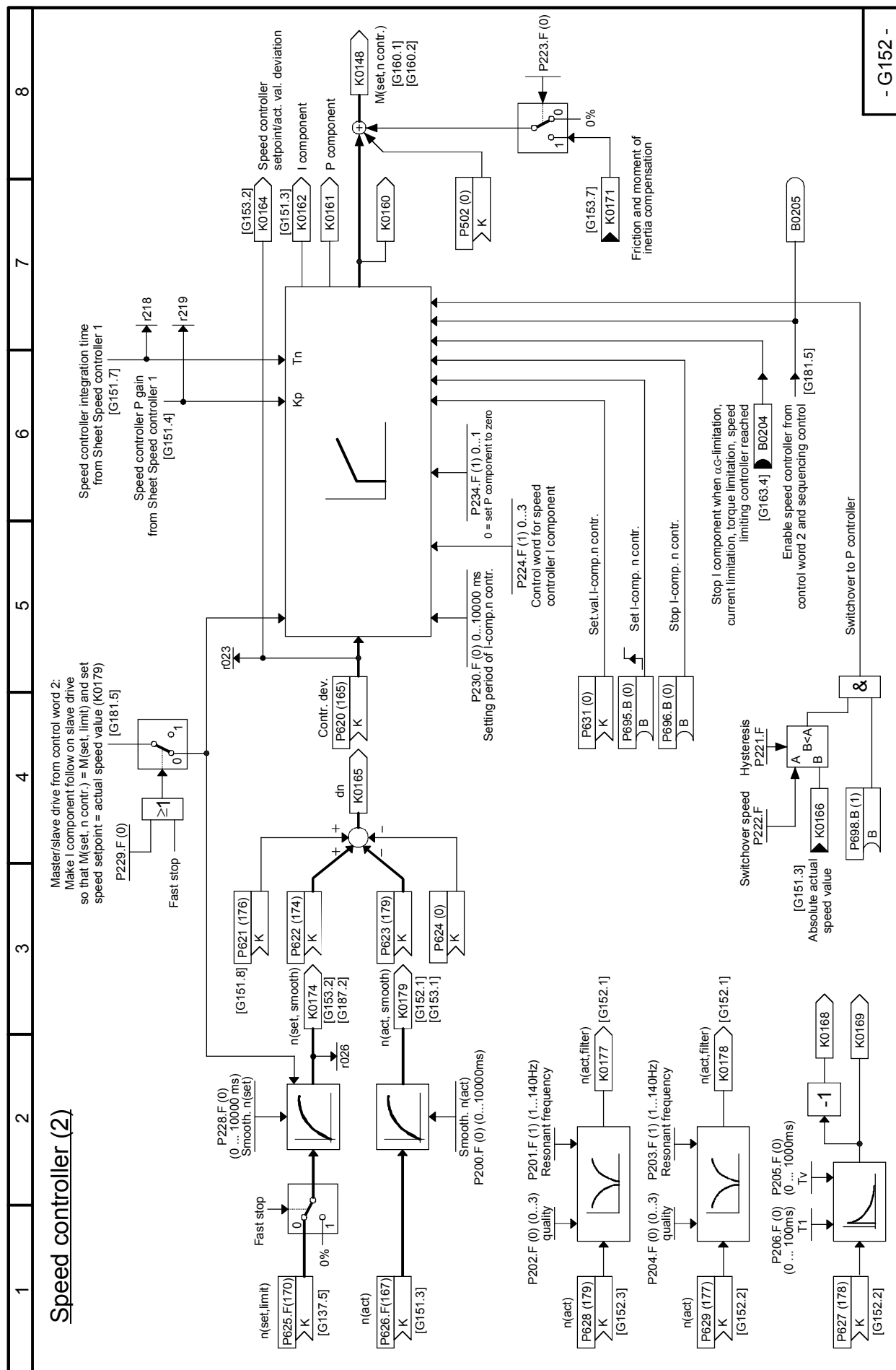
- G140 -



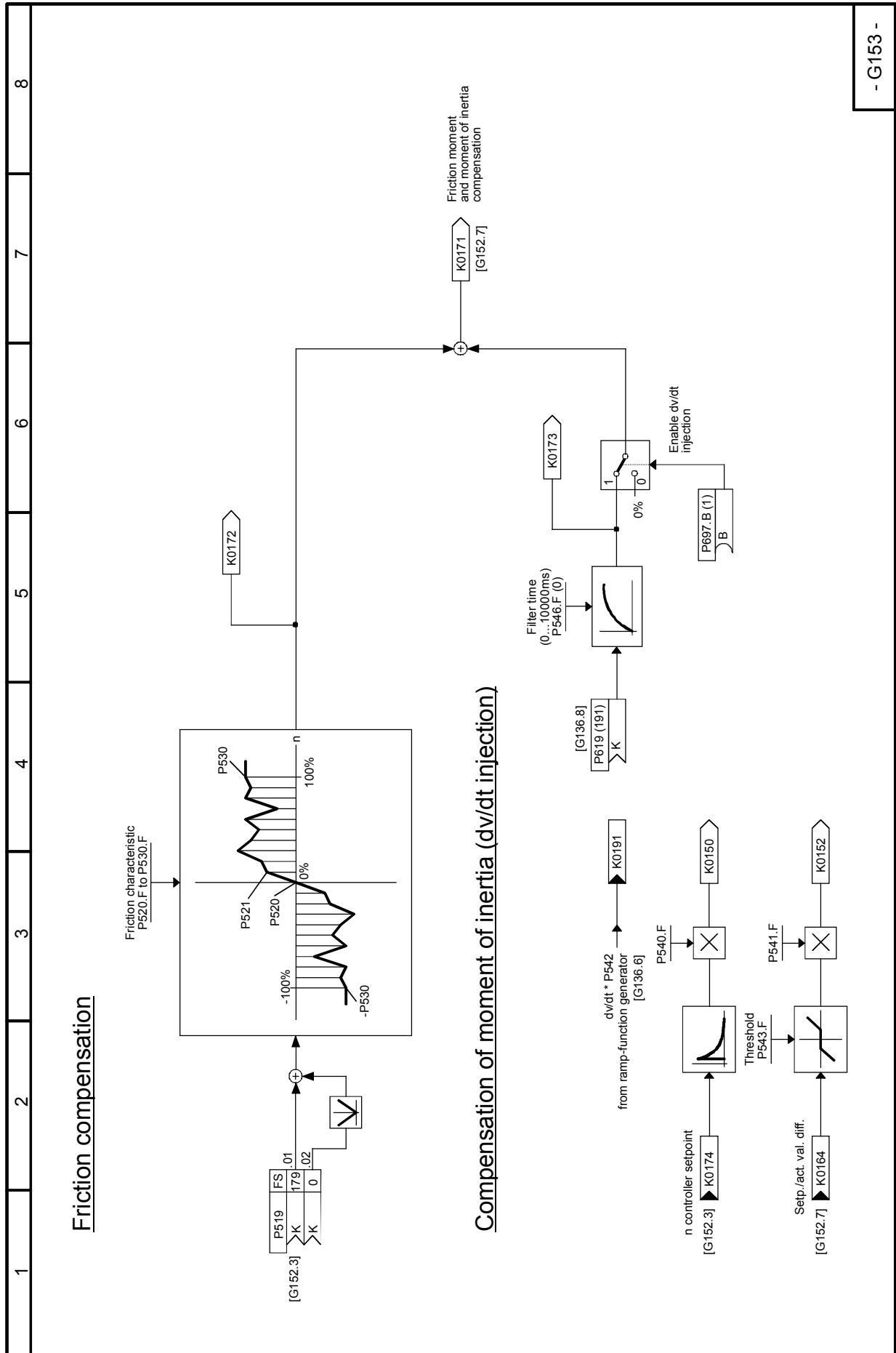
Sheet G150 Starting pulse - speed controller



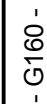




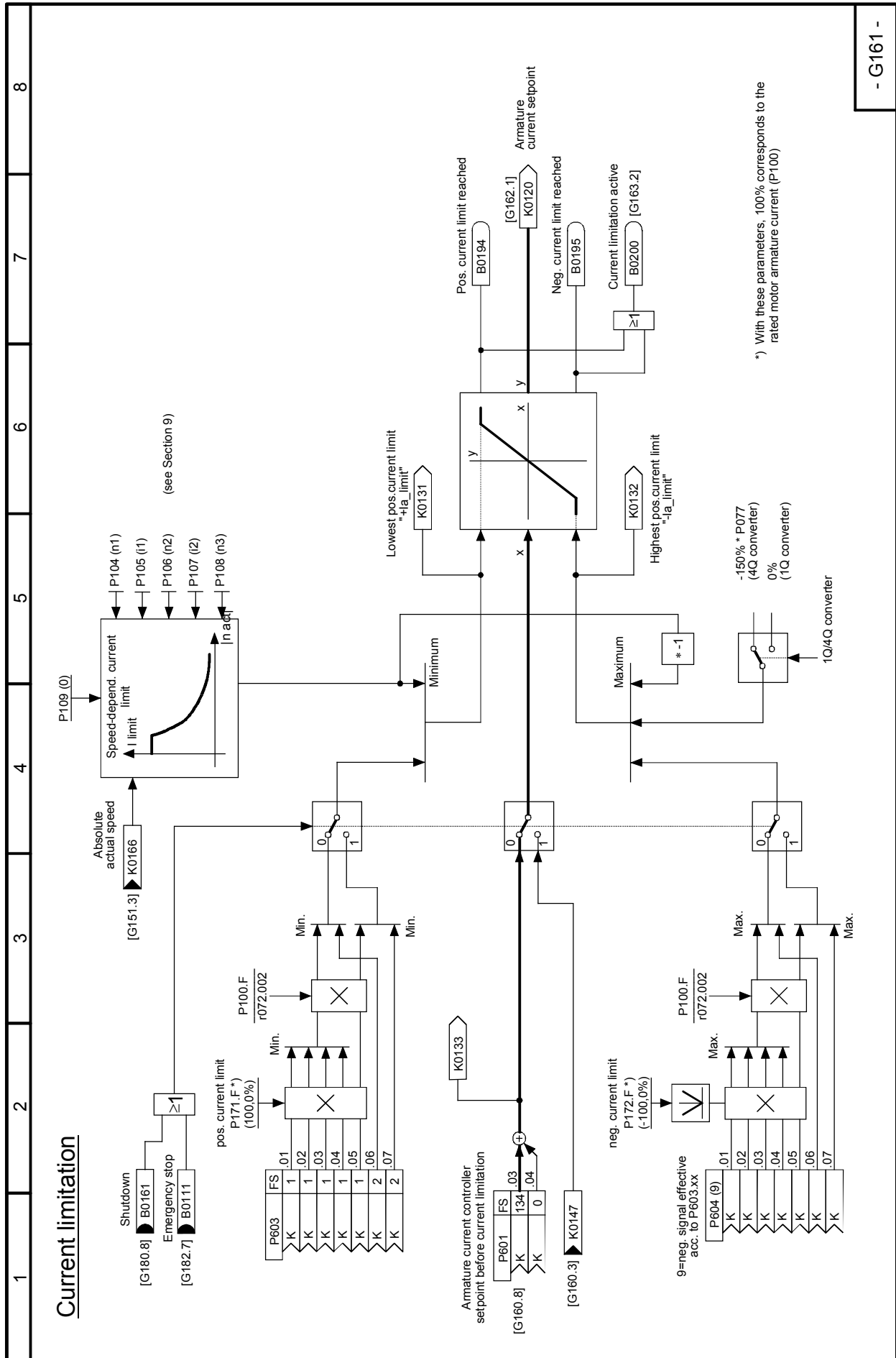
# Sheet G153 Friction compensation, Compensation of moment of inertia (dv/dt injection)







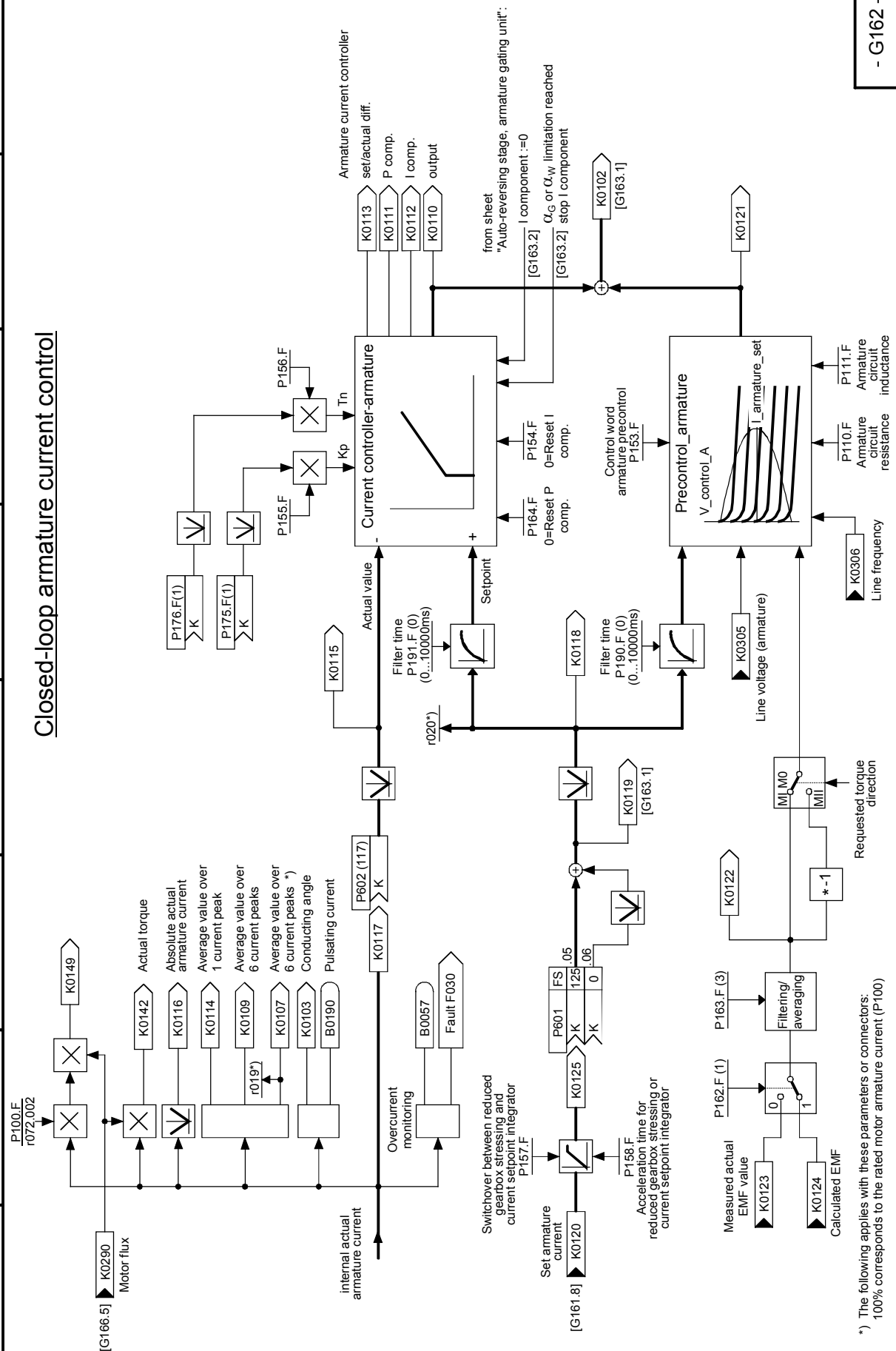
## Sheet G161 Current limitation



- G161 -

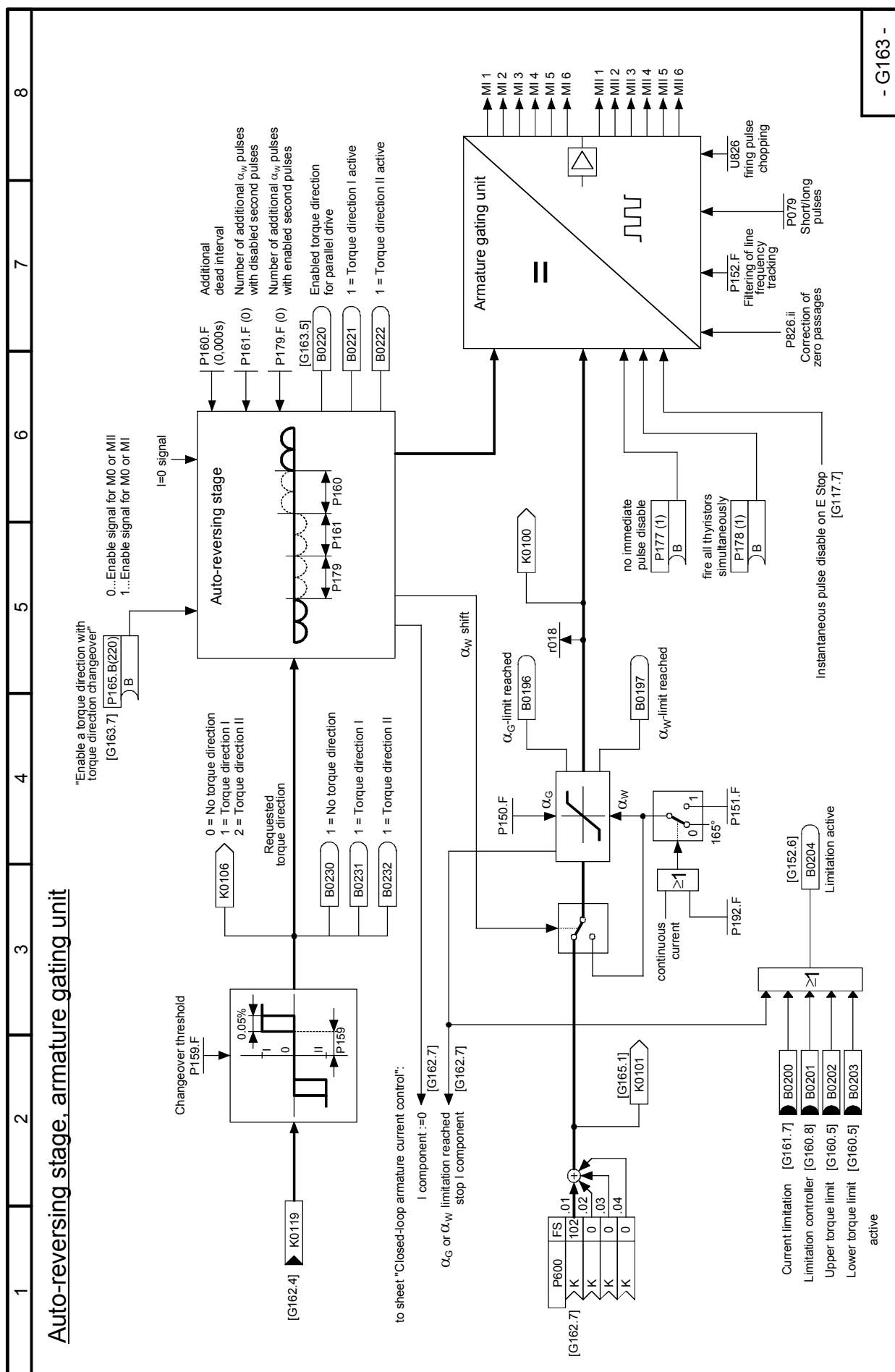
## Sheet G162 Closed-loop armature current control

## Closed-loop armature current control

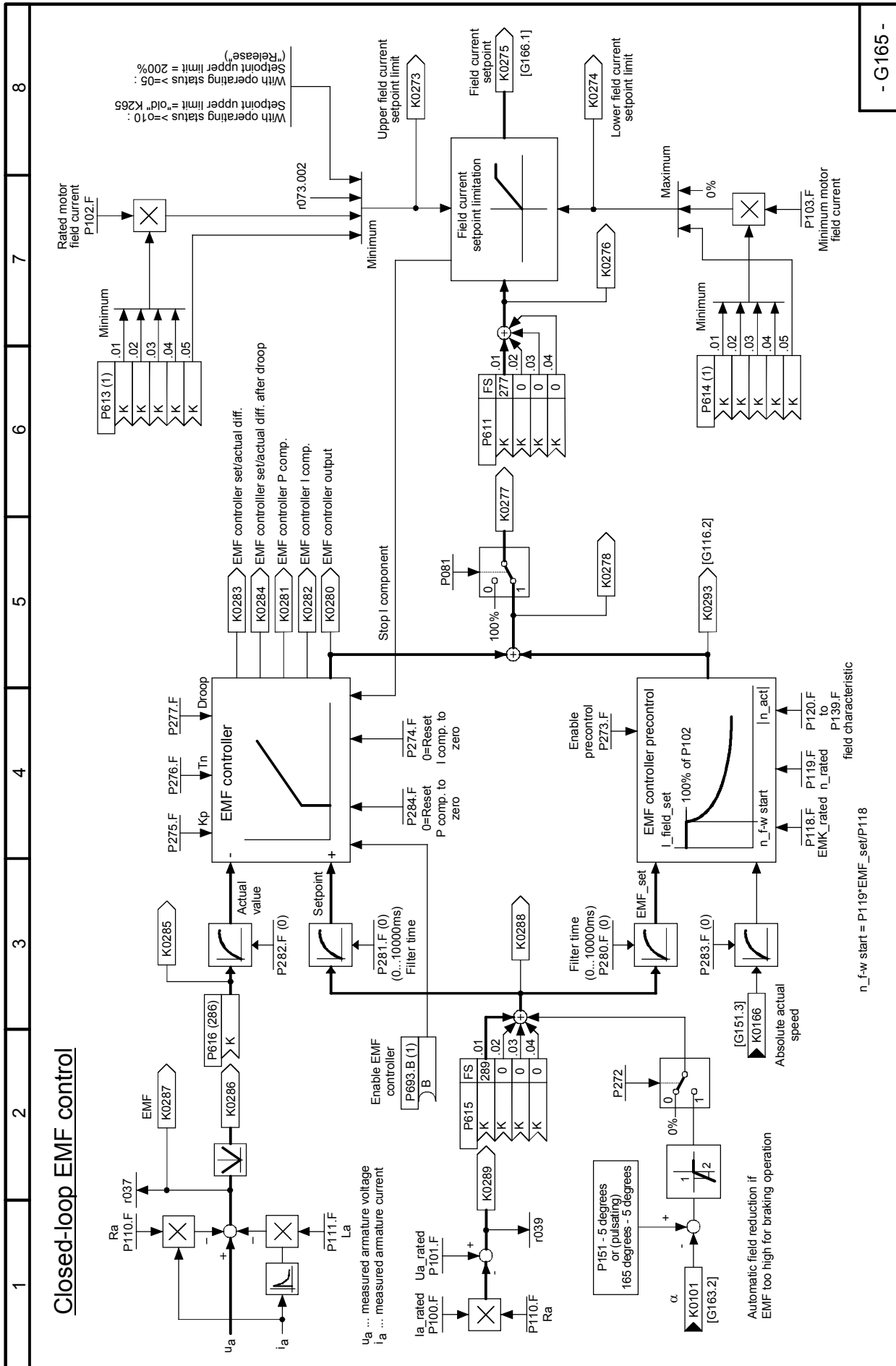


- G162 -

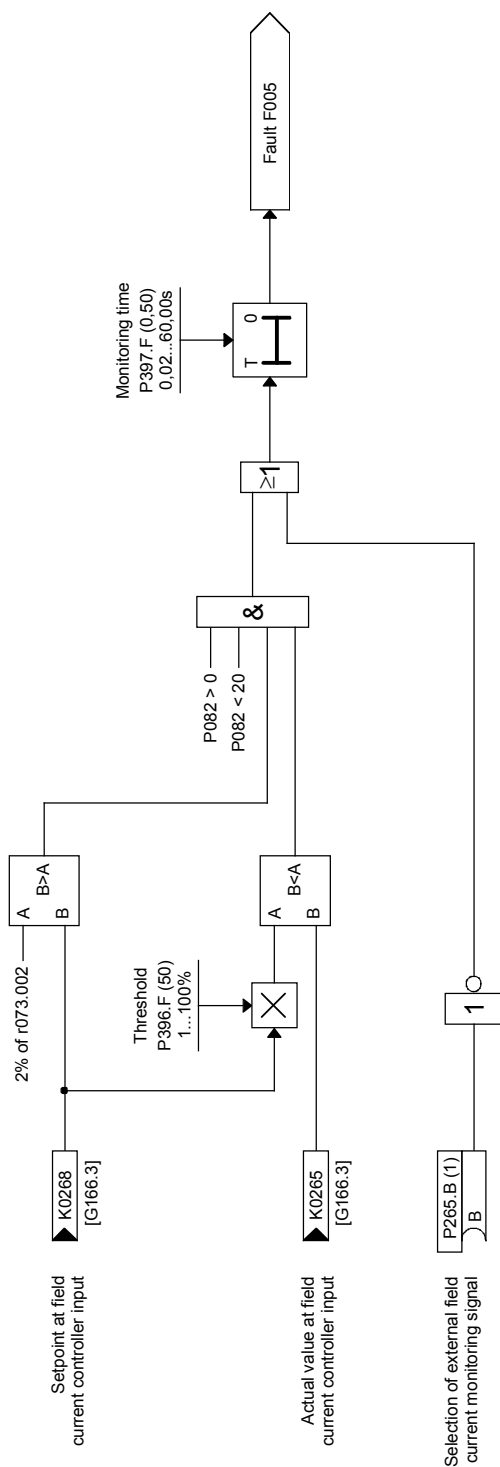
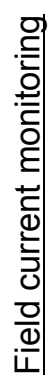
## Sheet G163 Auto-reversing stage, armature gating unit



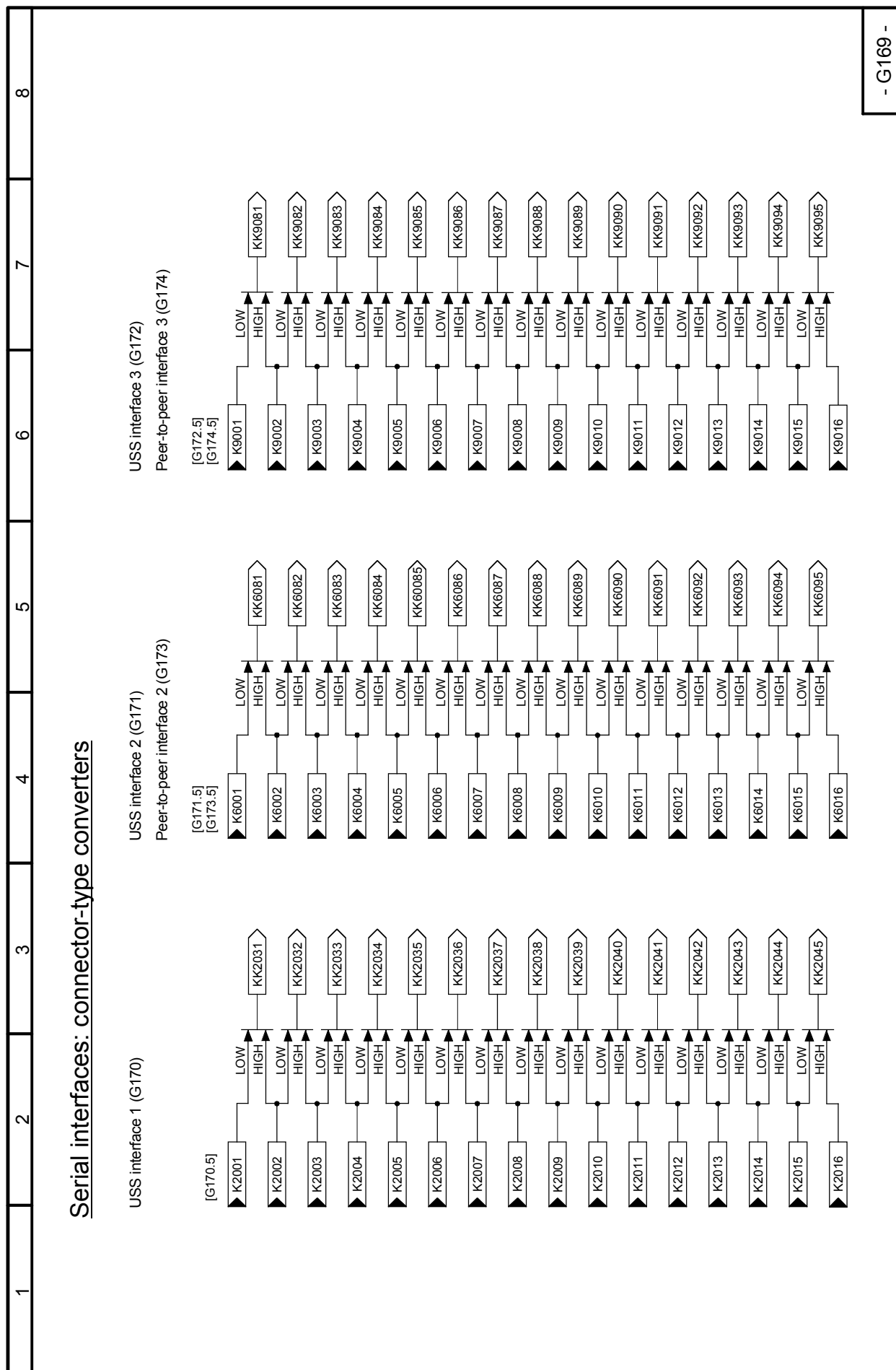
## Sheet G165 Closed-loop EMF control



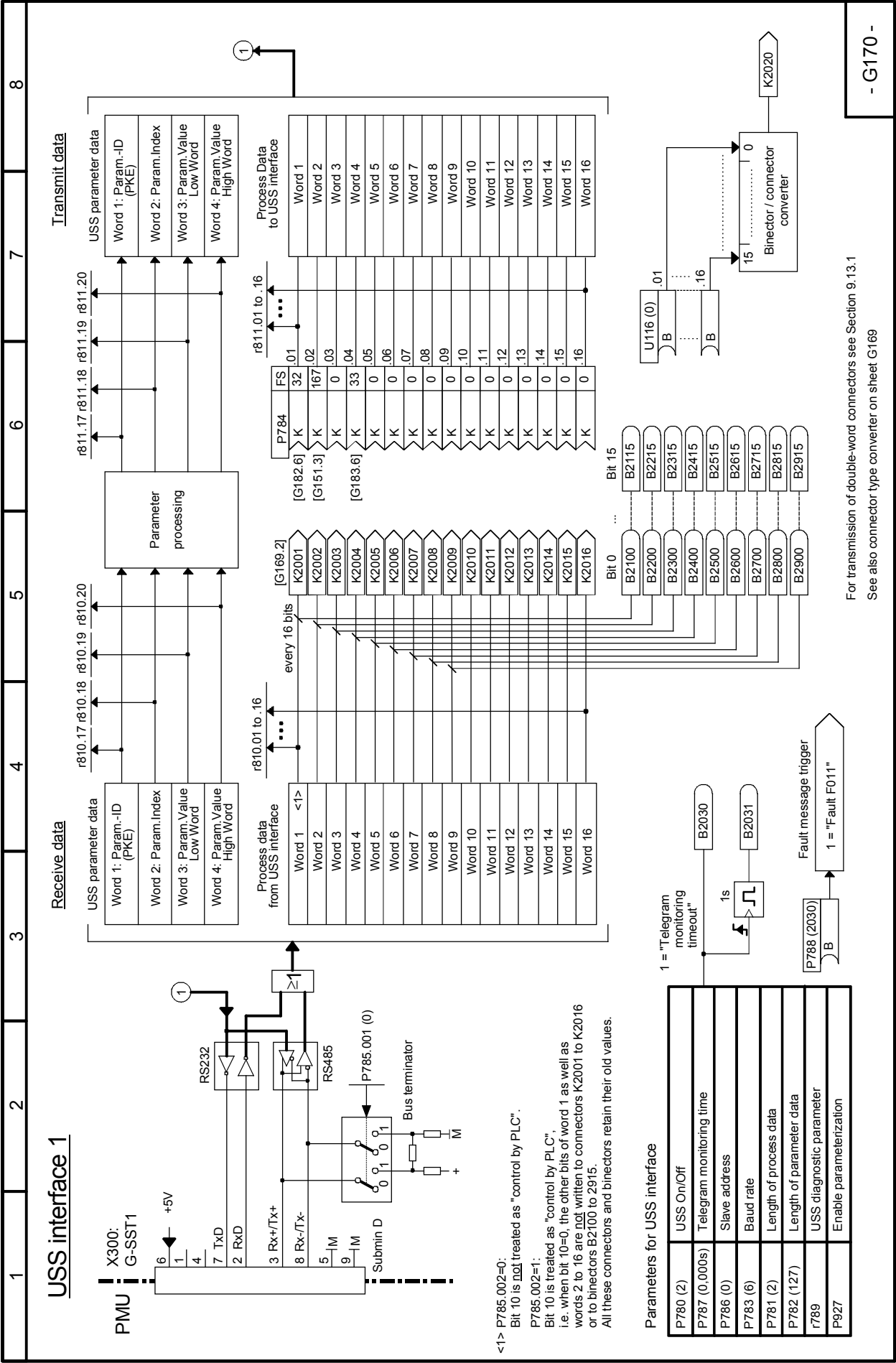




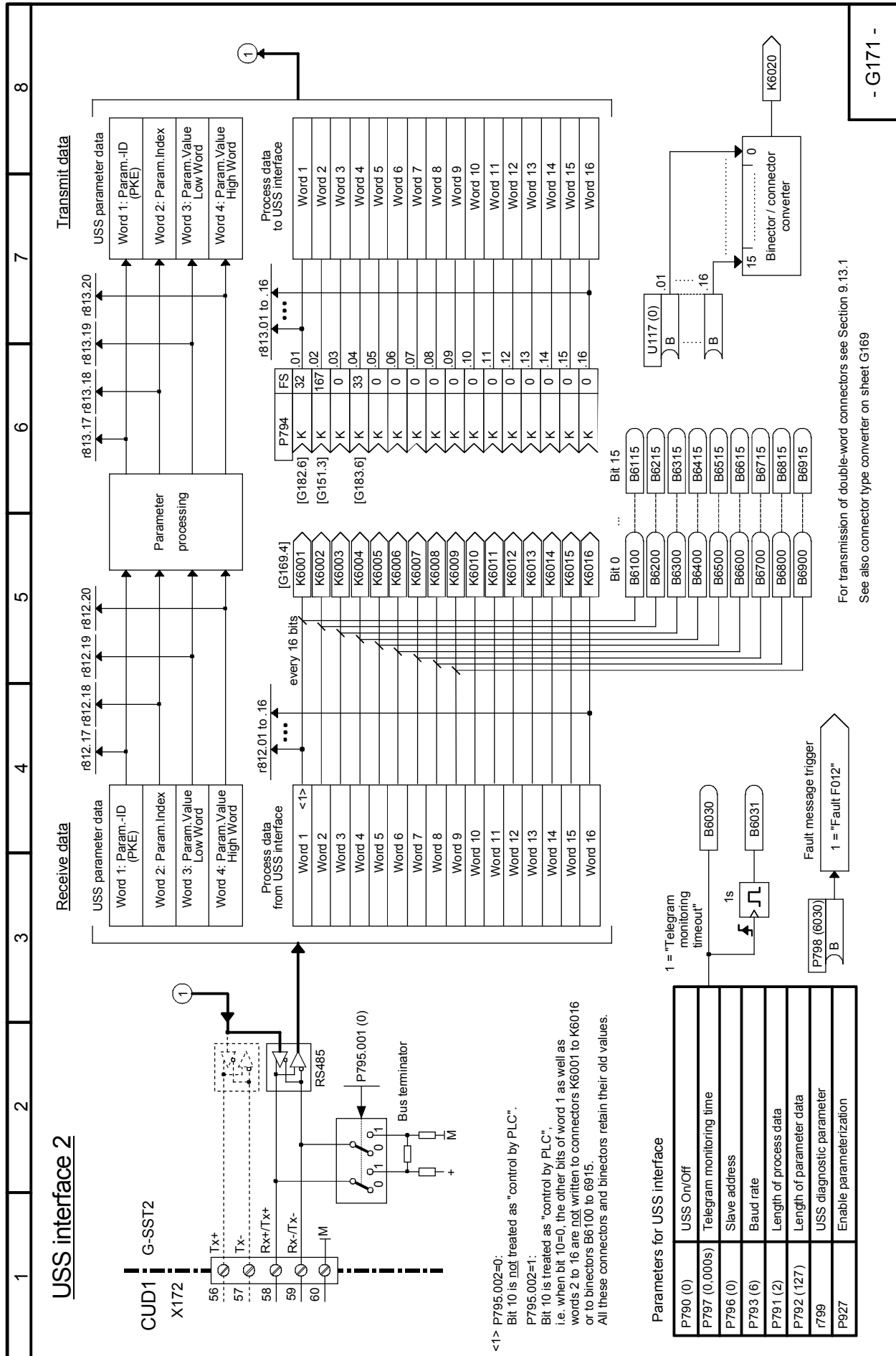
## Sheet G169 Serial interfaces: connector-type converters

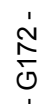




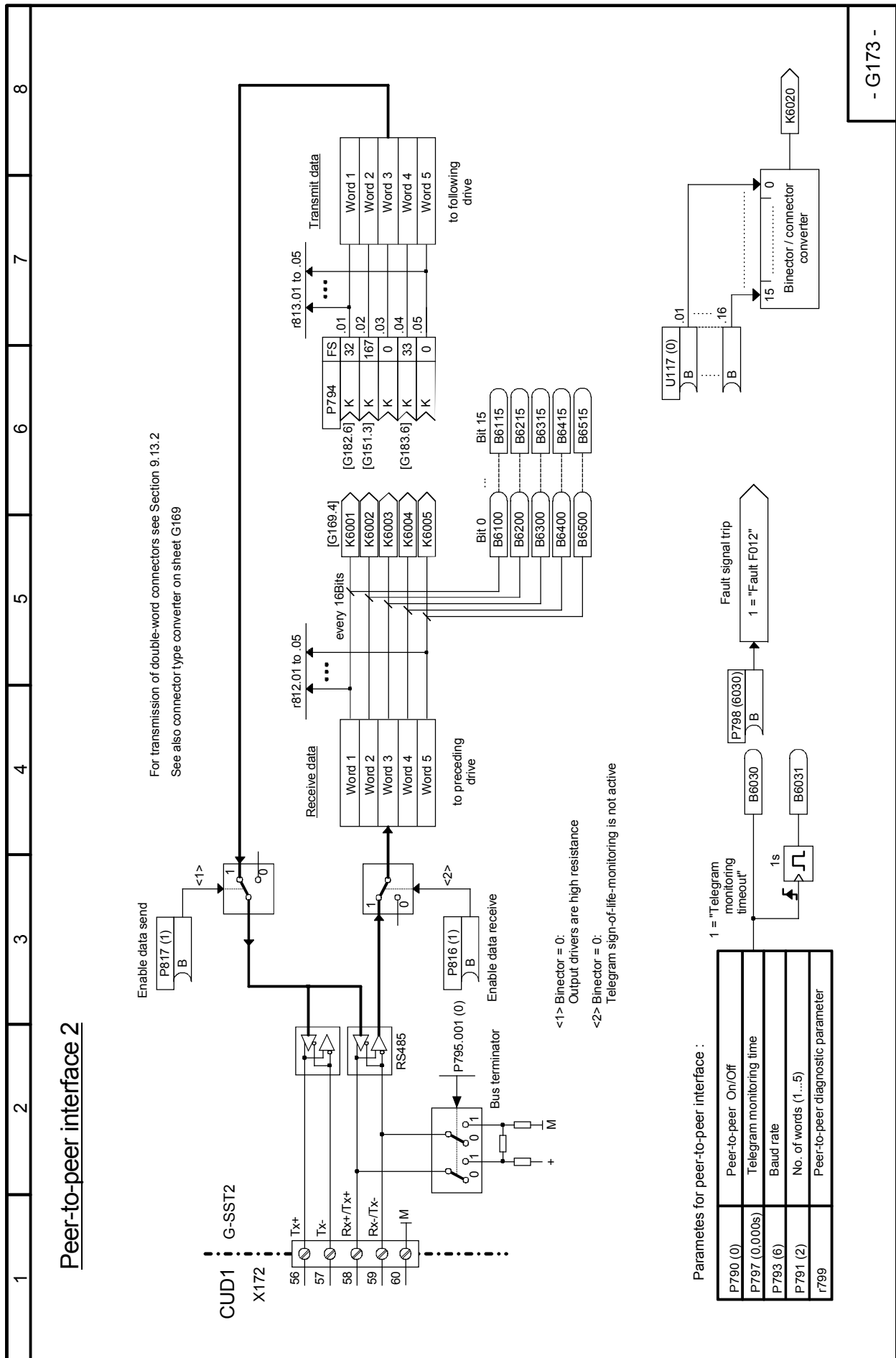


## Sheet G171 USS interface 2



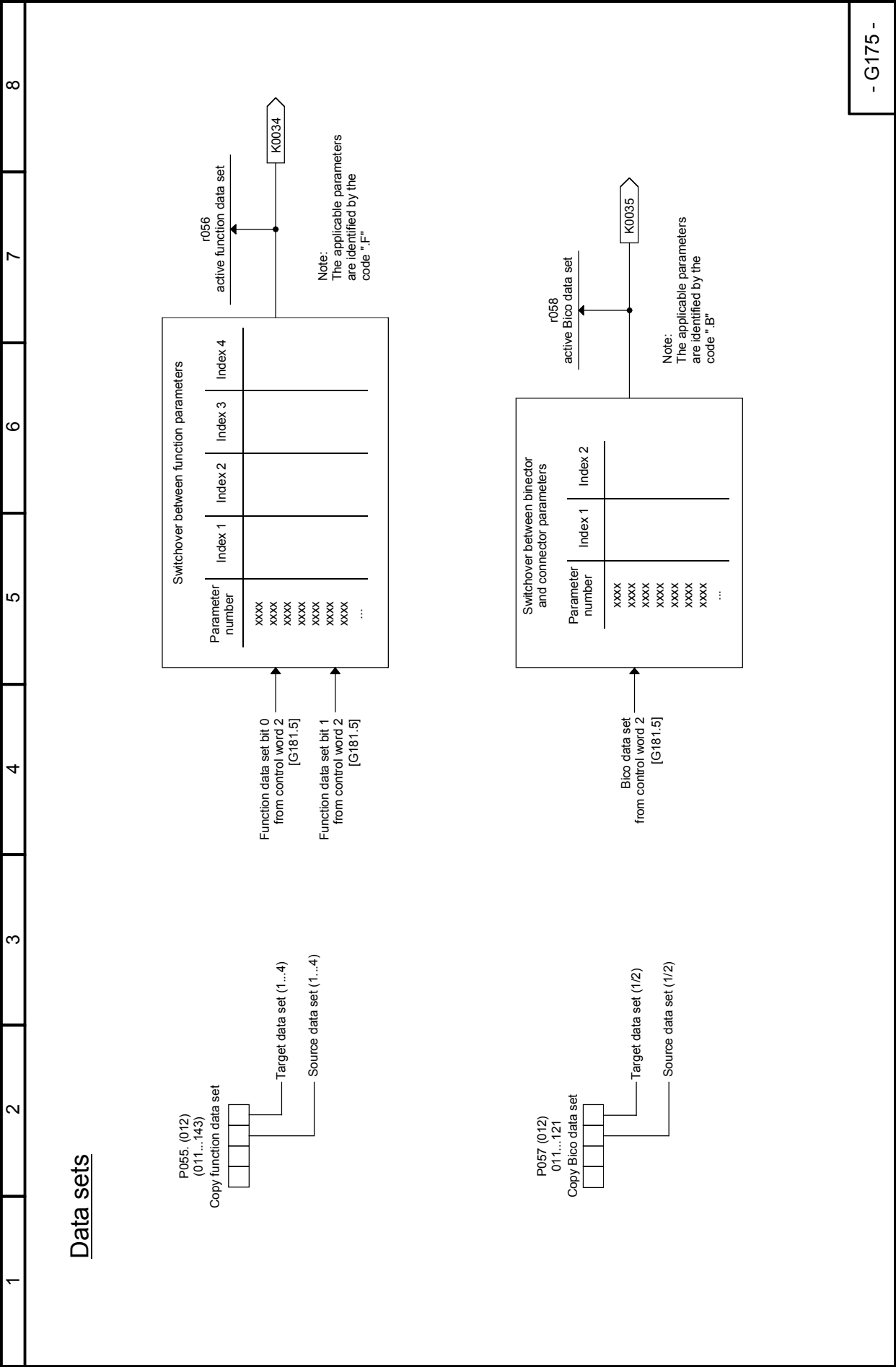
Transmit data

## Sheet G173 Peer-to-peer interface 2

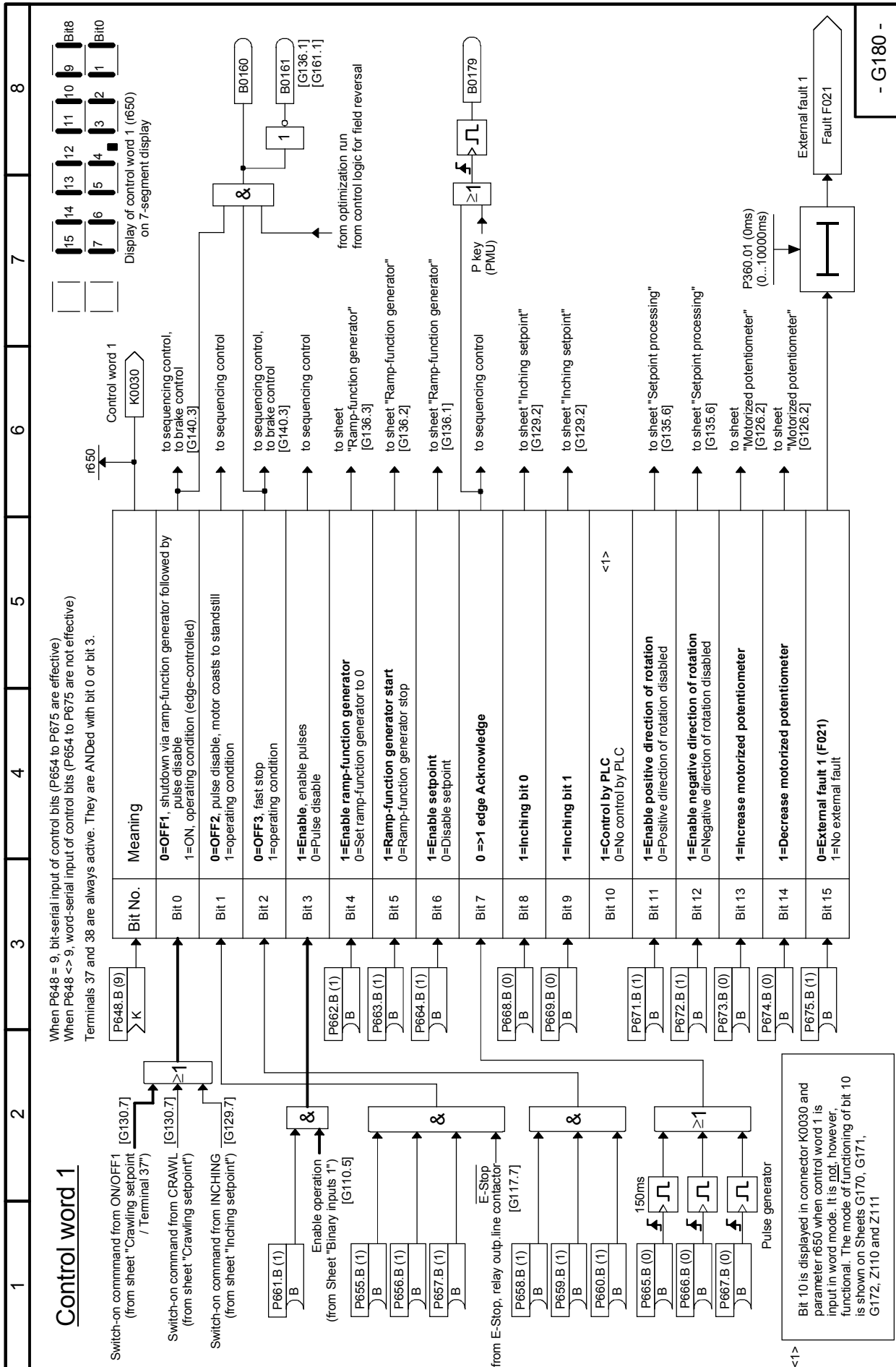


-G174-

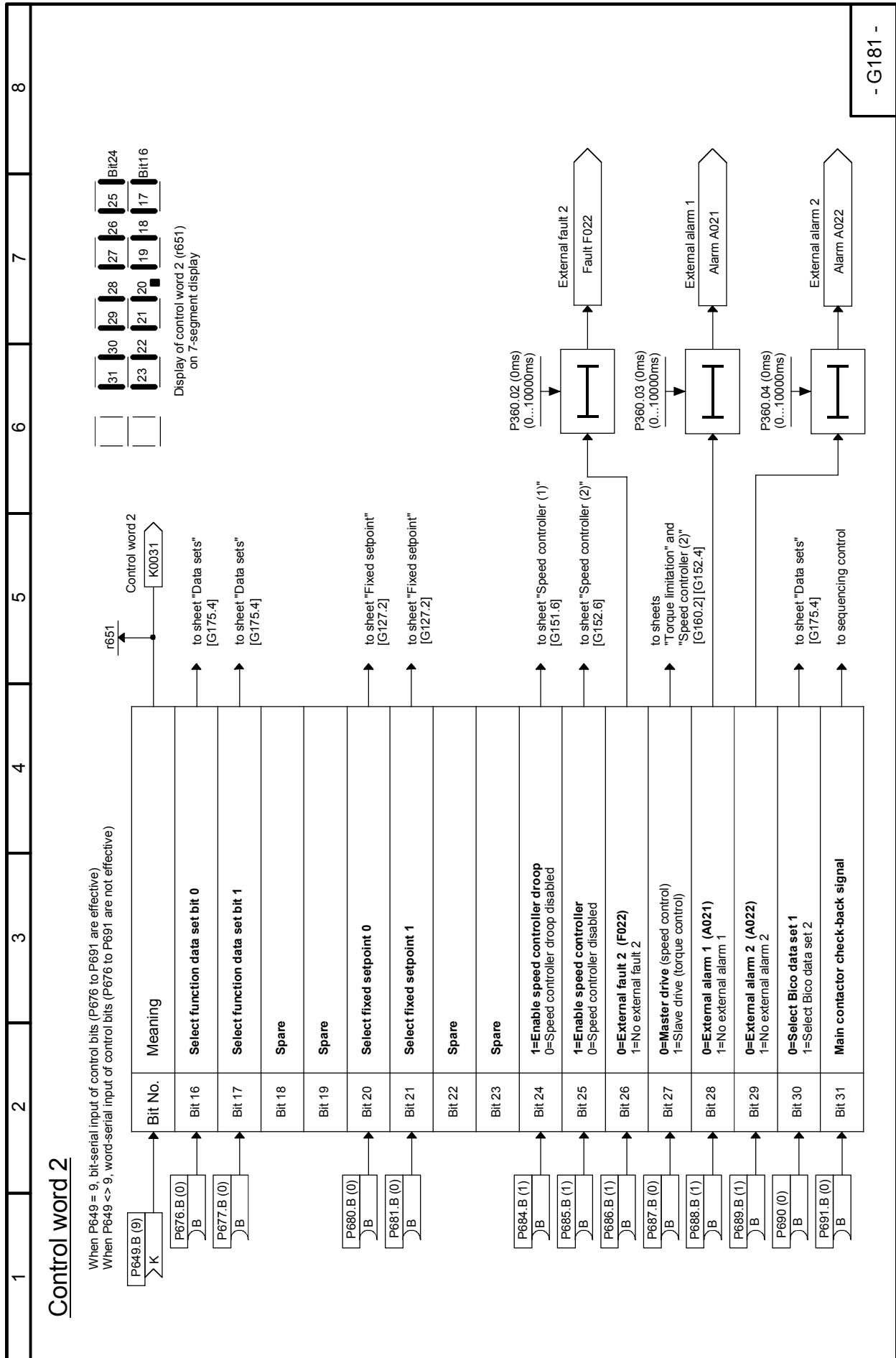




## Sheet G180 Control word 1

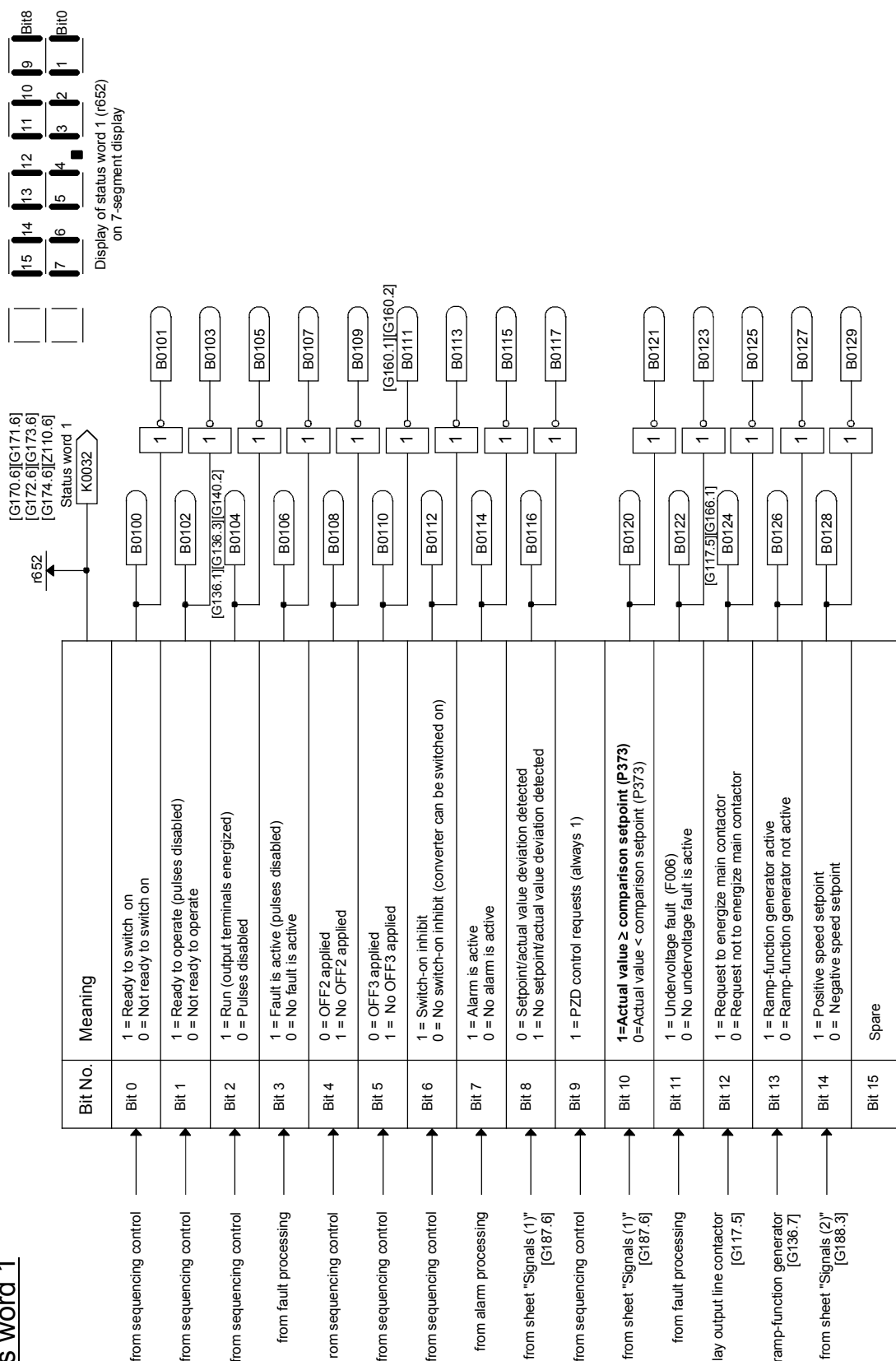


## Sheet G181 Control word 2





Status word 1



-G182-

[G170.6][G171.6]  
[G172.6][G173.6]  
[G174.6][Z110.6]

| Bit Nr. | Meaning                                                                                      |
|---------|----------------------------------------------------------------------------------------------|
| Bit 16  | Spare                                                                                        |
| Bit 17  | Spare                                                                                        |
| Bit 18  | 0 = Overspeed (A038 and F038)<br>1 = No overspeed                                            |
| Bit 19  | 1 = External fault 1 active (F021)<br>0 = No external fault 1 active                         |
| Bit 20  | 1 = External fault 2 active (F022)<br>0 = No external fault 2 active                         |
| Bit 21  | 1 = External alarm active (A021 or A022)<br>0 = No external alarm active                     |
| Bit 22  | 1 = Power section overload alarm active (A039)<br>0 = No overload alarm active               |
| Bit 23  | 1 = Power section overtemperature fault active (F067)<br>0 = No overtemperature fault active |
| Bit 24  | 1 = Power section overtemperature alarm active (A067)<br>0 = No overtemperature alarm active |
| Bit 25  | 1 = Motor overtemperature alarm active (A029)<br>0 = No motor overtemperature alarm active   |
| Bit 26  | 1 = Motor overtemperature fault active (F029)<br>0 = No motor overtemperature fault active   |
| Bit 27  | spare                                                                                        |
| Bit 28  | 1 = Motor locked fault active (F035)<br>0 = No motor locked fault active                     |
| Bit 29  | spare                                                                                        |
| Bit 30  | spare                                                                                        |
| Bit 31  | spare                                                                                        |

from sheet "Signals" [G188.7] → Bit 18

from sequencing control → Bit 19

from sequencing control → Bit 20

from sequencing control → Bit 21

from alarm processing → Bit 22

from fault processing → Bit 23

from alarm processing → Bit 24

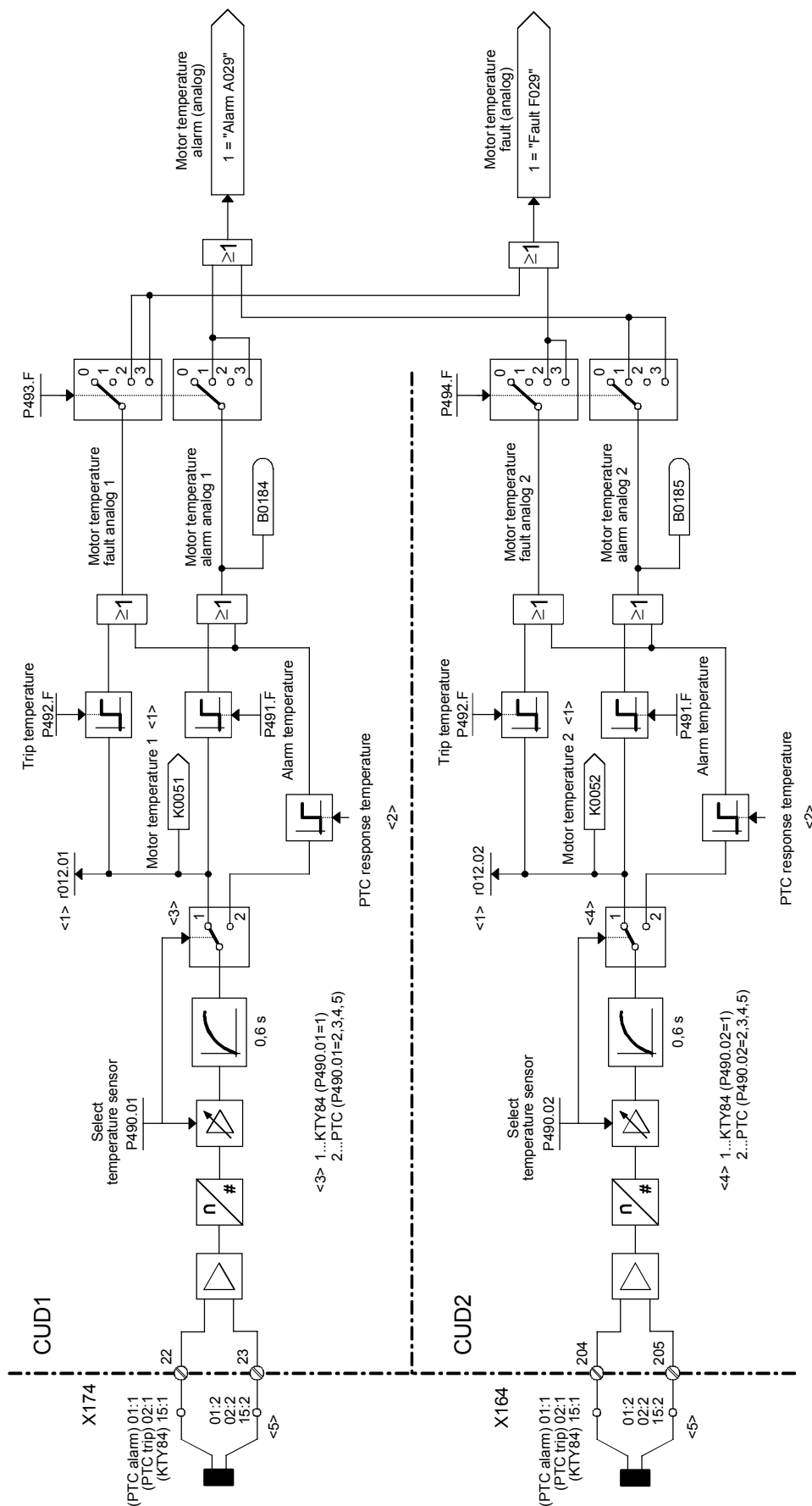
from alarm processing → Bit 25

from alarm processing → Bit 26

from fault processing → Bit 28

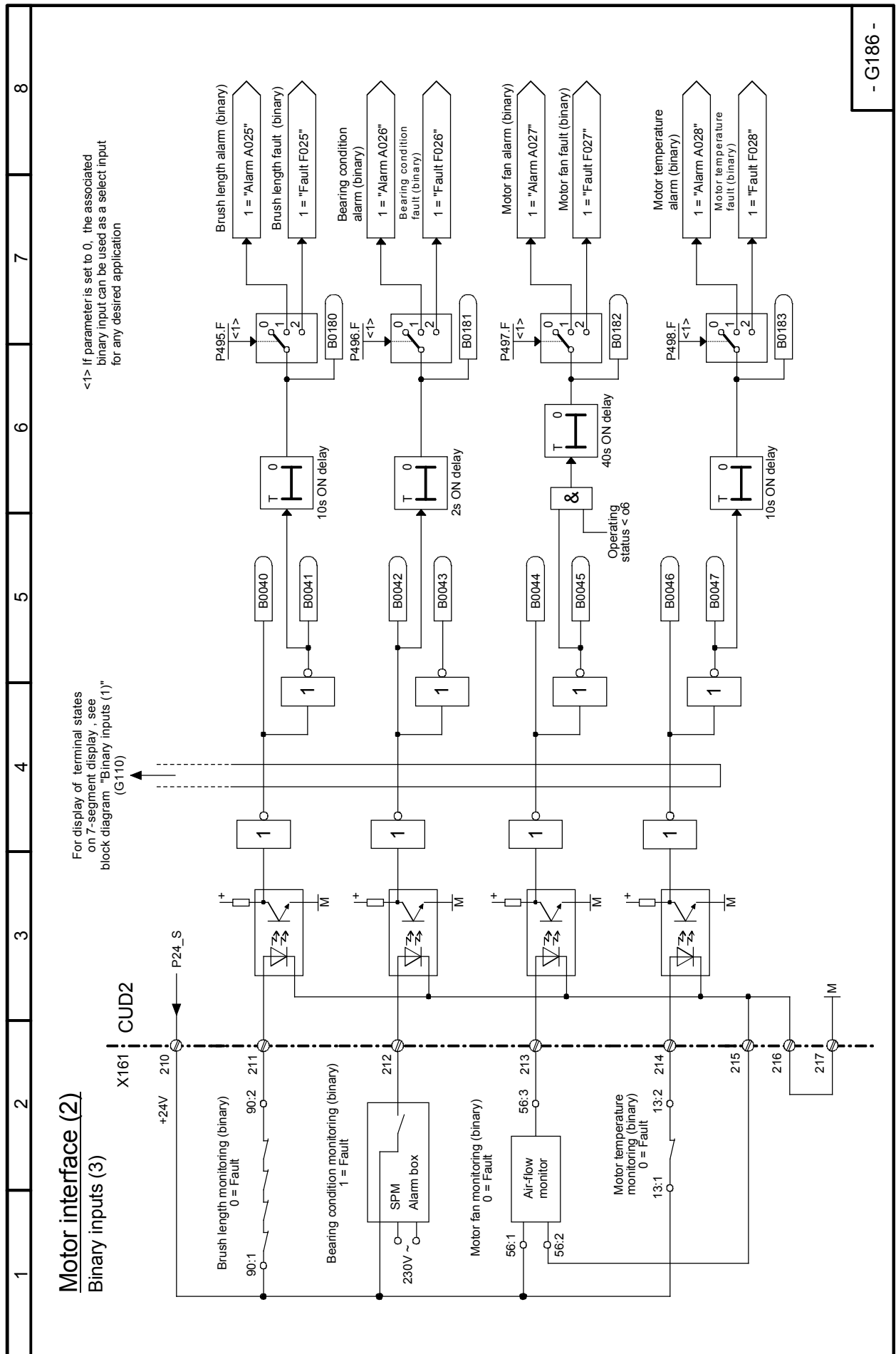
## Sheet G185 Motor interface (1)

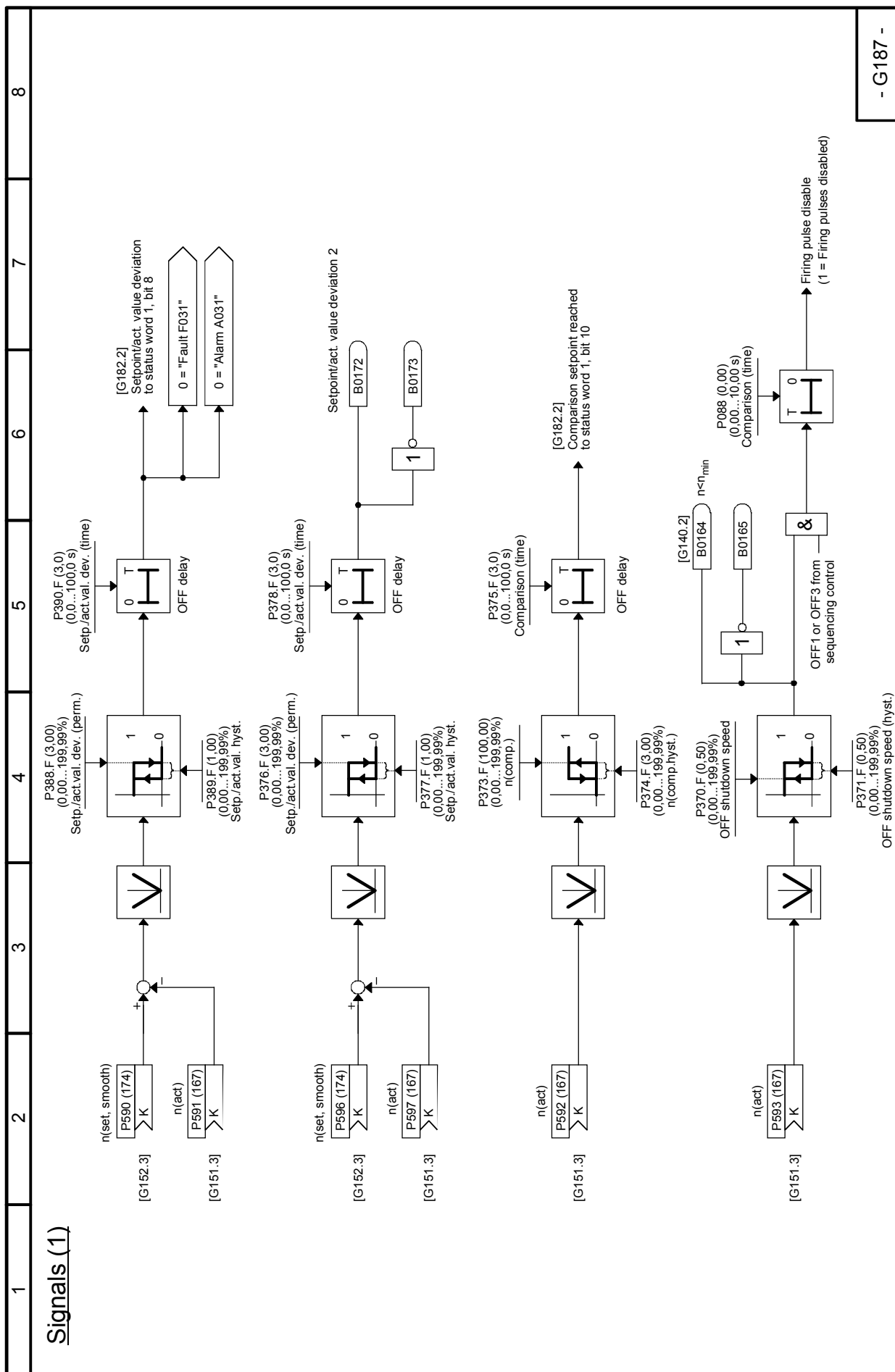
## Motor interface (1)



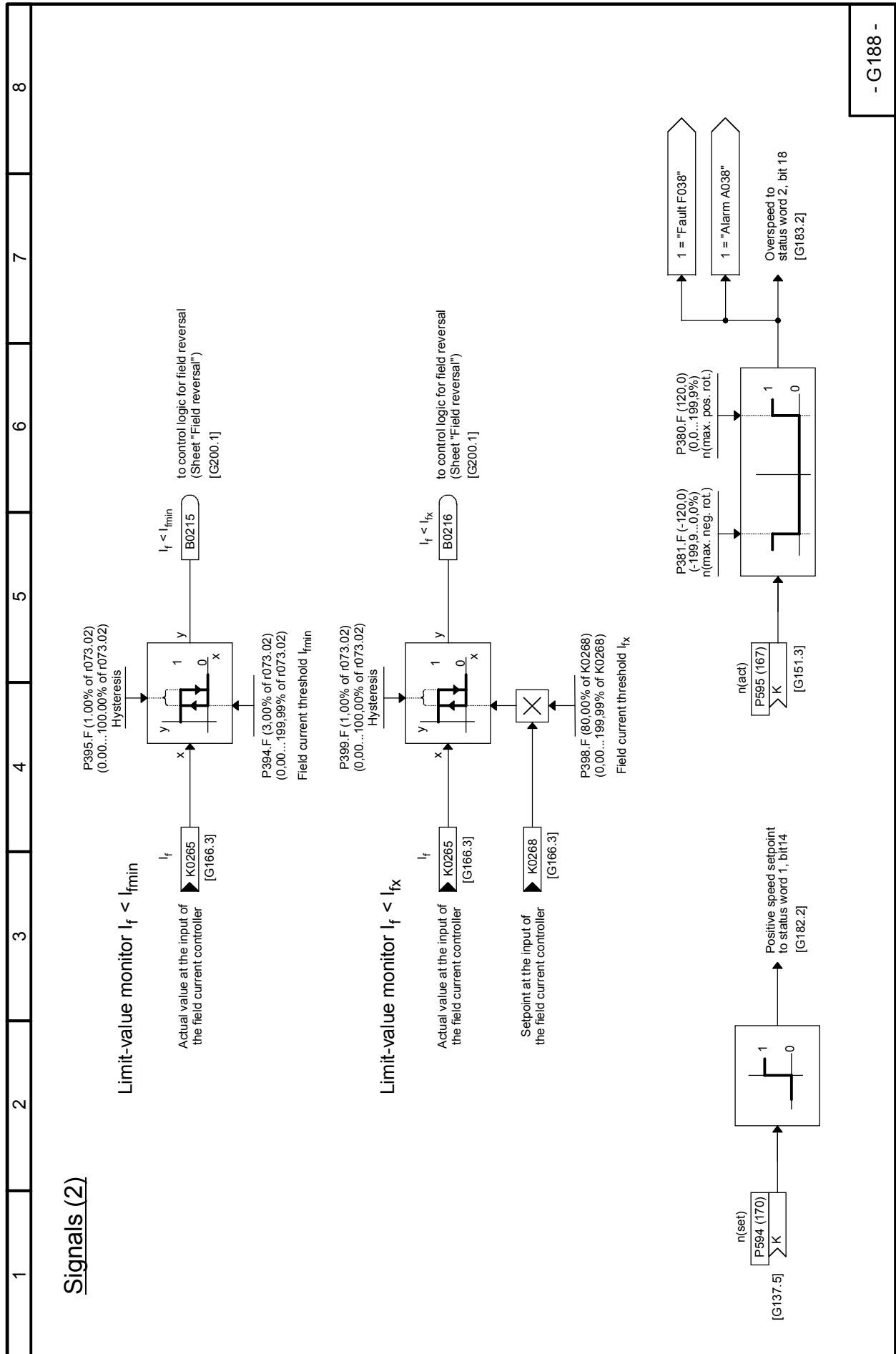
- G185 -

## Sheet G186 Motor interface (2) / binary inputs, terminals 211 to 214

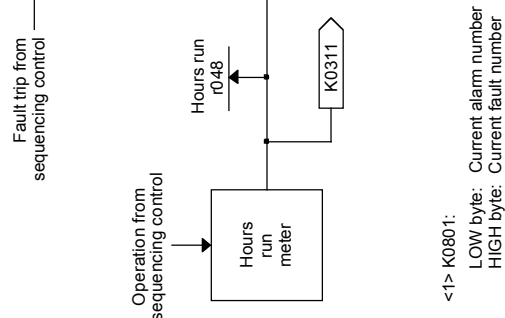




## Sheet G188 Messages (2)

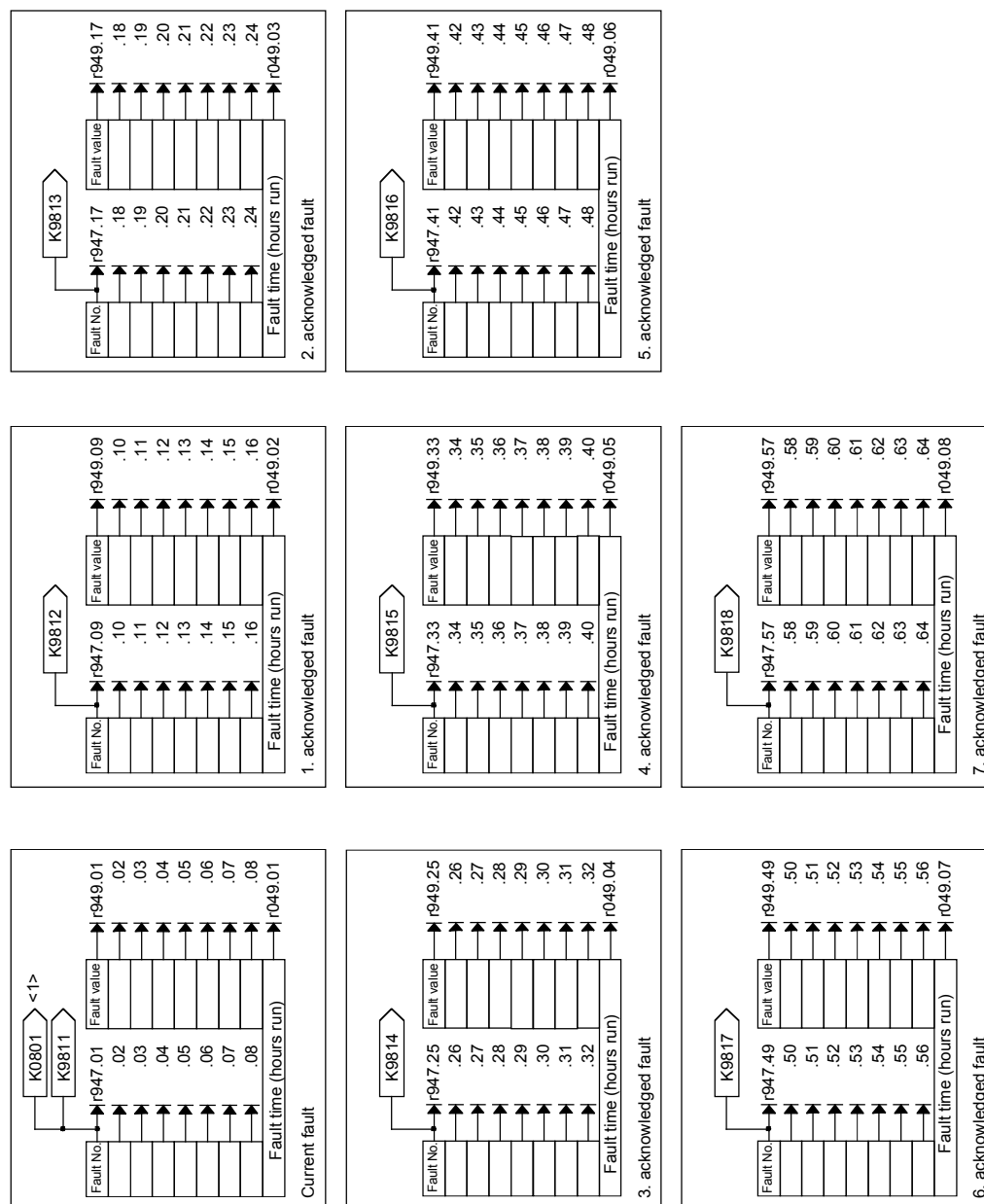


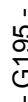
## Fault memory



<1> K0801:

LOW byte: Current alarm number  
HIGH byte: Current fault number

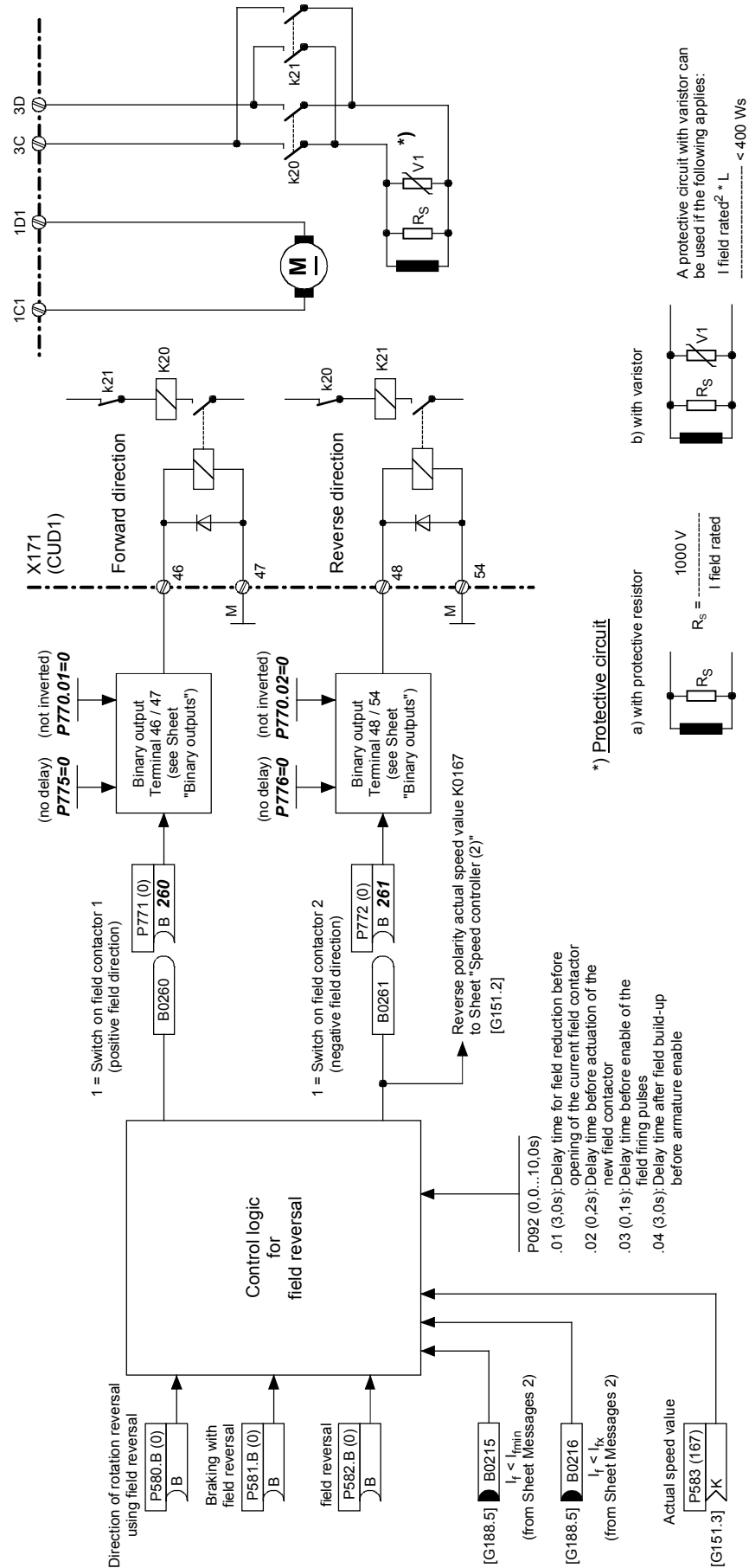






## Sheet G200 Field reversal with SIMOREG single-quadrant device

## Field reversal with SIMOREG single-quadrant converter



$R_s \leq 1.5 \text{ k}\Omega$   
V1 = B32k420 (SIOV, block varistor)

- G200 -

**Free function blocks Sheets B100 to B216**

Technology software in the basic converter, S00 option

**NOTE**

Freely assignable function blocks are enabled in parameter U977.  
For enabling instructions, please refer to Section 11, Parameter List, description of parameters U977 and n978.

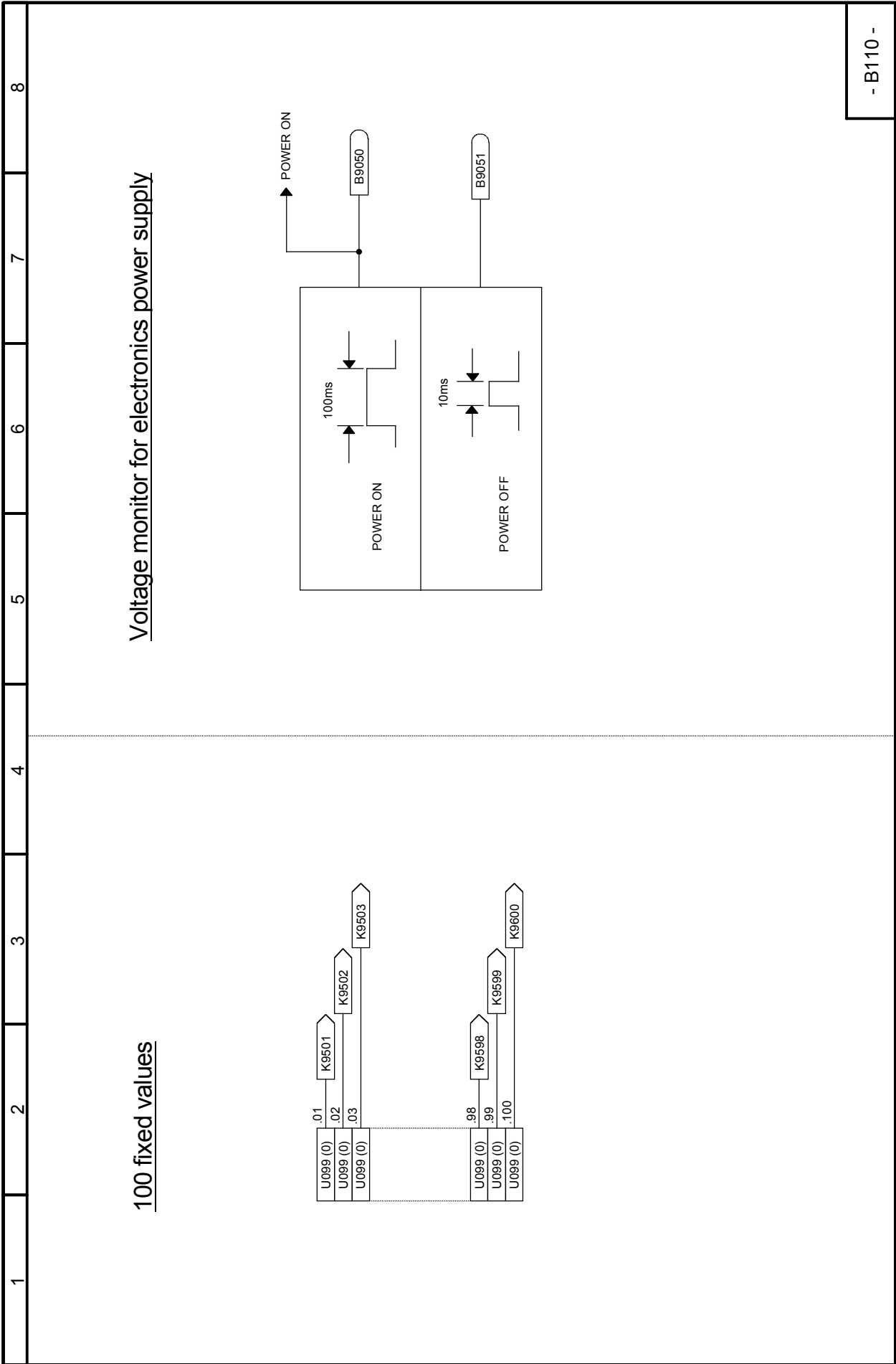
The setting for the sequence in which these function blocks are executed is made using parameters U960, U961, U962, and U963.

## Sheet B100 Table of contents

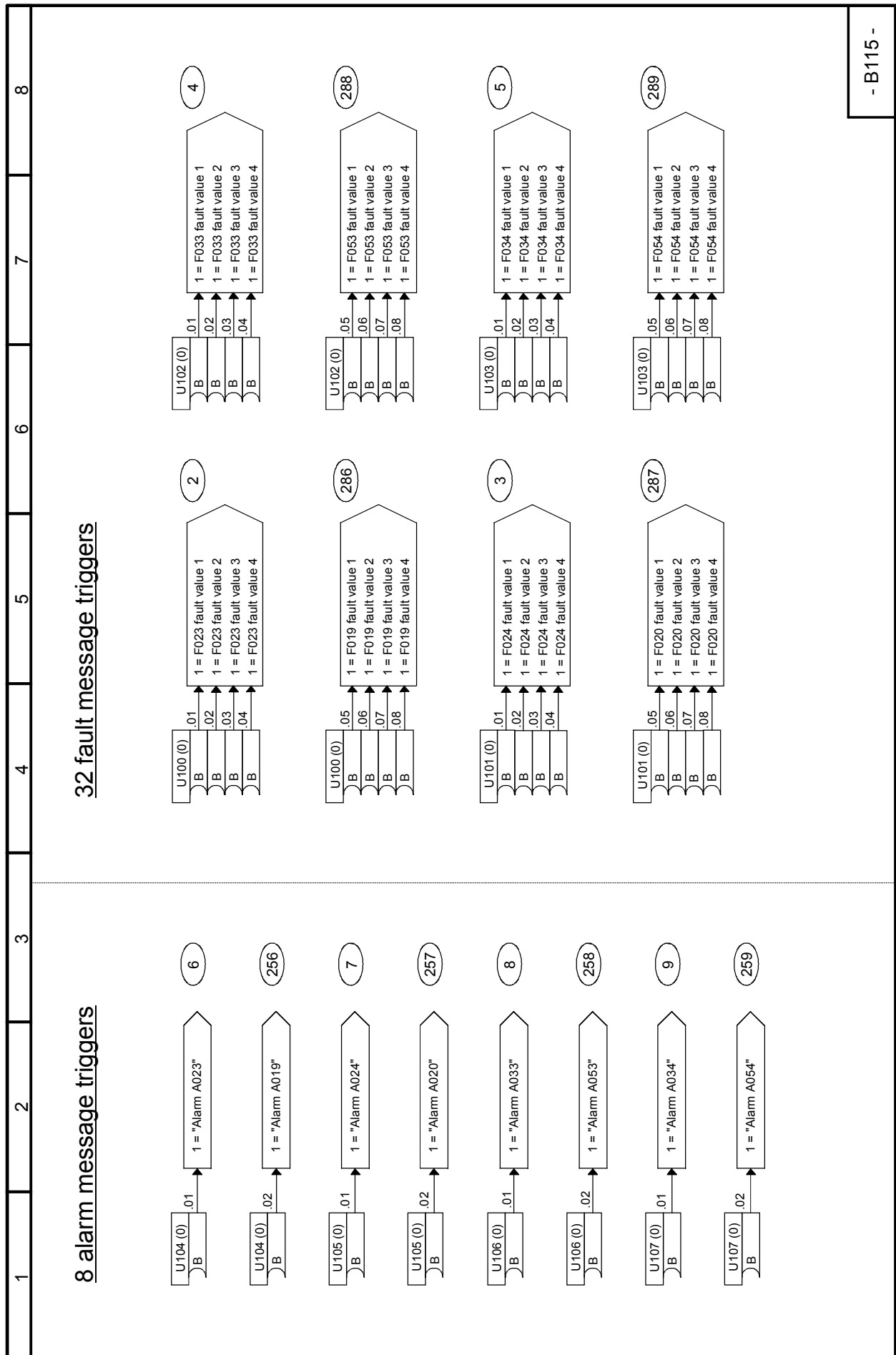
| 1                                                                                                       | 2 | 3     | 4 | 5                                                            | 6 | 7           | 8 |
|---------------------------------------------------------------------------------------------------------|---|-------|---|--------------------------------------------------------------|---|-------------|---|
| Function diagram SIMOREG 6RA70 - Contents of the technology software in the basic converter, option S00 |   |       |   |                                                              |   |             |   |
| Content                                                                                                 |   | Sheet |   | Content                                                      |   | Sheet       |   |
| Startup of the technology software (option S00)                                                         |   | B101  |   | 1 Position/positional deviation acquisition                  |   | B152        |   |
| <b>Fixed values</b>                                                                                     |   |       |   | 1 Root extractor                                             |   | B153        |   |
| 100 Fixed values                                                                                        |   | B110  |   | <b>Control elements</b>                                      |   |             |   |
| <b>Monitoring</b>                                                                                       |   |       |   | 3 Integrators                                                |   | B155        |   |
| 1 Voltage monitor for electronics power supply                                                          |   | B110  |   | 3 DT1 elements                                               |   | B155        |   |
| <b>Alarm, fault messages</b>                                                                            |   |       |   | 10 Derivative/delay elements (LEAD / LAG blocks)             |   | B156 - B158 |   |
| 8 Alarm message triggers                                                                                |   | B115  |   | <b>Characteristics</b>                                       |   |             |   |
| 32 Fault message triggers                                                                               |   | B115  |   | 9 Characteristic blocks                                      |   | B160        |   |
| <b>Connector/binector converter</b>                                                                     |   |       |   | 3 Dead zones                                                 |   | B161        |   |
| 3 Connector/binector converter                                                                          |   | B120  |   | 1 Setpoint branching                                         |   | B161        |   |
| 3 Binector/connector converter                                                                          |   | B121  |   | <b>Ramp function generator</b>                               |   |             |   |
| <b>Mathematical functions</b>                                                                           |   |       |   | 1 Simple ramp function generator                             |   | B165        |   |
| 15 Adders/subtractors                                                                                   |   | B125  |   | <b>Controllers</b>                                           |   |             |   |
| 4 Sign inverters                                                                                        |   | B125  |   | 1 Technology controller                                      |   | B170        |   |
| 2 Switchable sign inverters                                                                             |   | B125  |   | 10 PI controllers                                            |   | B180 - B189 |   |
| 12 Multipliers                                                                                          |   | B131  |   | <b>Velocity/speed controller, variable moment of inertia</b> |   |             |   |
| 6 Dividers                                                                                              |   | B131  |   | 1 Velocity/speed calculator                                  |   | B190        |   |
| 3 High-resolution multipliers/dividers                                                                  |   | B131  |   | 1 Speed/velocity calculator                                  |   | B190        |   |
| 4 Absolute-value generator with filtering                                                               |   | B135  |   | 1 Calculation of variable inertia                            |   | B191        |   |
| <b>Limiters, limit-value monitors</b>                                                                   |   |       |   | <b>Multiplexer for connectors</b>                            |   |             |   |
| 3 Limiters                                                                                              |   | B134  |   | 3 Multiplexers                                               |   | B195        |   |
| 3 Limiters                                                                                              |   | B135  |   | <b>Counter</b>                                               |   |             |   |
| 3 Limit-value monitors with filtering                                                                   |   | B136  |   | 1 16-bit software counter                                    |   | B196        |   |
| 4 Limit-value monitors without filtering                                                                |   | B137  |   | <b>Logic functions</b>                                       |   |             |   |
| 3 Limit-value monitors without filtering                                                                |   | B138  |   | 2 Decoders/demultiplexers binary to 1 from 8                 |   | B200        |   |
| <b>Processing of connectors</b>                                                                         |   |       |   | 28 AND elements with 3 inputs each                           |   | B205        |   |
| 4 Averagers                                                                                             |   | B139  |   | 20 OR elements with 3 inputs each                            |   | B206        |   |
| 4 Maximum selections                                                                                    |   | B140  |   | 4 EXCLUSIVE OR elements with 2 inputs each                   |   | B206        |   |
| 4 Minimum selections                                                                                    |   | B145  |   | 16 Inverters                                                 |   | B207        |   |
| 2 Tracking/storage elements                                                                             |   | B145  |   | 12 NAND elements with 3 inputs each                          |   | B207        |   |
| 2 Connector memories                                                                                    |   | B150  |   | 14 RS flipflop                                               |   | B210        |   |
| 15 Connector changeover switches                                                                        |   |       |   | 4 D flipflop                                                 |   | B211        |   |
| <b>High-resolution blocks</b>                                                                           |   |       |   | 10 Timers                                                    |   | B215, B216  |   |
| 2 limit-value monitors (for double connectors)                                                          |   | B151  |   | 5 Binary signal selector switches                            |   | B216        |   |
| 2 connector-type converters                                                                             |   | B151  |   |                                                              |   |             |   |
| 2 adders/subtractors (for double connectors)                                                            |   | B151  |   |                                                              |   |             |   |
|                                                                                                         |   |       |   |                                                              |   | - B100 -    |   |

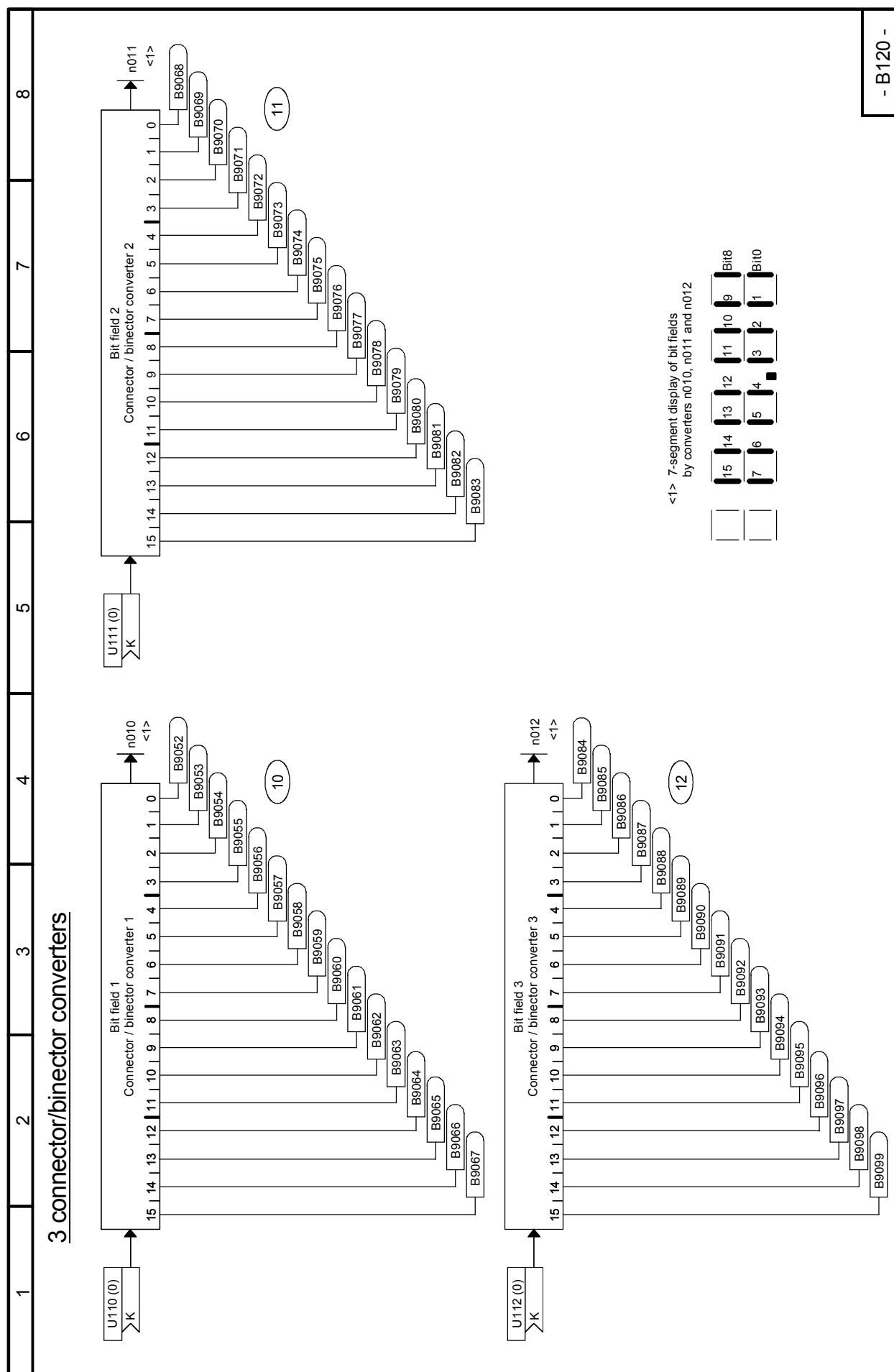
# Sheet B101 Startup of the technology software (option S00)

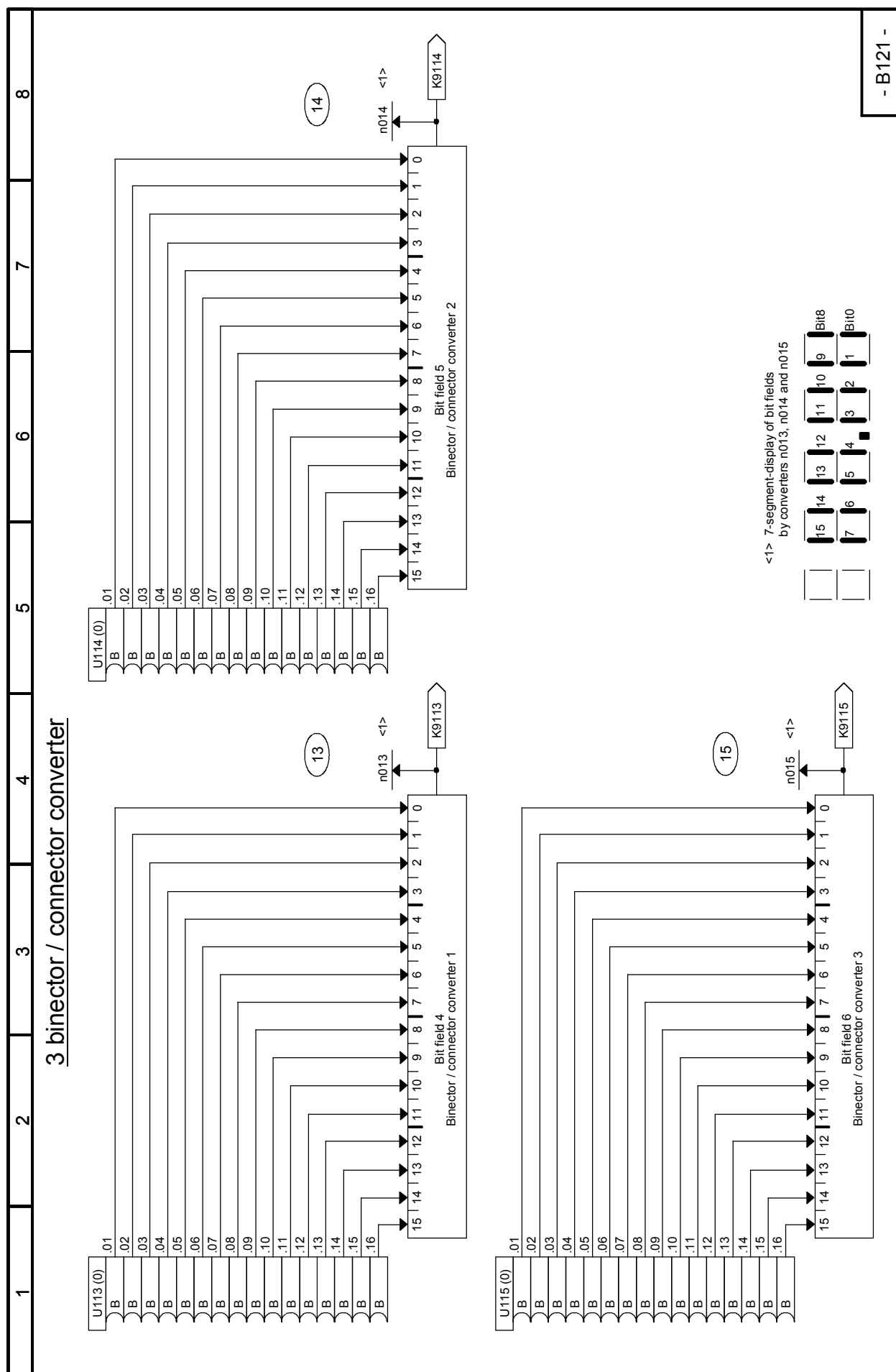
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          |                                           |          |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------|---|--------------------------------------------------------------------------|-------------------------------------------|----------|----------|
| 1                                                                                                                                                                                                                                                                                                                                                                                     | 2                                            | 3             | 4 | 5                                                                        | 6                                         | 7        | 8        |
| Startup of the technology software in the basic converter (option S00)                                                                                                                                                                                                                                                                                                                |                                              |               |   |                                                                          |                                           |          |          |
| 1. Enabling                                                                                                                                                                                                                                                                                                                                                                           |                                              |               |   |                                                                          |                                           |          |          |
| Permanent enabling<br>U977 = PIN number<br>n978 = 2000                                                                                                                                                                                                                                                                                                                                |                                              |               |   | Temporary enabling<br>U977 = 1500<br>n978 = 1xxx (xxx = hours remaining) |                                           |          |          |
| 2. Setting and activating the sampling times                                                                                                                                                                                                                                                                                                                                          |                                              |               |   |                                                                          |                                           |          |          |
| For each function block, it is necessary to define in which "time slice" (i.e. with which sampling time) it is processed.<br>(Note: In the factory setting of the parameters, all existing function blocks are activated)                                                                                                                                                             |                                              |               |   |                                                                          |                                           |          |          |
| 5 time slices are available:                                                                                                                                                                                                                                                                                                                                                          |                                              |               |   |                                                                          |                                           |          |          |
| Time slice                                                                                                                                                                                                                                                                                                                                                                            |                                              | Sampling time |   |                                                                          | Function block No. Setting with parameter |          |          |
| 1                                                                                                                                                                                                                                                                                                                                                                                     | 1 * T0 (firing-pulse-synchronous time slice) | <1>           |   |                                                                          | 1                                         | U950.01  |          |
| 2                                                                                                                                                                                                                                                                                                                                                                                     | 2 * T0 (firing-pulse-synchronous time slice) | <1>           |   |                                                                          | 2                                         | U950.02  |          |
| 4                                                                                                                                                                                                                                                                                                                                                                                     | 4 * T0 (firing-pulse-synchronous time slice) | <1>           |   |                                                                          | .                                         | .        |          |
| 10                                                                                                                                                                                                                                                                                                                                                                                    | 20 ms (not firing-pulse-synchronous)         | <2>           |   |                                                                          | 99                                        | U950.99  |          |
| 20                                                                                                                                                                                                                                                                                                                                                                                    | Block is not calculated                      | <2>           |   |                                                                          | 100                                       | U950.100 |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          | 101                                       | U951.01  |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          | 102                                       | U951.02  |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          | .                                         | .        |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          | 199                                       | U951.99  |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          | 200                                       | U951.100 |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          | 201                                       | U952.01  |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          | 202                                       | U952.02  |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          | .                                         | .        |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          | 299                                       | U952.99  |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          | 300                                       | U952.100 |          |
| <1> T0 = Mean distance between 2 firing pulses<br>T0 = 3.33 ms at 50 Hz line frequency<br>T0 = 2.78 ms at 60 Hz line frequency                                                                                                                                                                                                                                                        |                                              |               |   |                                                                          |                                           |          |          |
| <2> All function blocks for which a time slice <20 is set are activated                                                                                                                                                                                                                                                                                                               |                                              |               |   |                                                                          |                                           |          |          |
| (287) = function block number                                                                                                                                                                                                                                                                                                                                                         |                                              |               |   |                                                                          |                                           |          |          |
| The sampling times must be chosen in such a way that the maximum processor load (n009.02) is indicated on average as <90%.                                                                                                                                                                                                                                                            |                                              |               |   |                                                                          |                                           |          |          |
| 3. Execution sequence                                                                                                                                                                                                                                                                                                                                                                 |                                              |               |   |                                                                          |                                           |          |          |
| The execution sequence of the function blocks can be defined with parameters U960, U961, and U962.                                                                                                                                                                                                                                                                                    |                                              |               |   |                                                                          |                                           |          |          |
| The execution sequence of the function blocks and their activation can also be made automatic:                                                                                                                                                                                                                                                                                        |                                              |               |   |                                                                          |                                           |          |          |
| U969 = 1: Restore standard sequence<br>U960, U961, and U962 are set to the factory setting                                                                                                                                                                                                                                                                                            |                                              |               |   |                                                                          |                                           |          |          |
| = 2: Set optimum sequence<br>U960, U961, and U962 are set in such a way that as few deadtimes as possible occur                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          |                                           |          |          |
| = 3: Set standard setting of the sampling times. U950, U951, and U952 are set to the factory setting!                                                                                                                                                                                                                                                                                 |                                              |               |   |                                                                          |                                           |          |          |
| = 4: Automatic activation/deactivation<br>U950, U951, and U952 are set in such a way that the unwired function blocks are deselected and the wired function blocks are selected (activated), if they are not yet selected<br>The time slice 10 (sampling time 20 ms) is set for all function blocks not previously activated, unchanged for all previously activated function blocks. |                                              |               |   |                                                                          |                                           |          |          |
| 4. Automatic setting                                                                                                                                                                                                                                                                                                                                                                  |                                              |               |   |                                                                          |                                           |          |          |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                              |               |   |                                                                          |                                           |          | - B101 - |



## Sheet B115 Fault message triggers, alarm message triggers

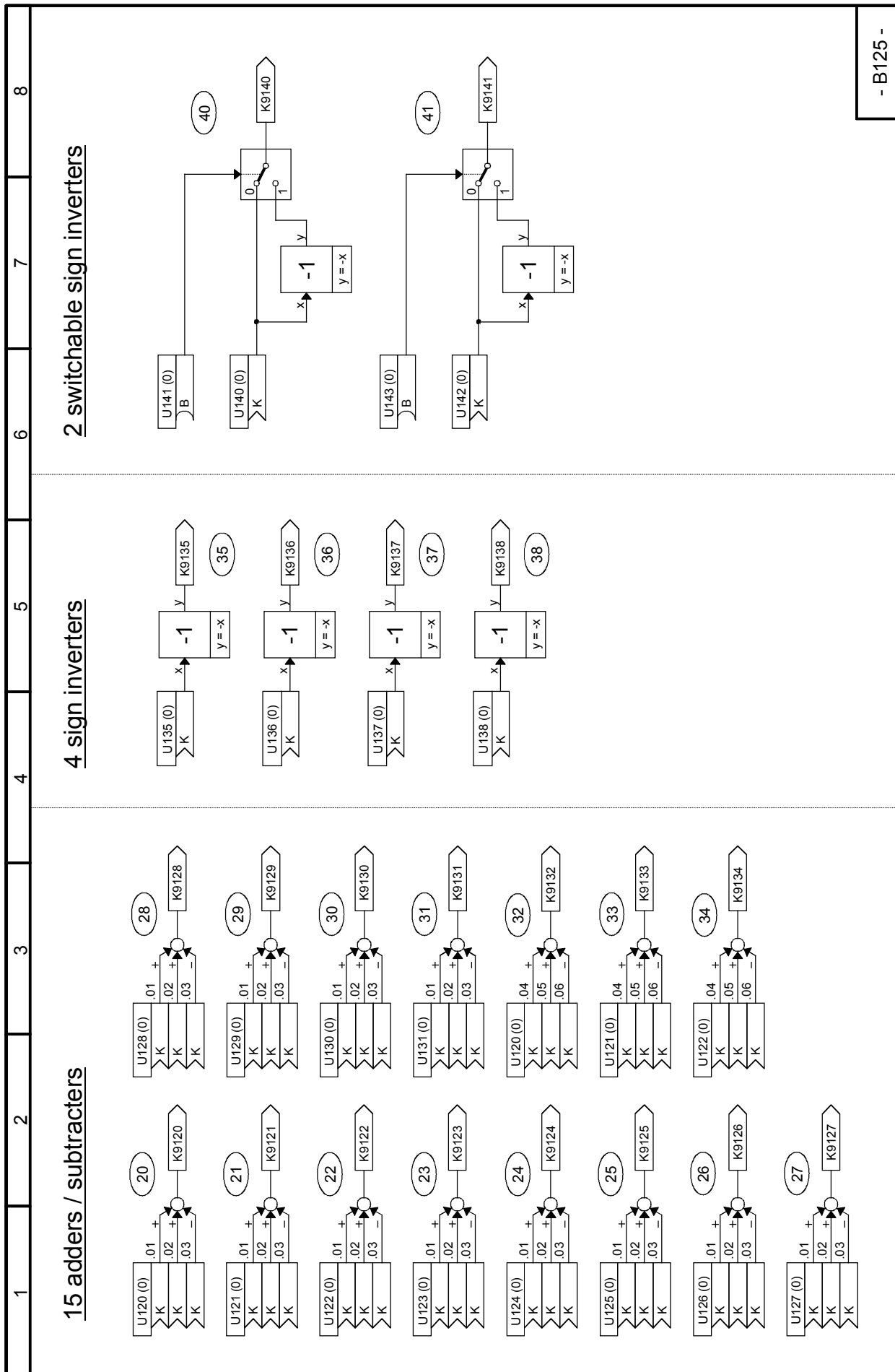




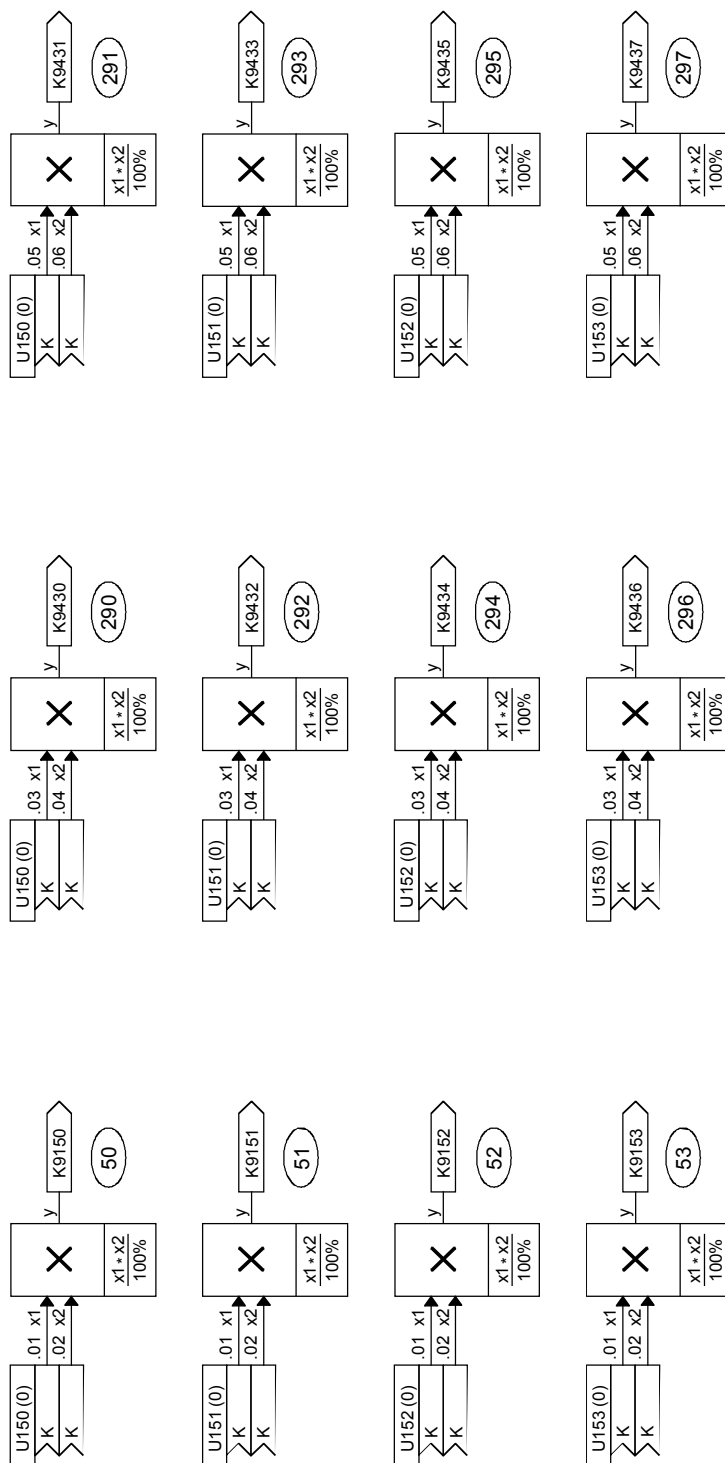




## Sheet B125 Adders / subtractors, sign inverters



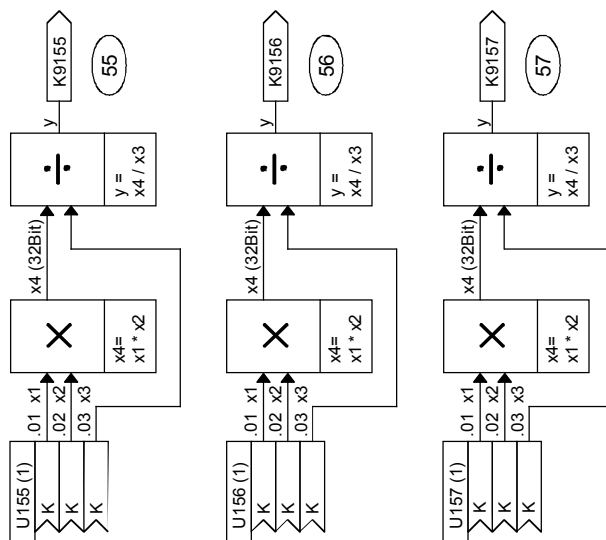
88



## Sheet B131 Dividers, High-resolution multipliers / dividers

- B131 -

## 3 high-resolution multipliers / dividers

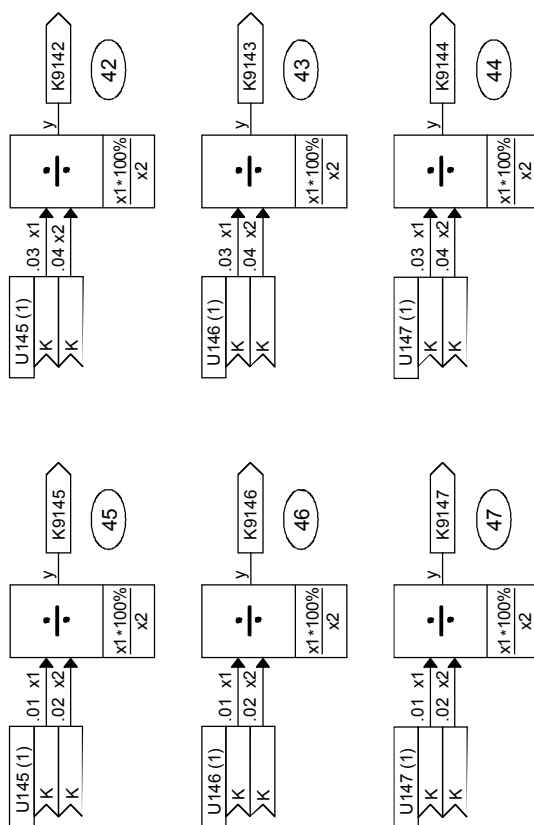


## Examples:

| x1    | x2    | x3    | y     |
|-------|-------|-------|-------|
| 100%  | 100%  | 100%  | 100%  |
| 100%  | 40%   | 50%   | 80%   |
| -200% | -200% | -200% | -200% |

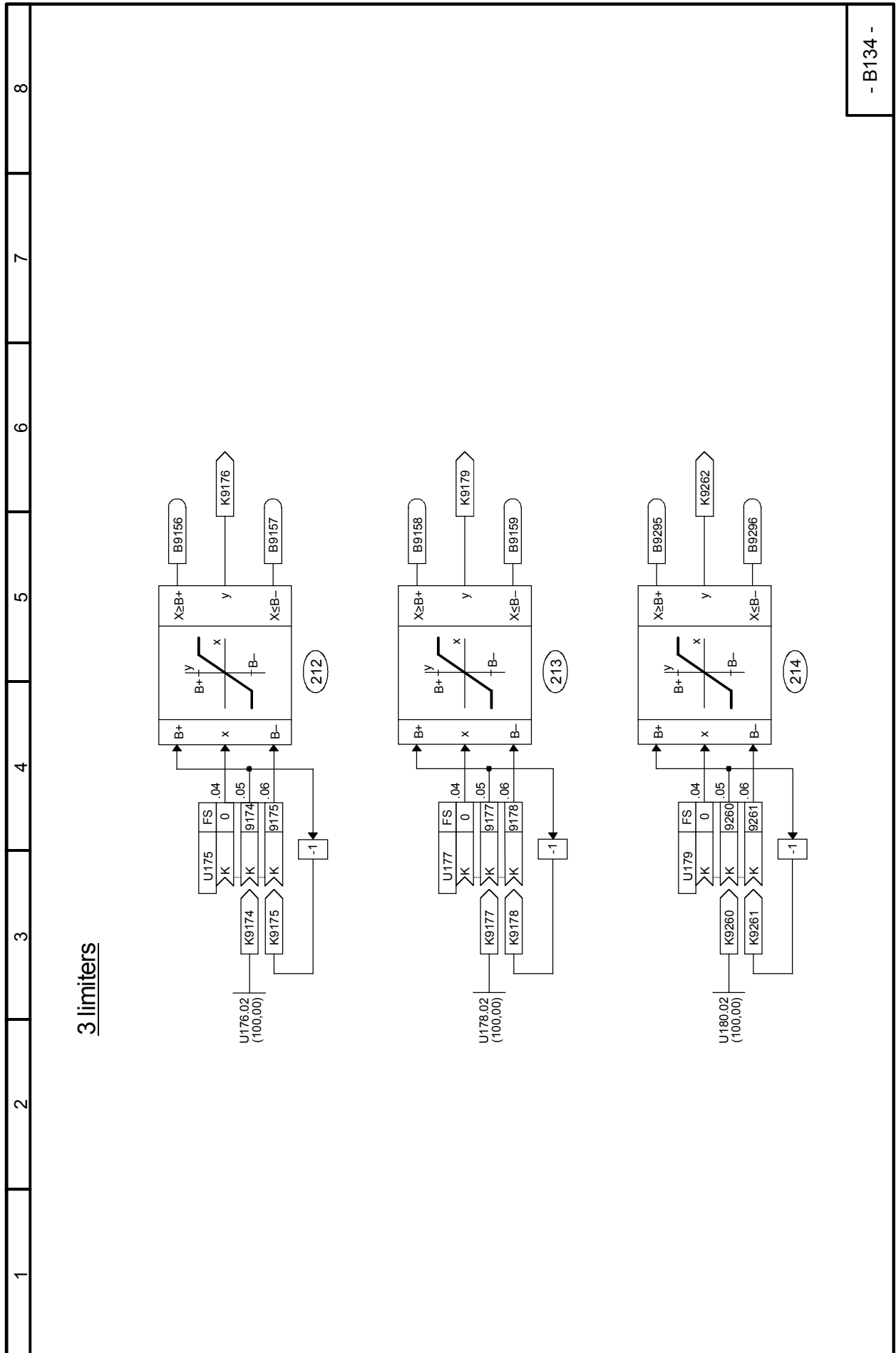
With division by 0 ( $x3 = 0$ ):  
 when  $x4 > 0$ :  $y = +199.99\%$   
 when  $x4 = 0$ :  $y = 0.00\%$   
 when  $x4 < 0$ :  $y = -199.99\%$

## 6 dividers



With division by 0 ( $x2 = 0$ ):  
 when  $x1 > 0$ :  $y = +199.99\%$   
 when  $x1 = 0$ :  $y = 0.00\%$   
 when  $x1 < 0$ :  $y = -199.99\%$

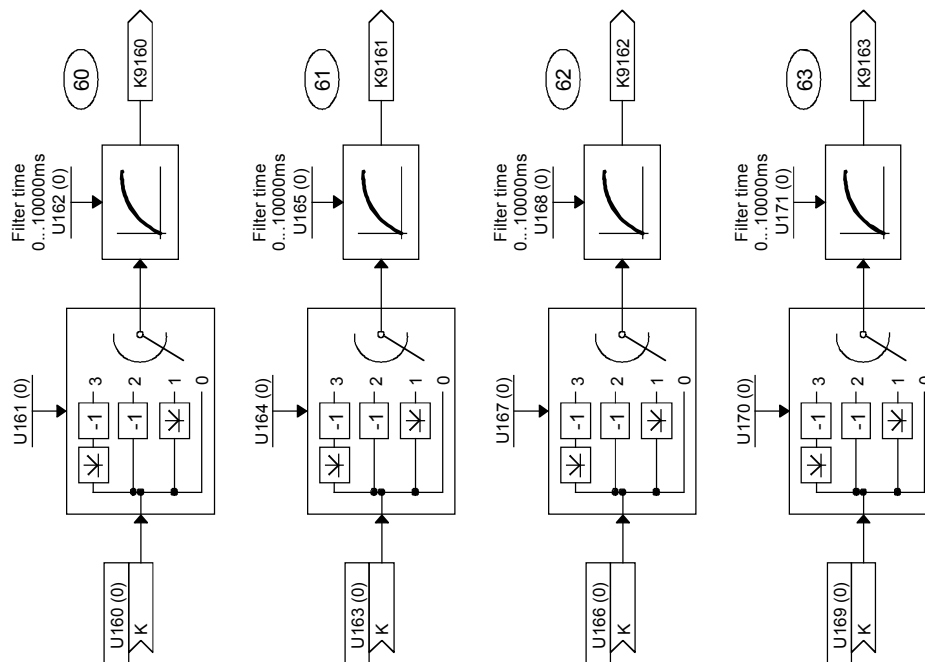
## Sheet B134 Limiters



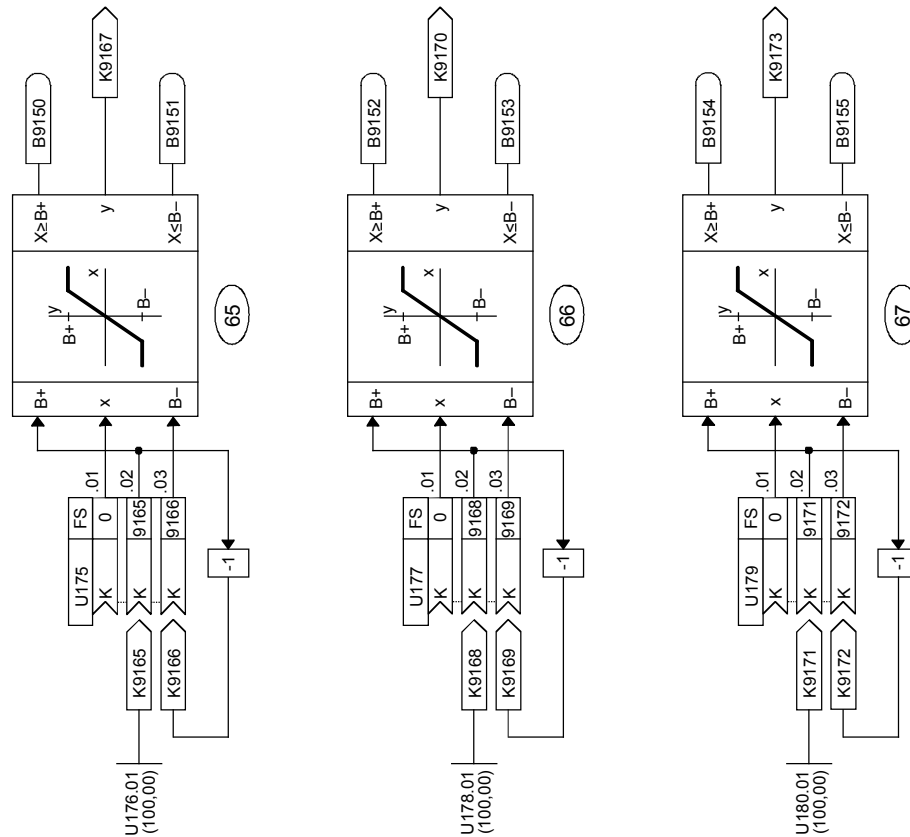
## Sheet B135 Absolute-value generators with filter, limiters

- B135 -

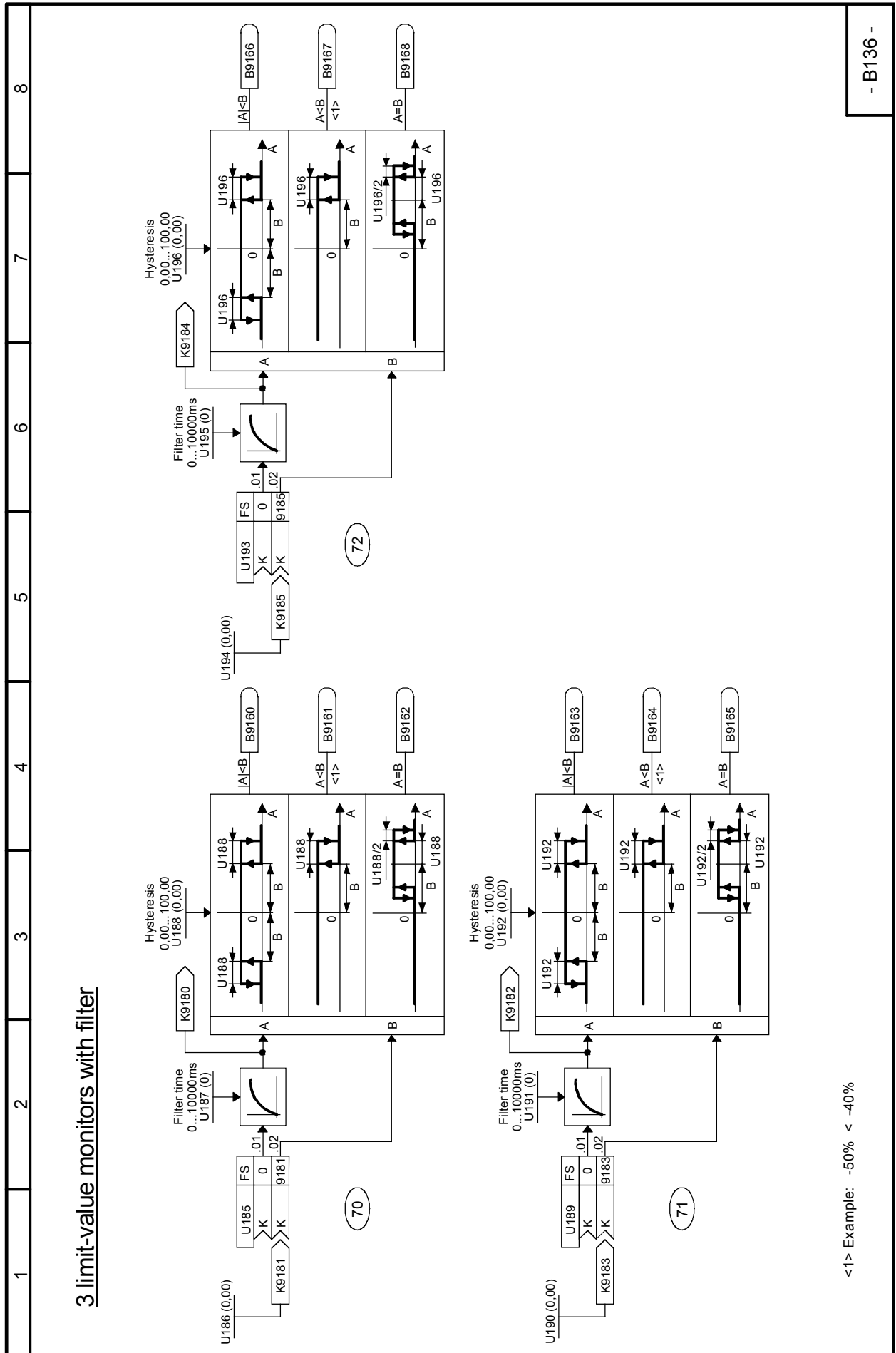
## 4 absolute-value generators with filter



## 3 limiters

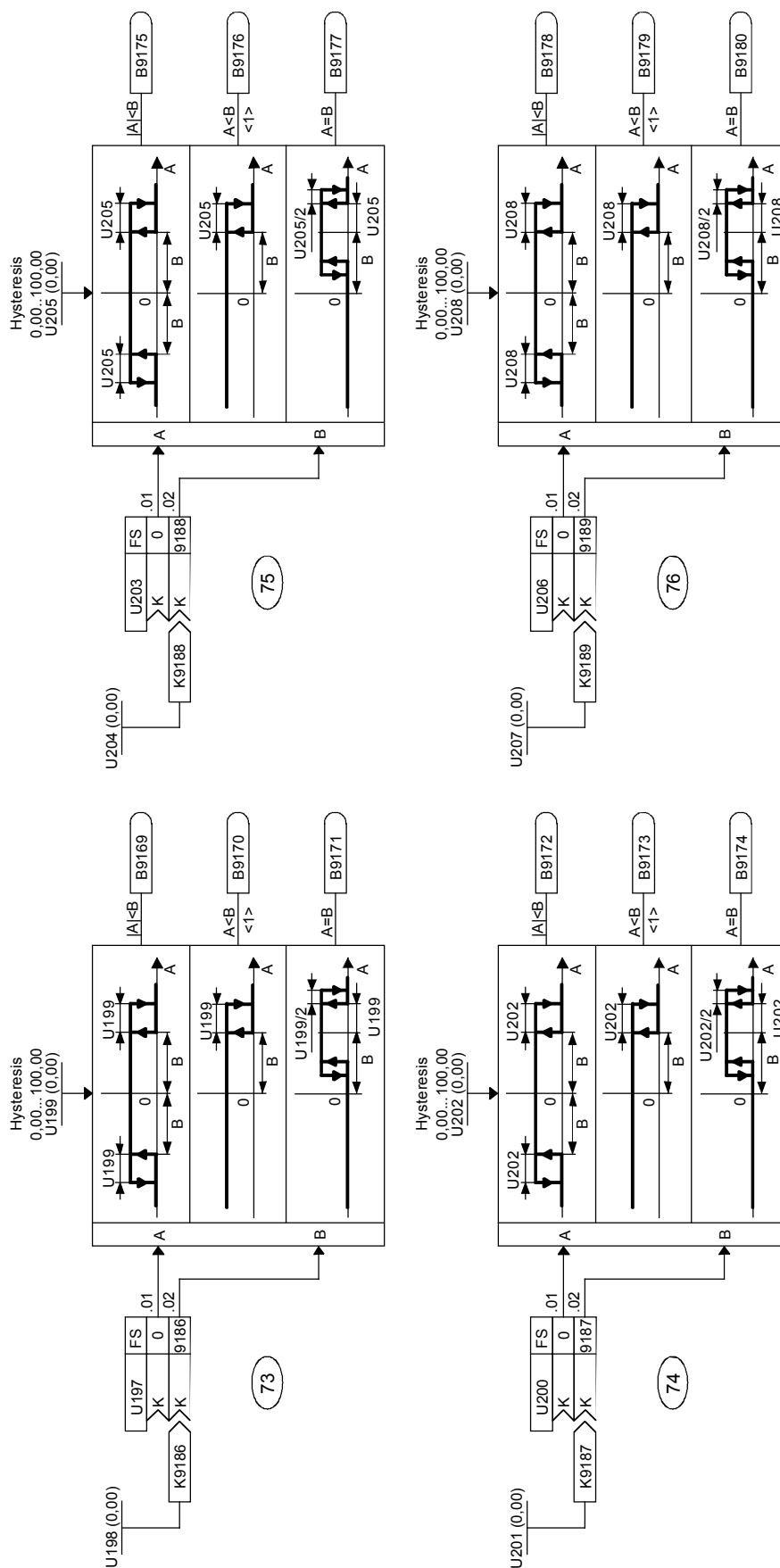


## Sheet B136 Limit-value monitors with filter



## Sheet B137 Limit-value monitors without filter

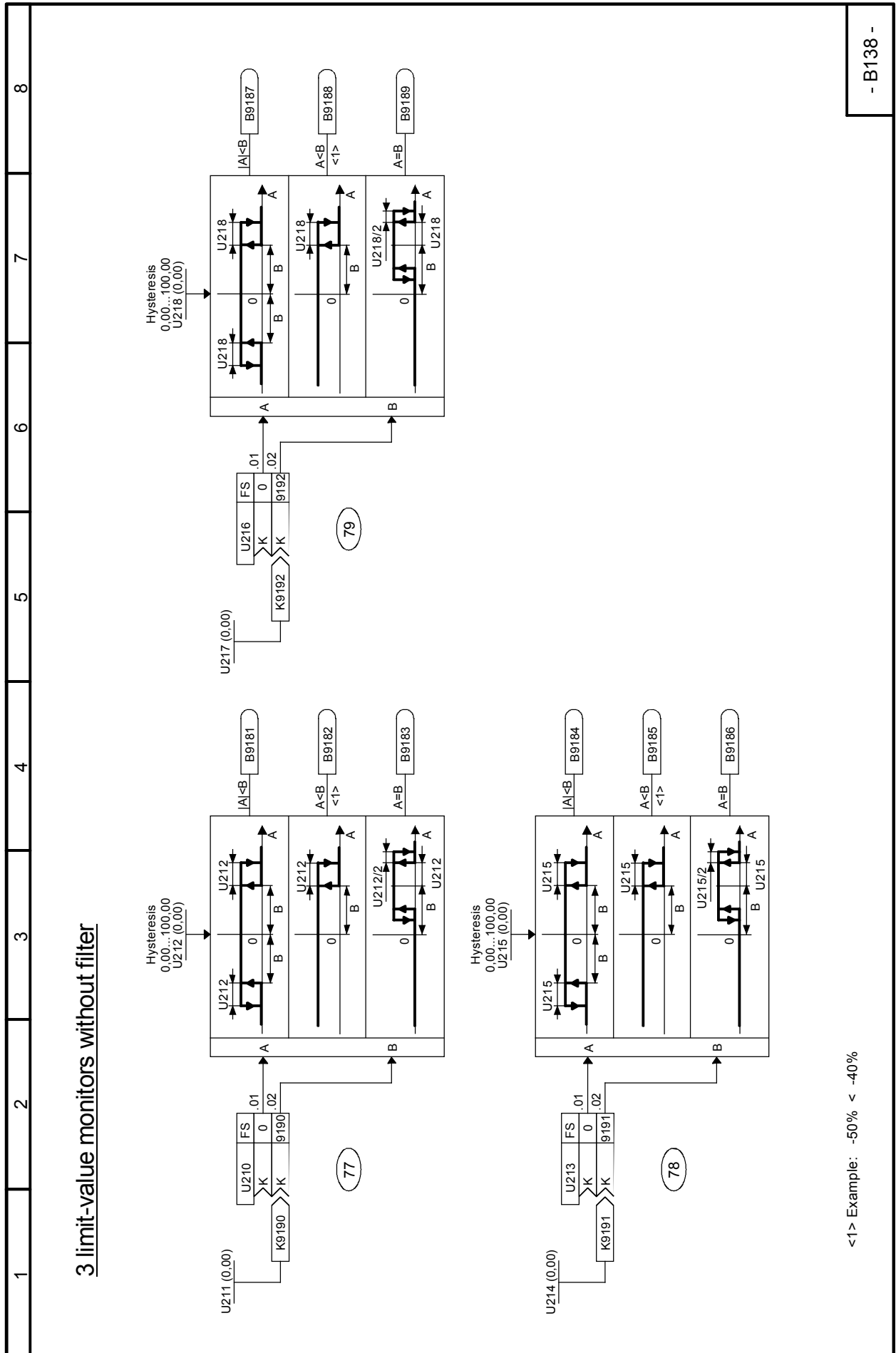
## 4 limit-value monitors without filter



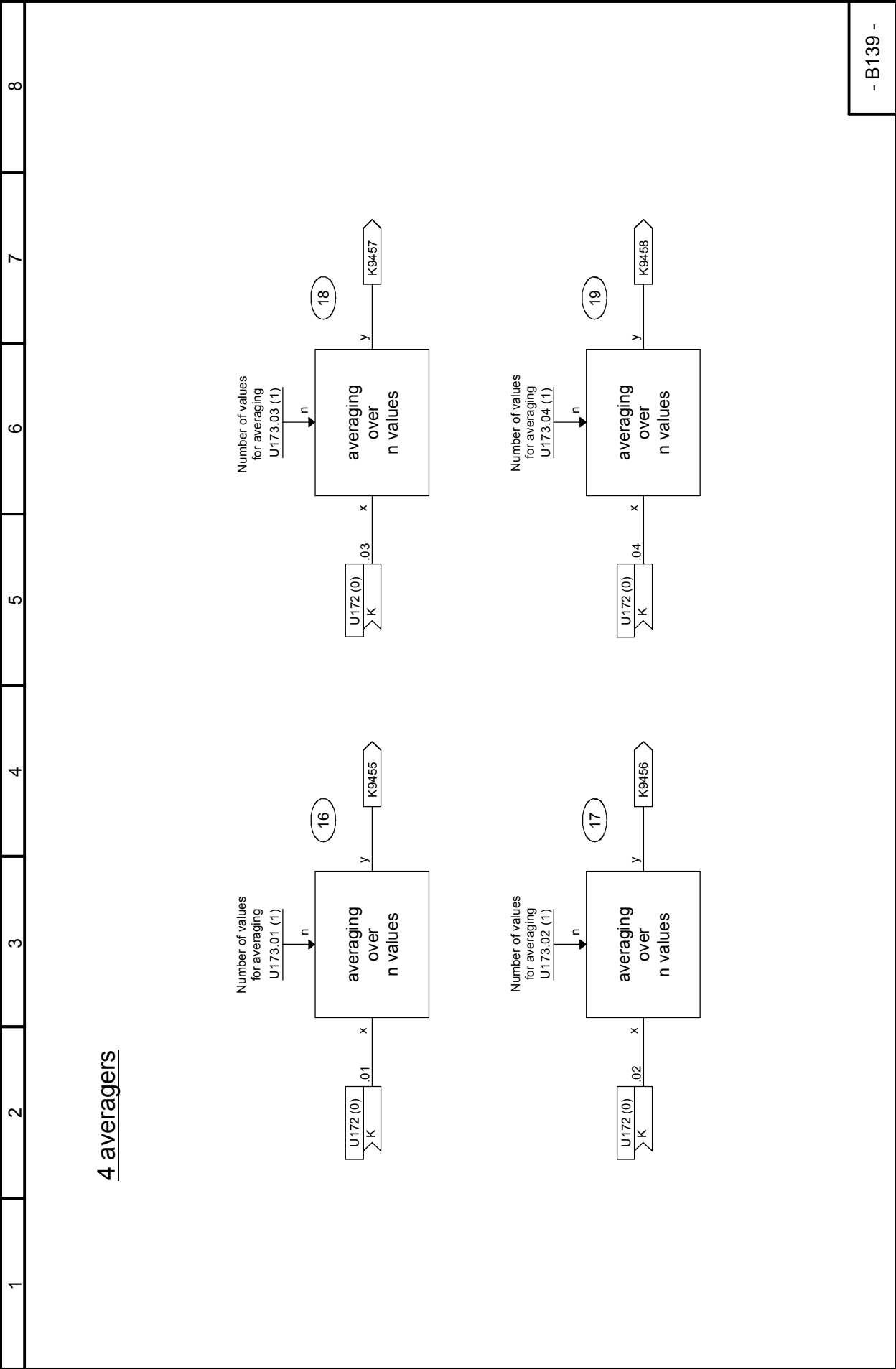
&lt;1&gt; Example: -50% &lt; -40%

- B137 -

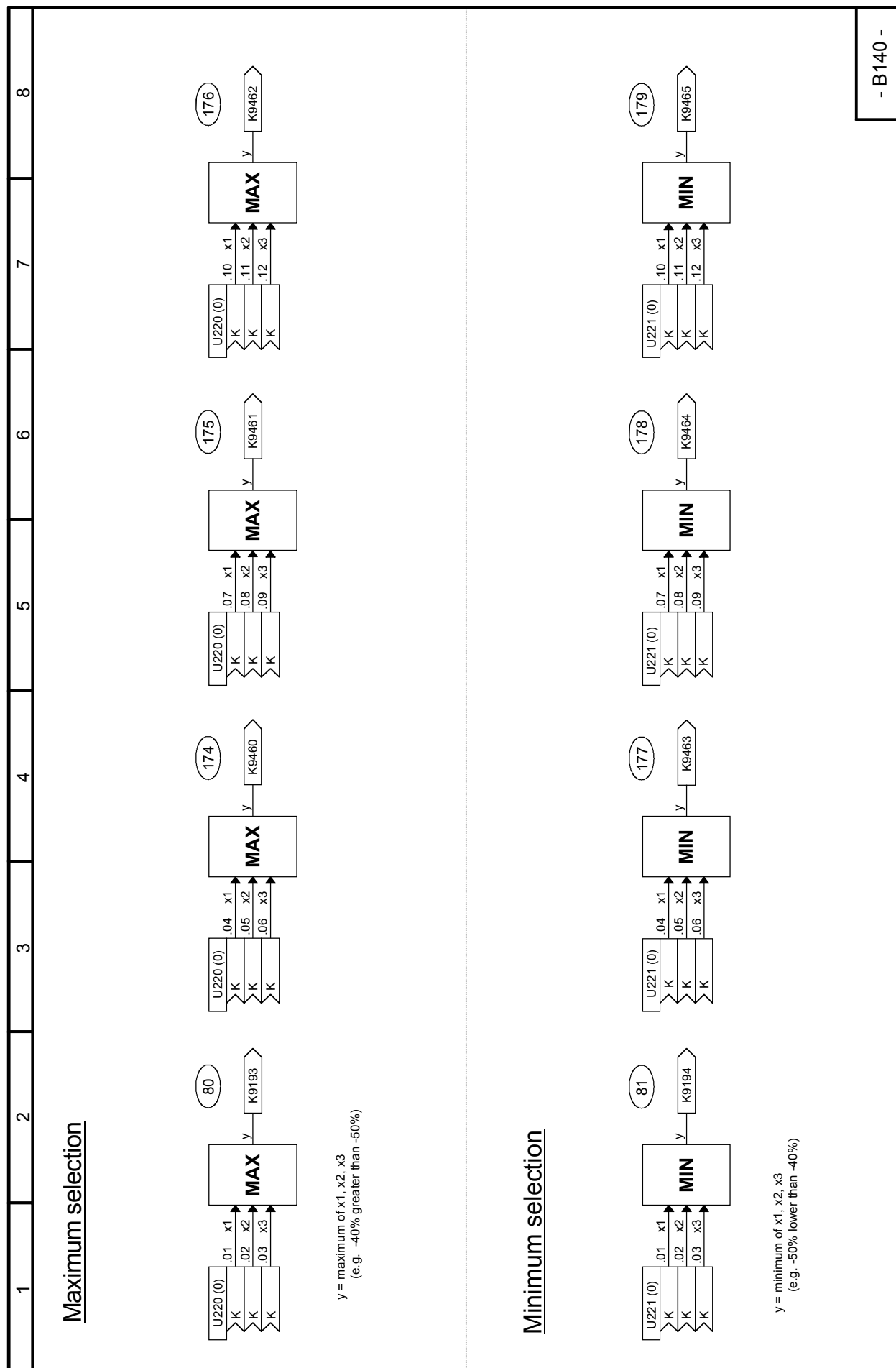
## Sheet B138 Limit-value monitors without filter



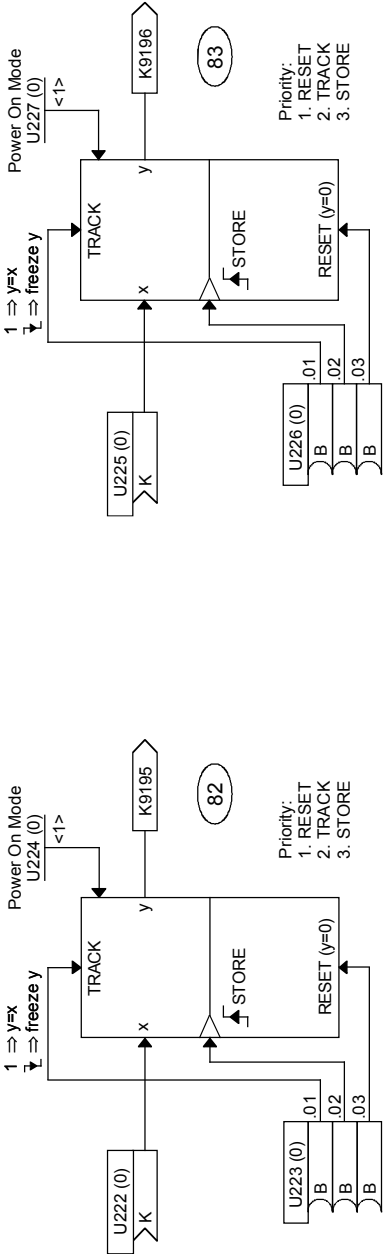




## Sheet B140 Maximum selections, minimum selections

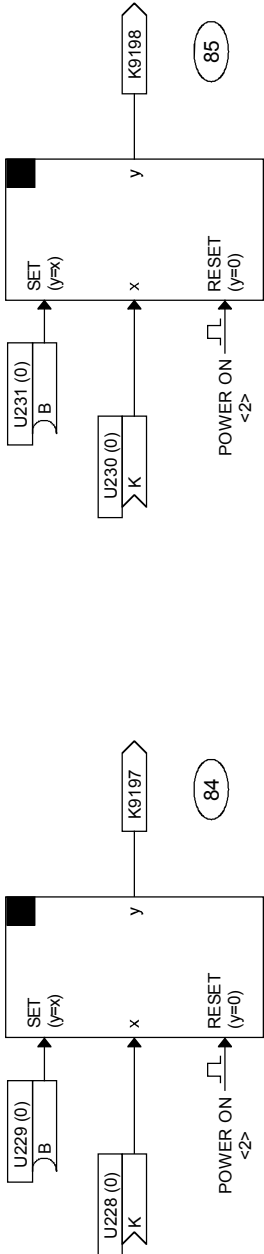


2 tracking / storage elements



<1> Power On Mode: U224/U227=0: No "non-volatile" storage: Zero appears at output when voltage recovers  
U224/U227=1: "Non-volatile" storage: When power is disconnected or falls, the current output value is stored and output again when voltage is reconnected/recovers.

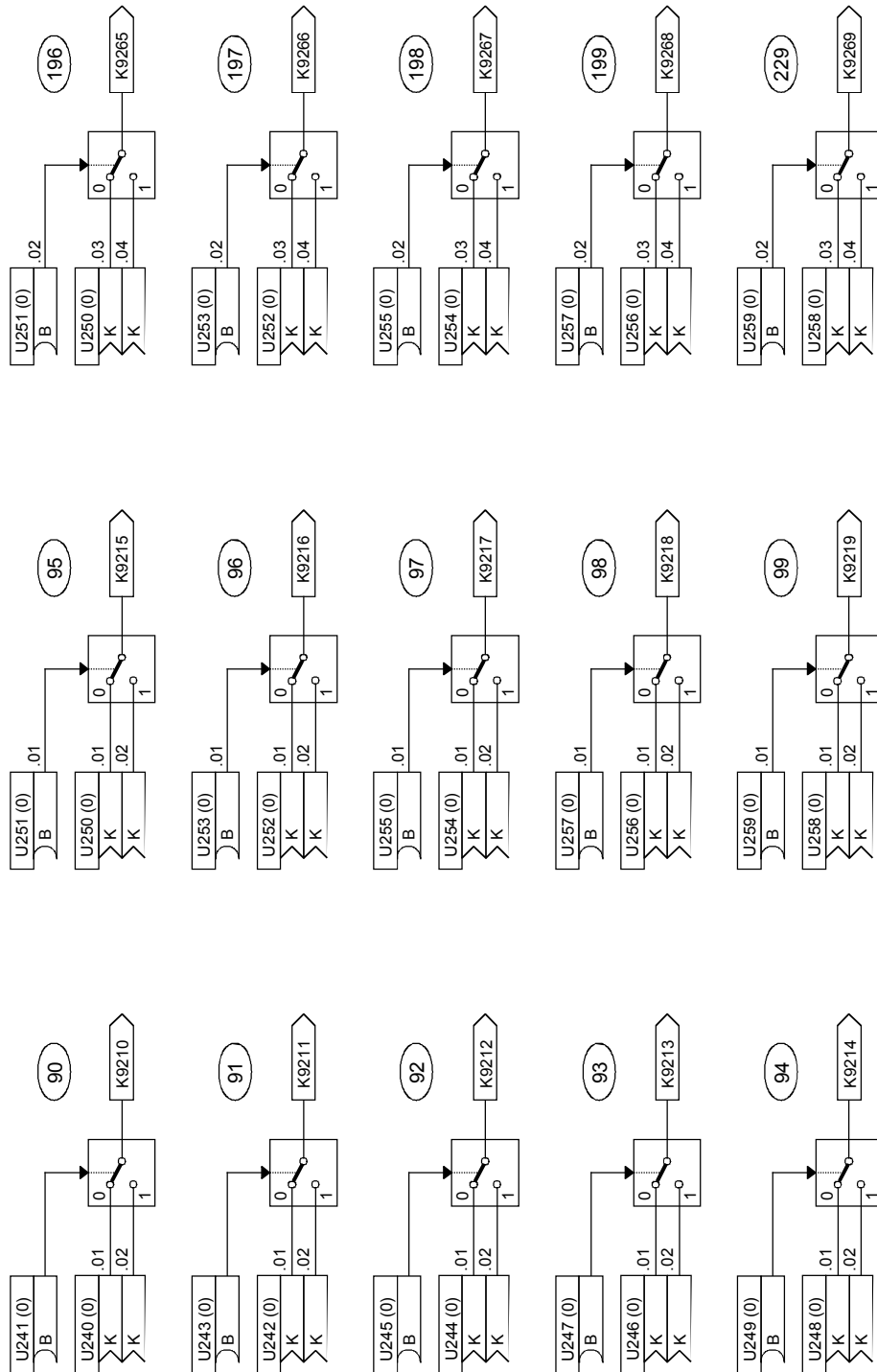
2 connector-memories



<2> from voltage monitor for electronics power supply

## Sheet B150 Connector changeover switches

## 15 connector changeover switches

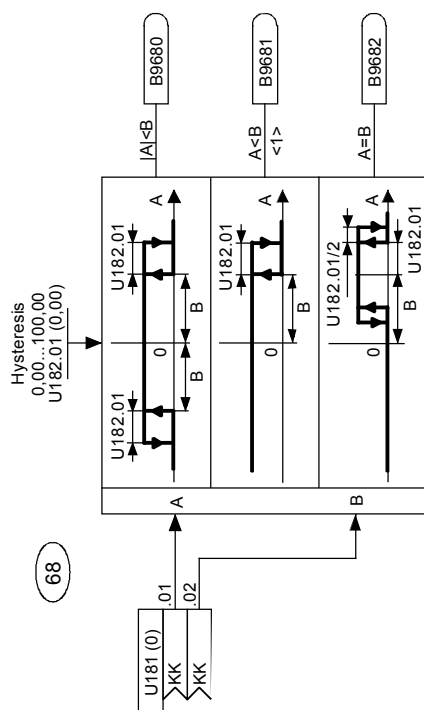
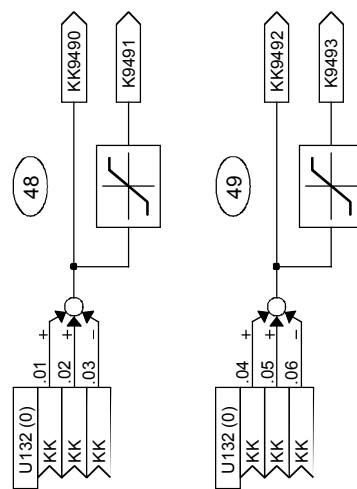


- B150 -

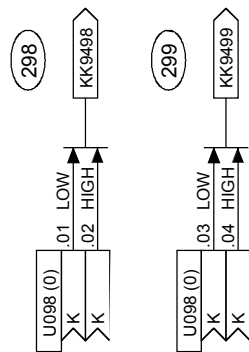
## Sheet B151 High-resolution blocks

## High-resolution blocks

Limit-value monitors (for double connectors)

Adders / subtractors  
(for double connectors)

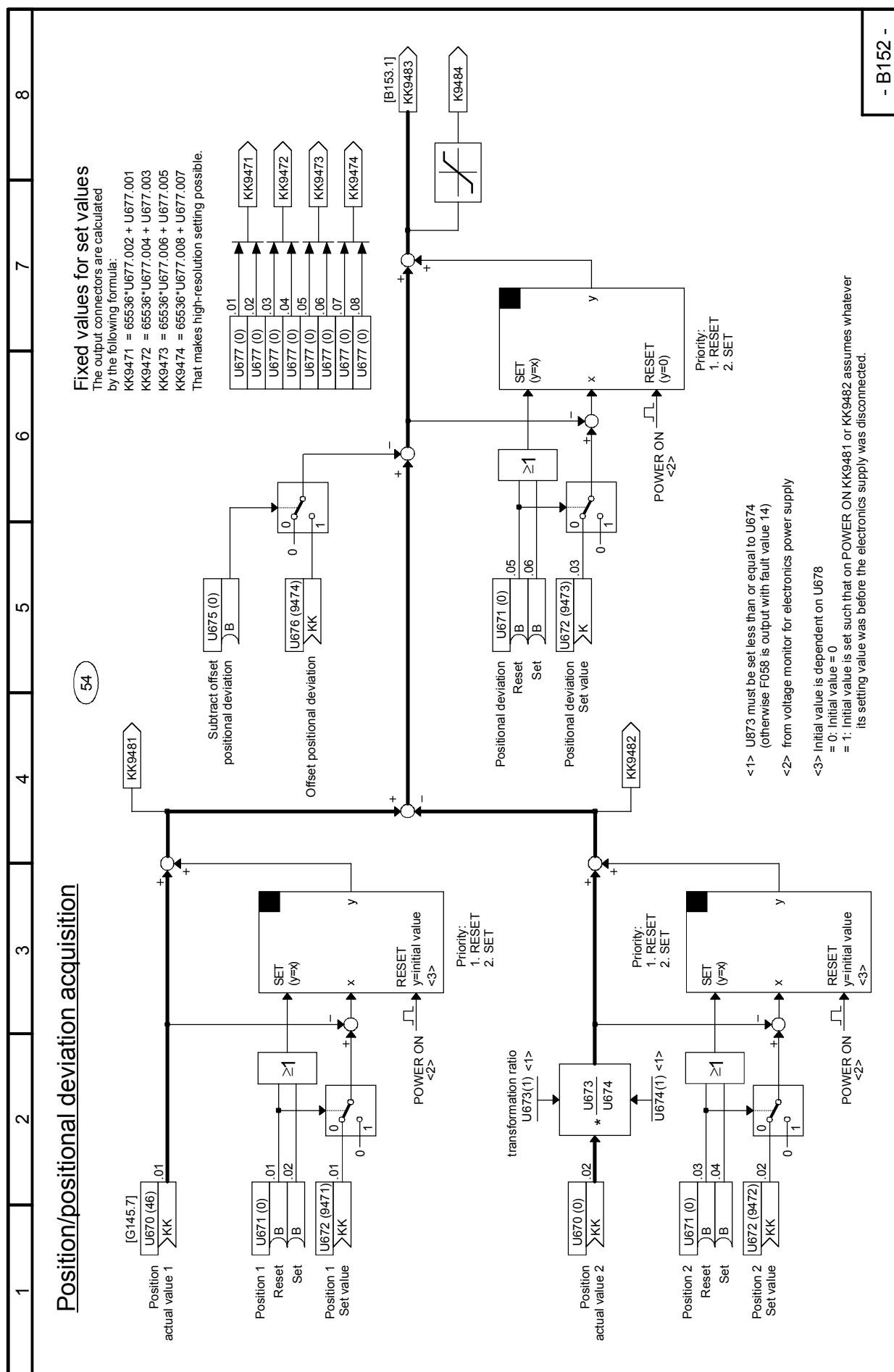
Connector-type converters

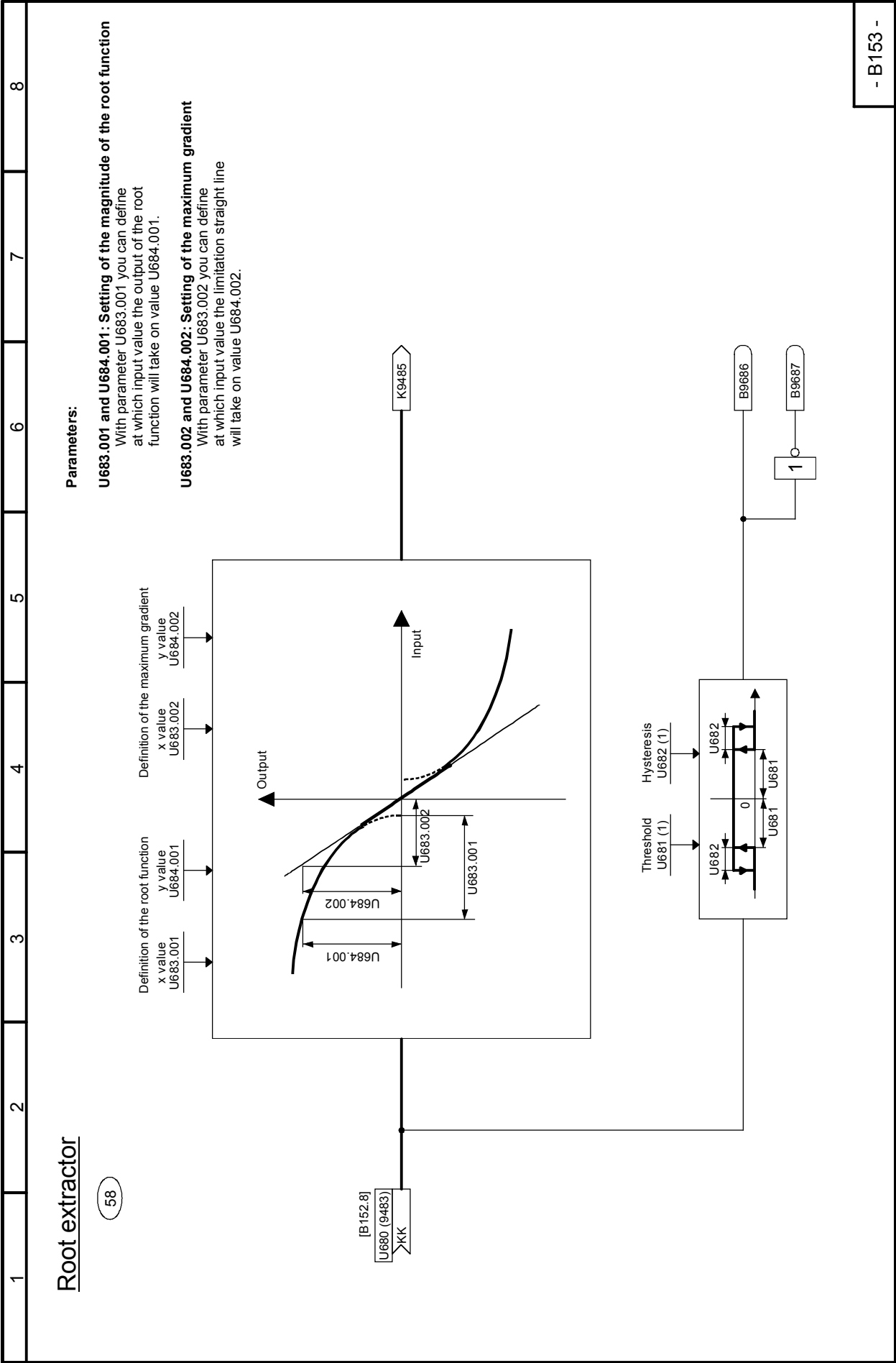


&lt;1&gt; Example: -50% &lt; -40%

- B151 -

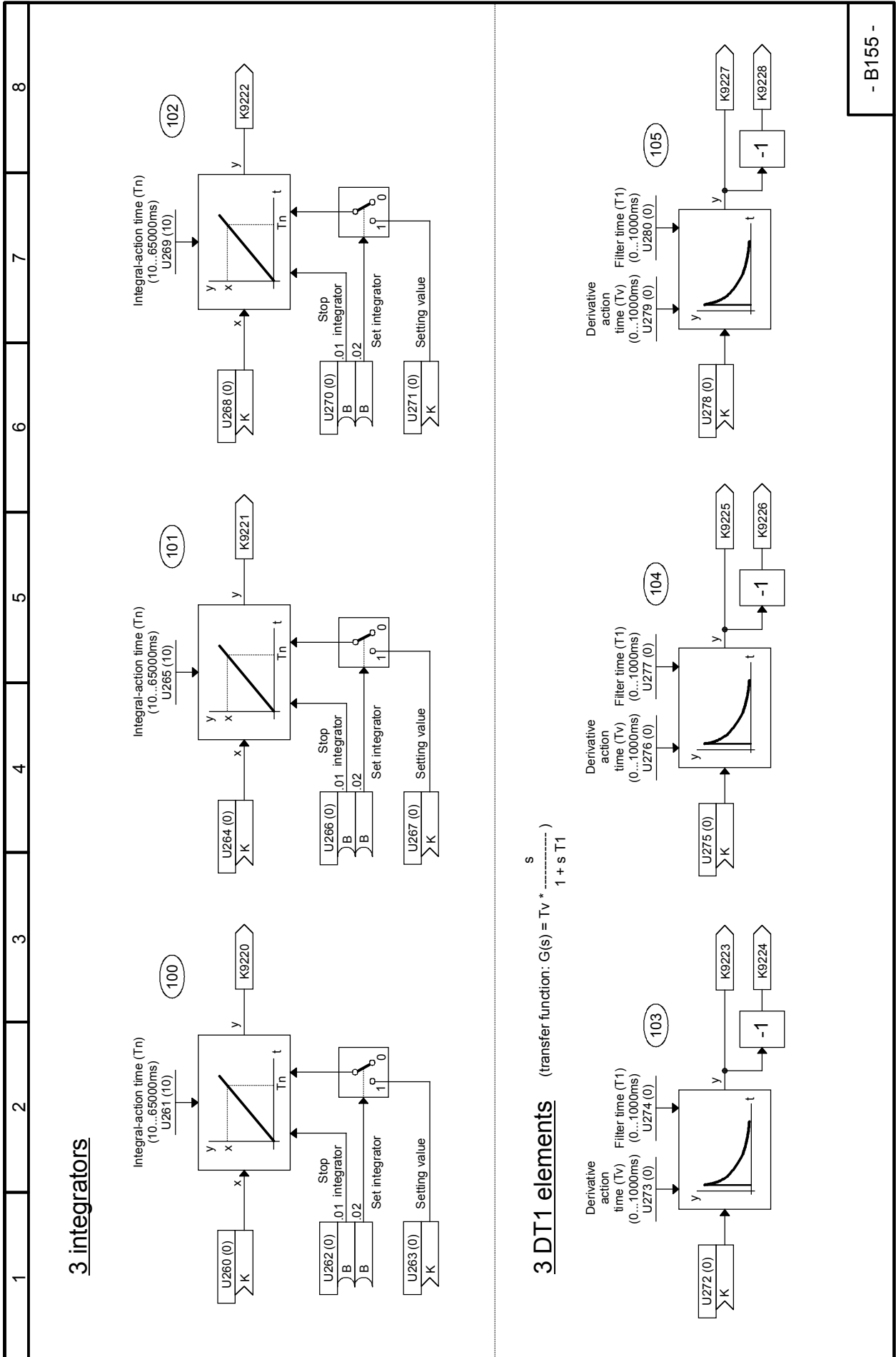
## Sheet B152 Position/positional deviation acquisition





- B153 -

## Sheet B155 Integrators, DT1 elements



- B155 -

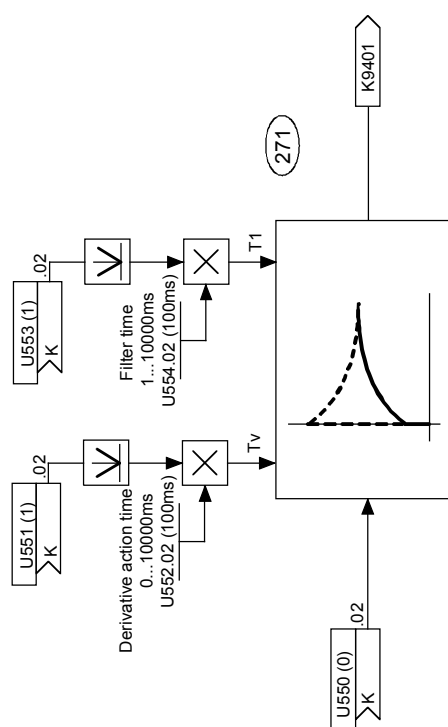
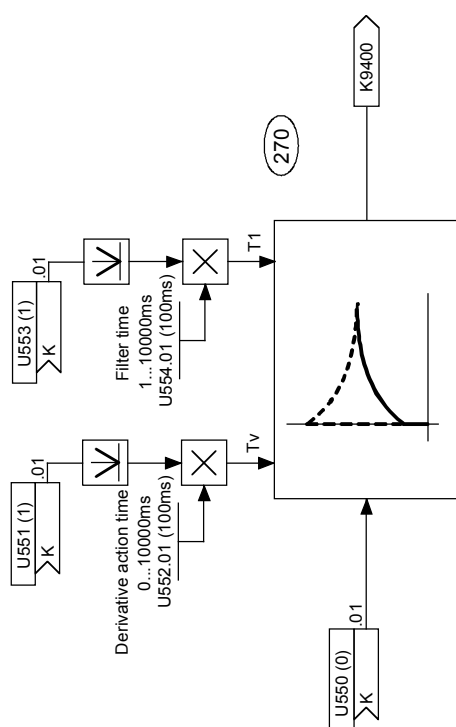
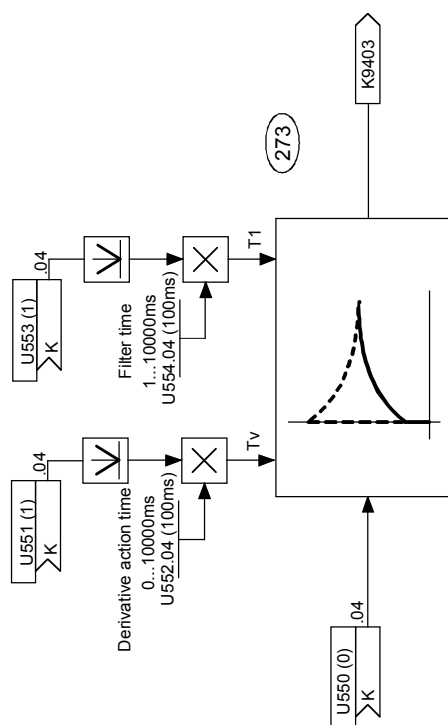
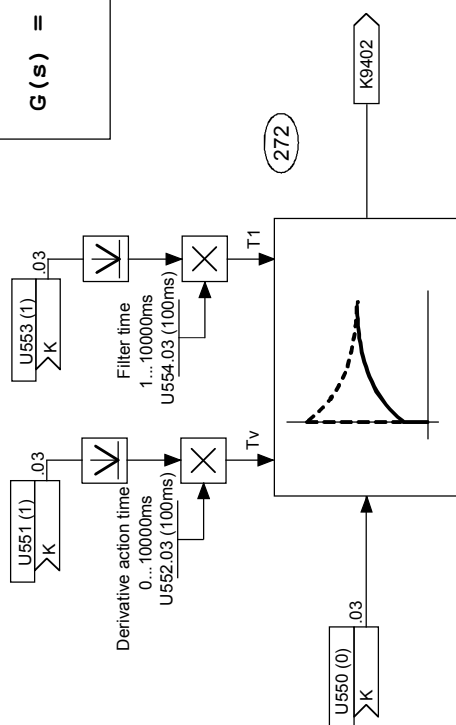


## Sheet B156 Derivative / delay elements (LEAD / LAG blocks)

## 4 LEAD / LAG blocks

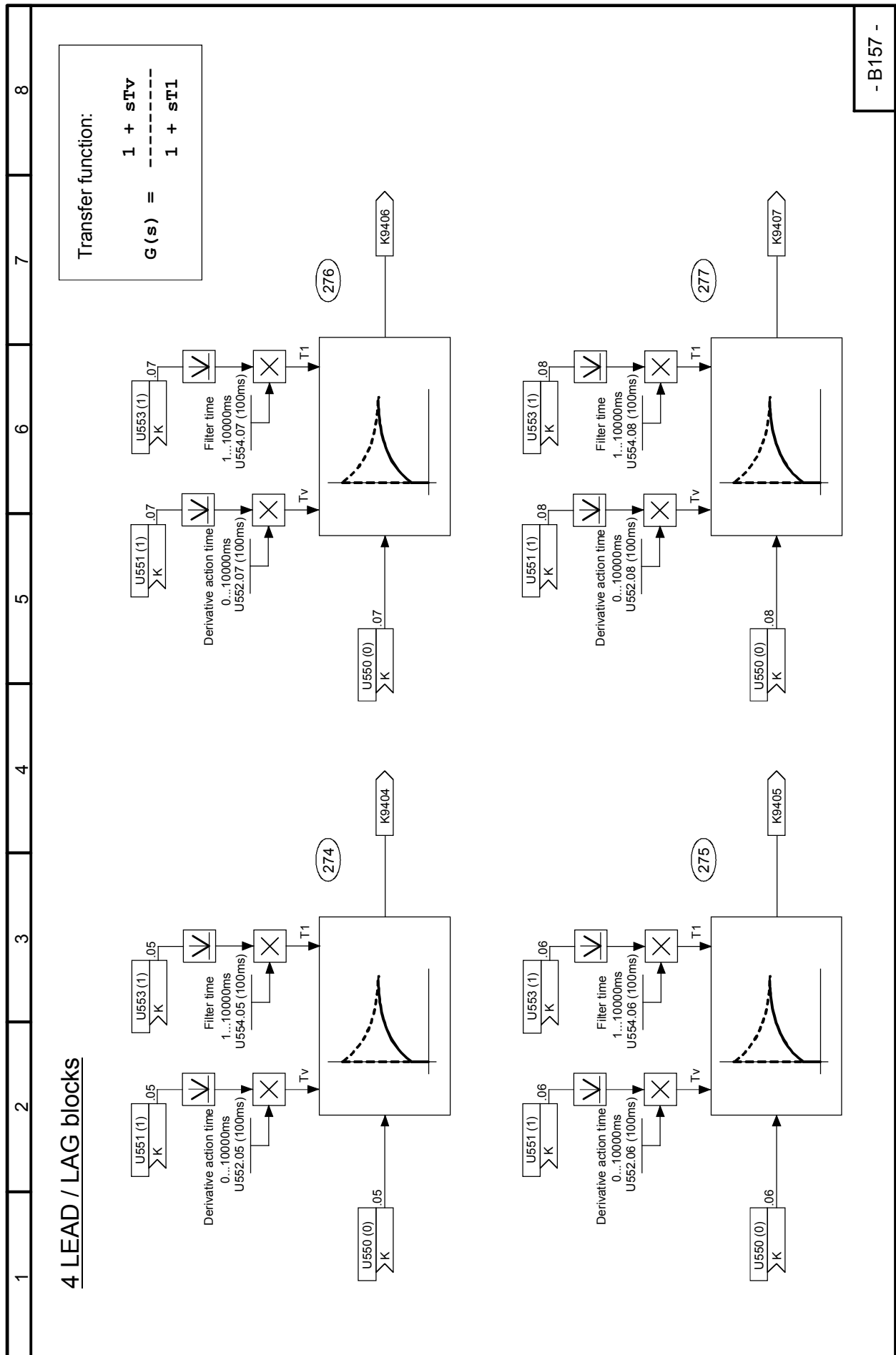
Transfer function:

$$G(s) = \frac{1 + sT_v}{1 + sT_1}$$



- B156 -

## Sheet B157 Derivative / delay elements (LEAD / LAG blocks)

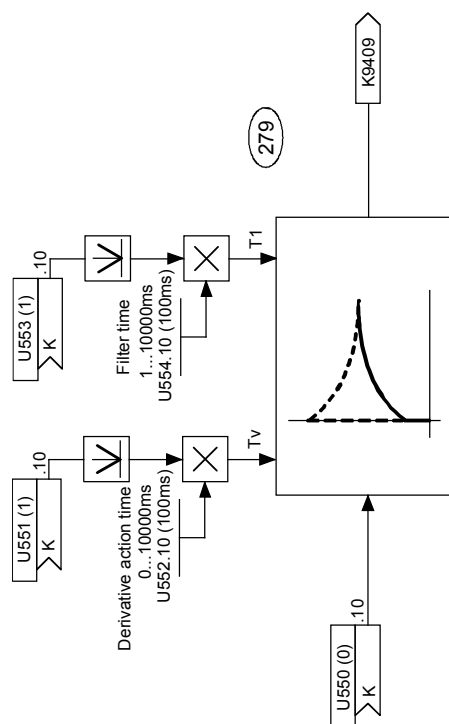
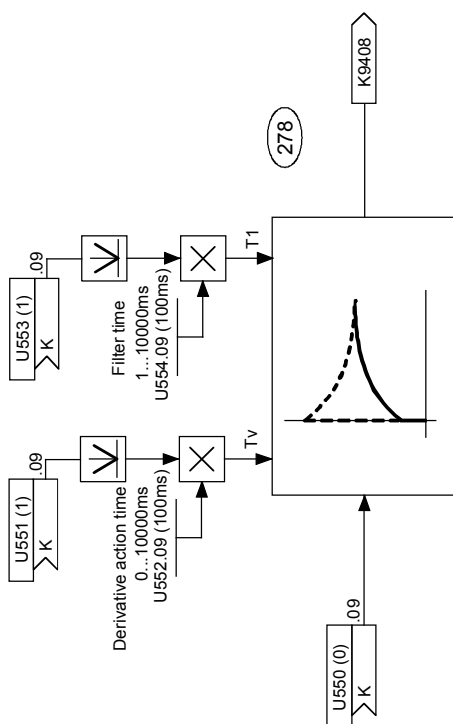


## Sheet B158 Derivative / delay elements (LEAD / LAG blocks)

## 2 LEAD / LAG blocks

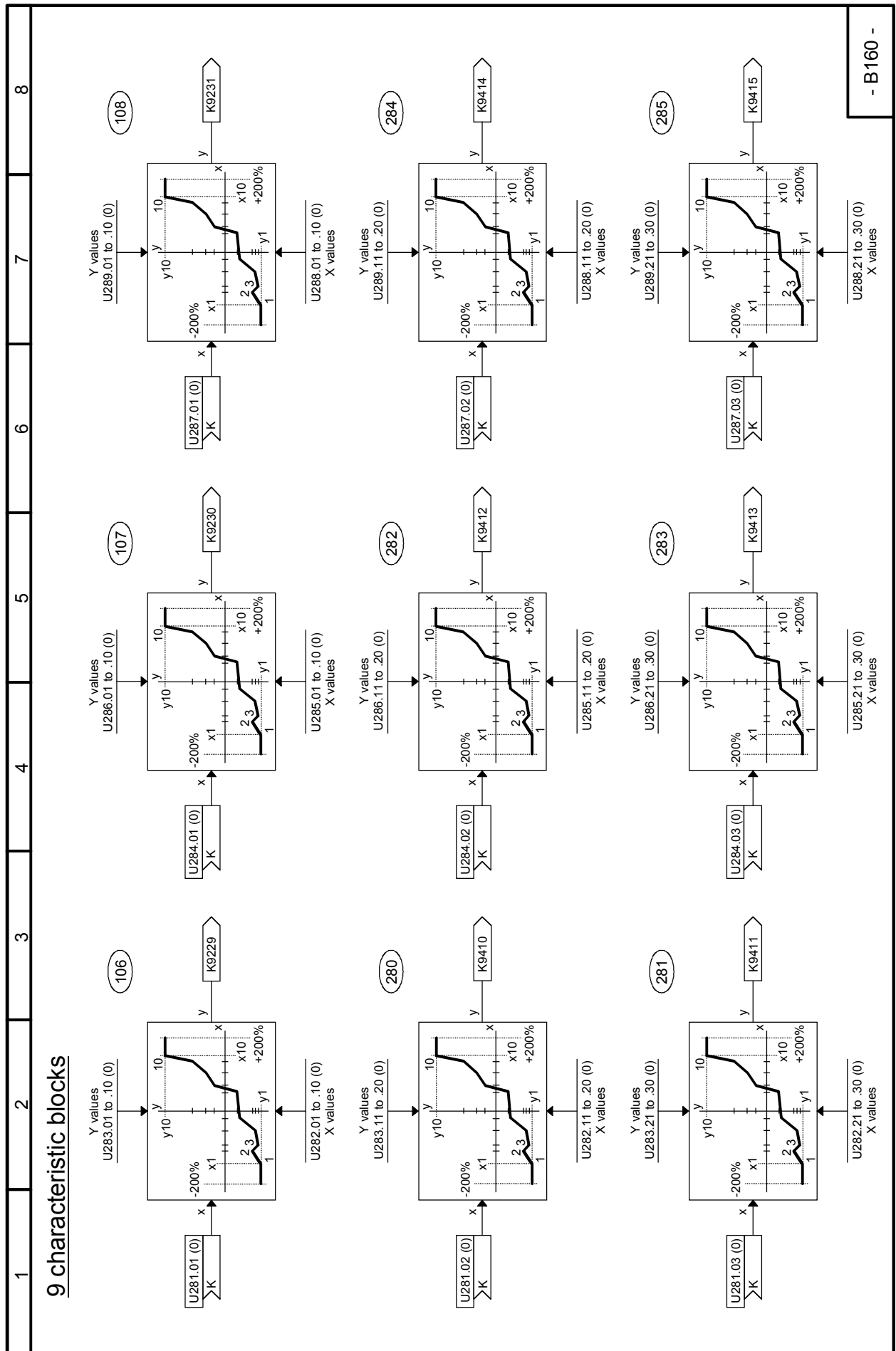
Transfer function:

$$G(s) = \frac{1 + sT_v}{1 + sT_l}$$



- B158 -

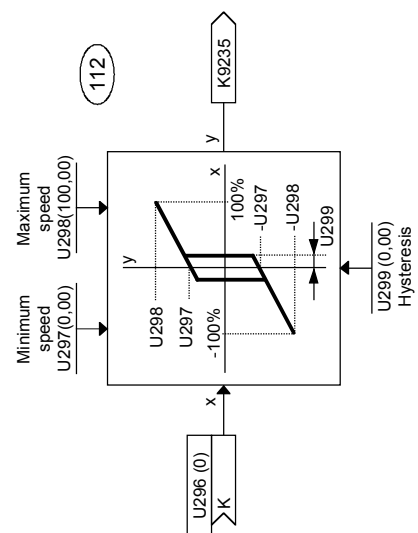
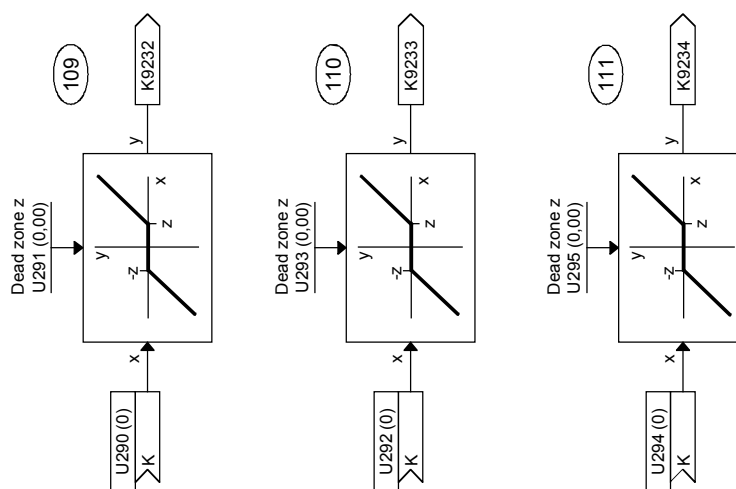
## Sheet B160 Characteristic blocks



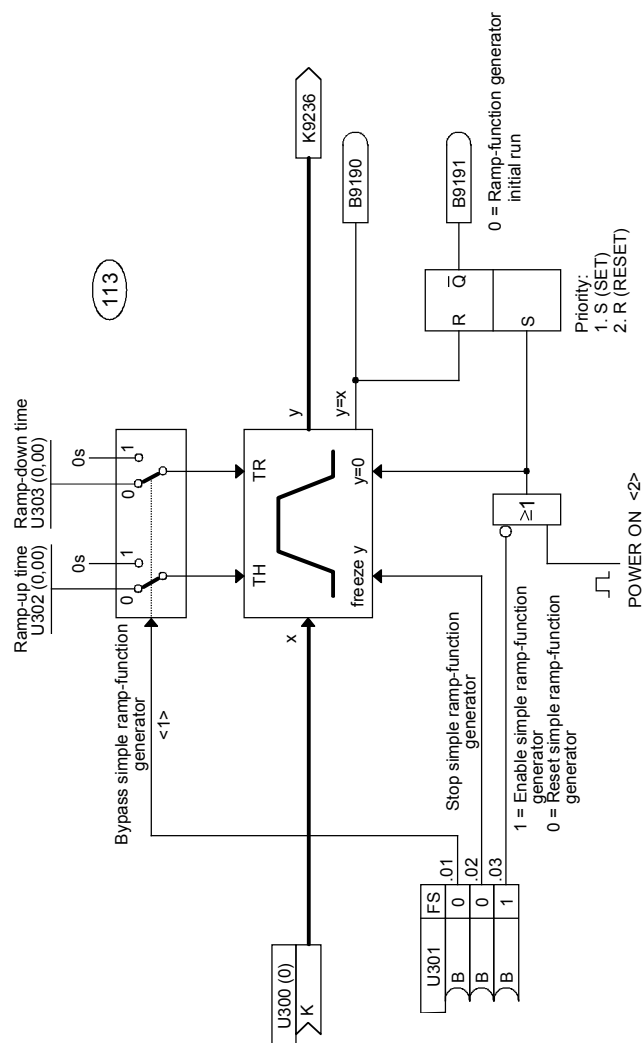
- B160 -

## Sheet B161 Dead zones, Setpoint branching

- B161 -

Setpoint branching3 dead zones

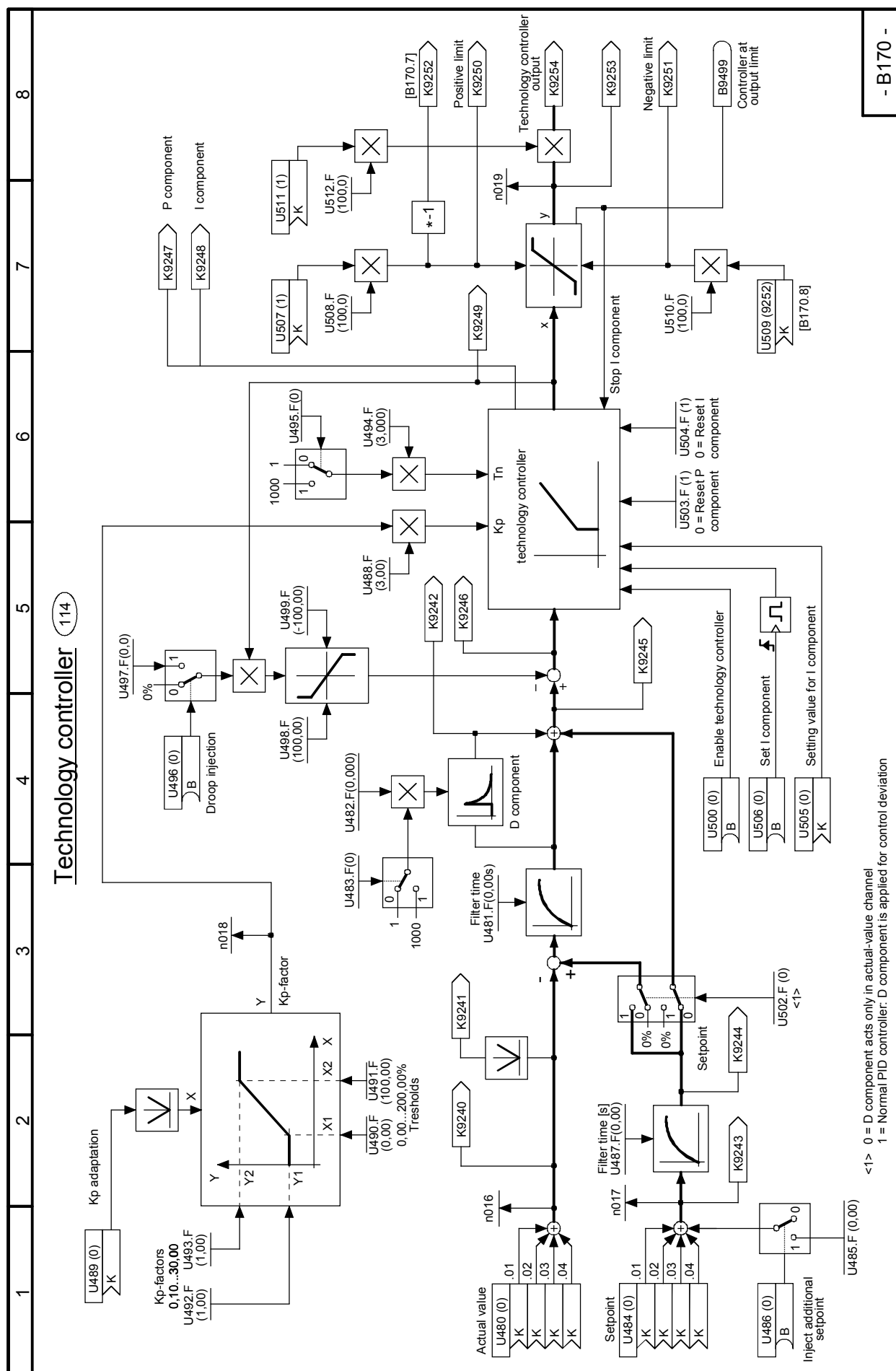
## Sheet B165 Simple ramp-function generator

Simple ramp-function generator

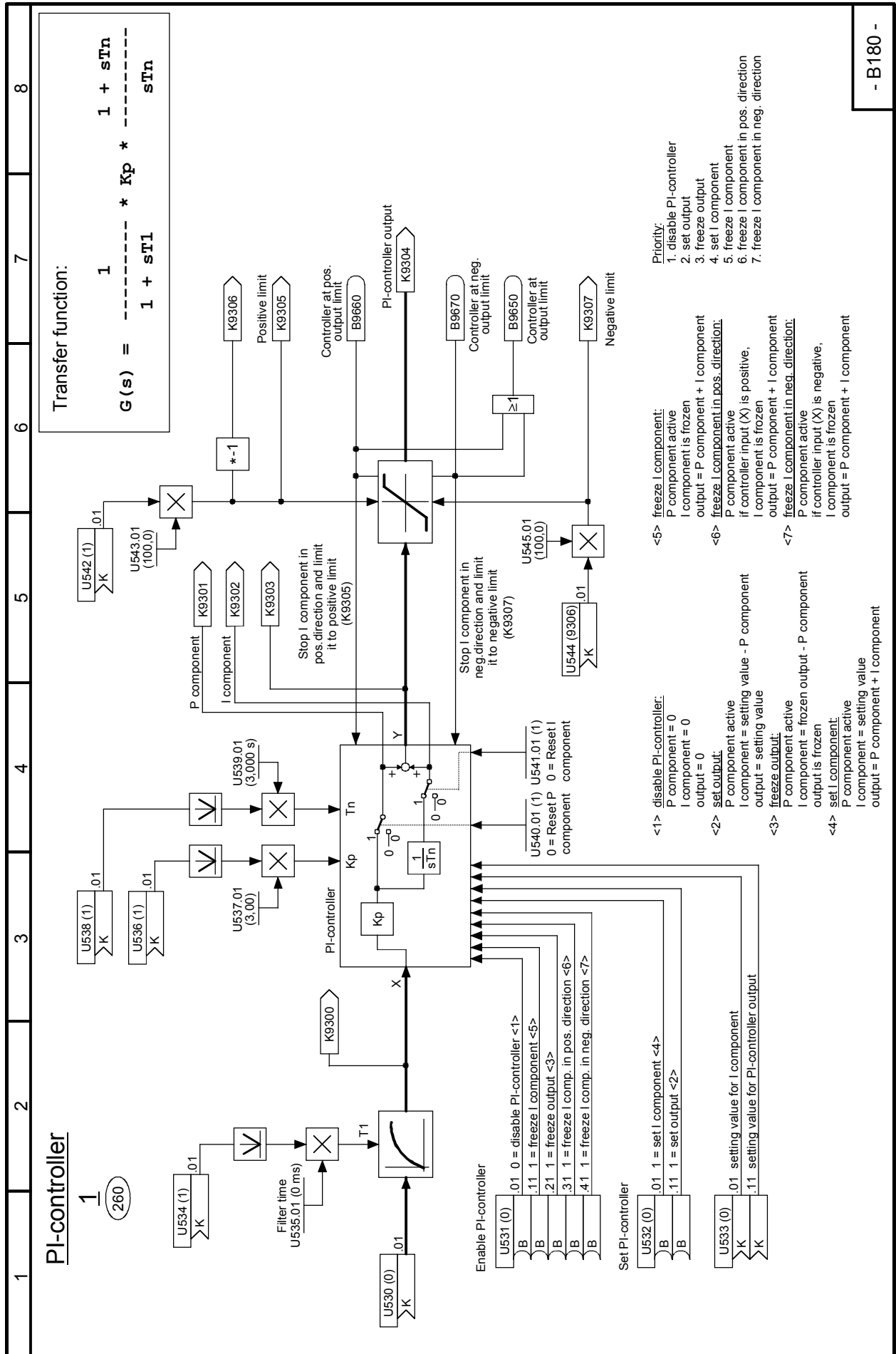
<1> When U301.01 = 9191, the ramp-function generator operates only once after it has been enabled (edge log. "0" to "1")

<2> from voltage monitor for electronics power supply

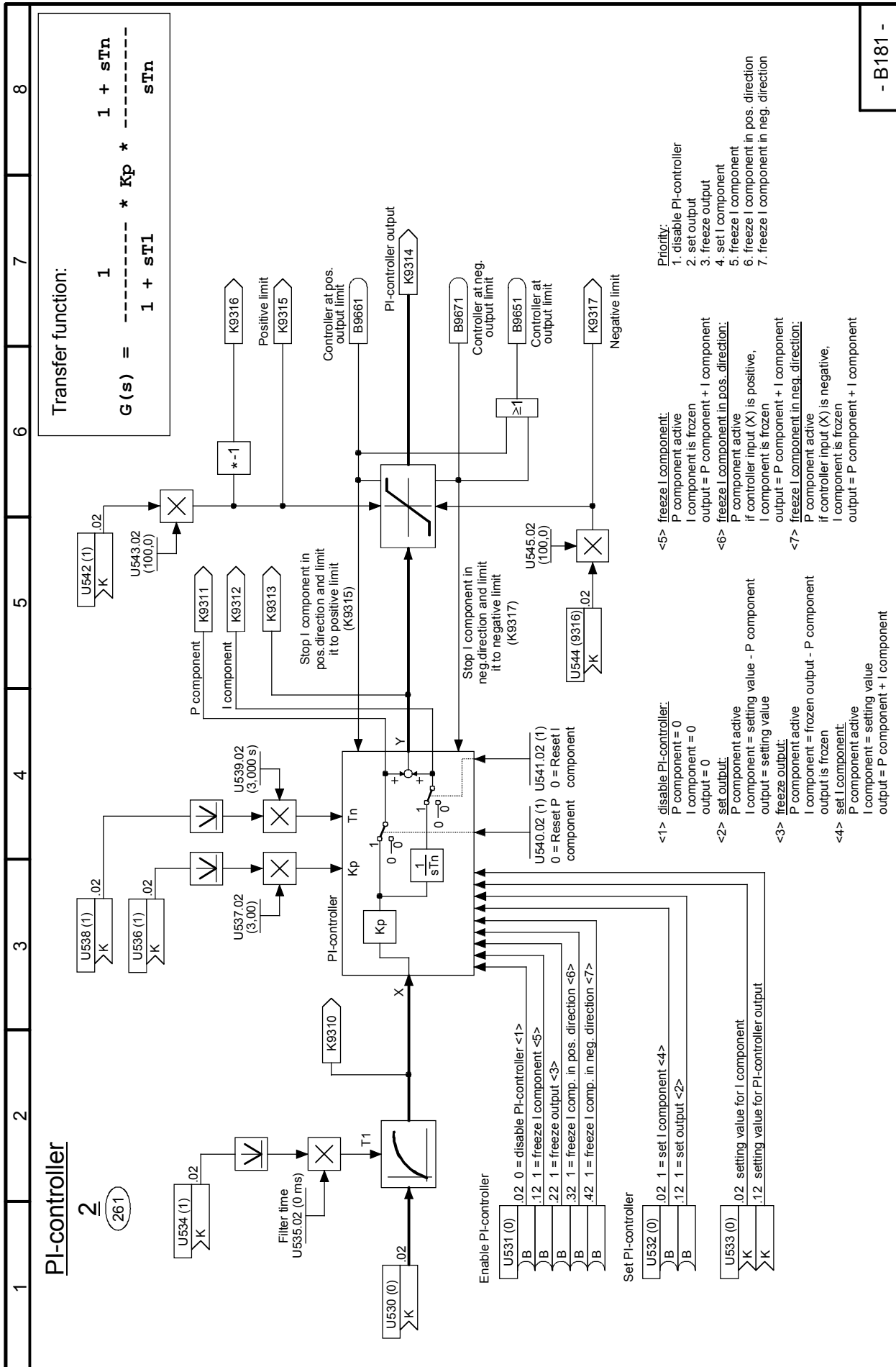
- B165 -



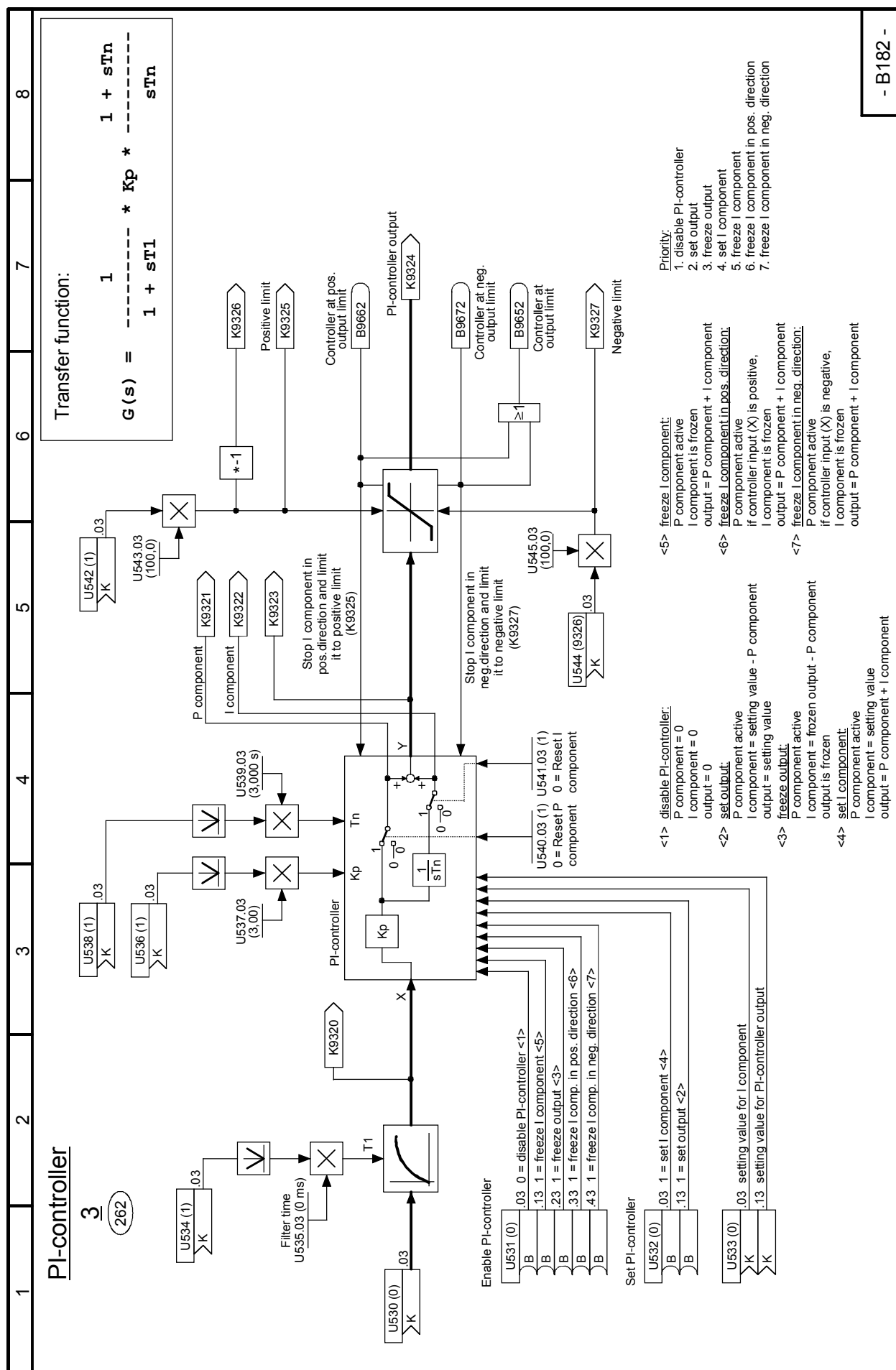
## Sheet B180 PI controller 1



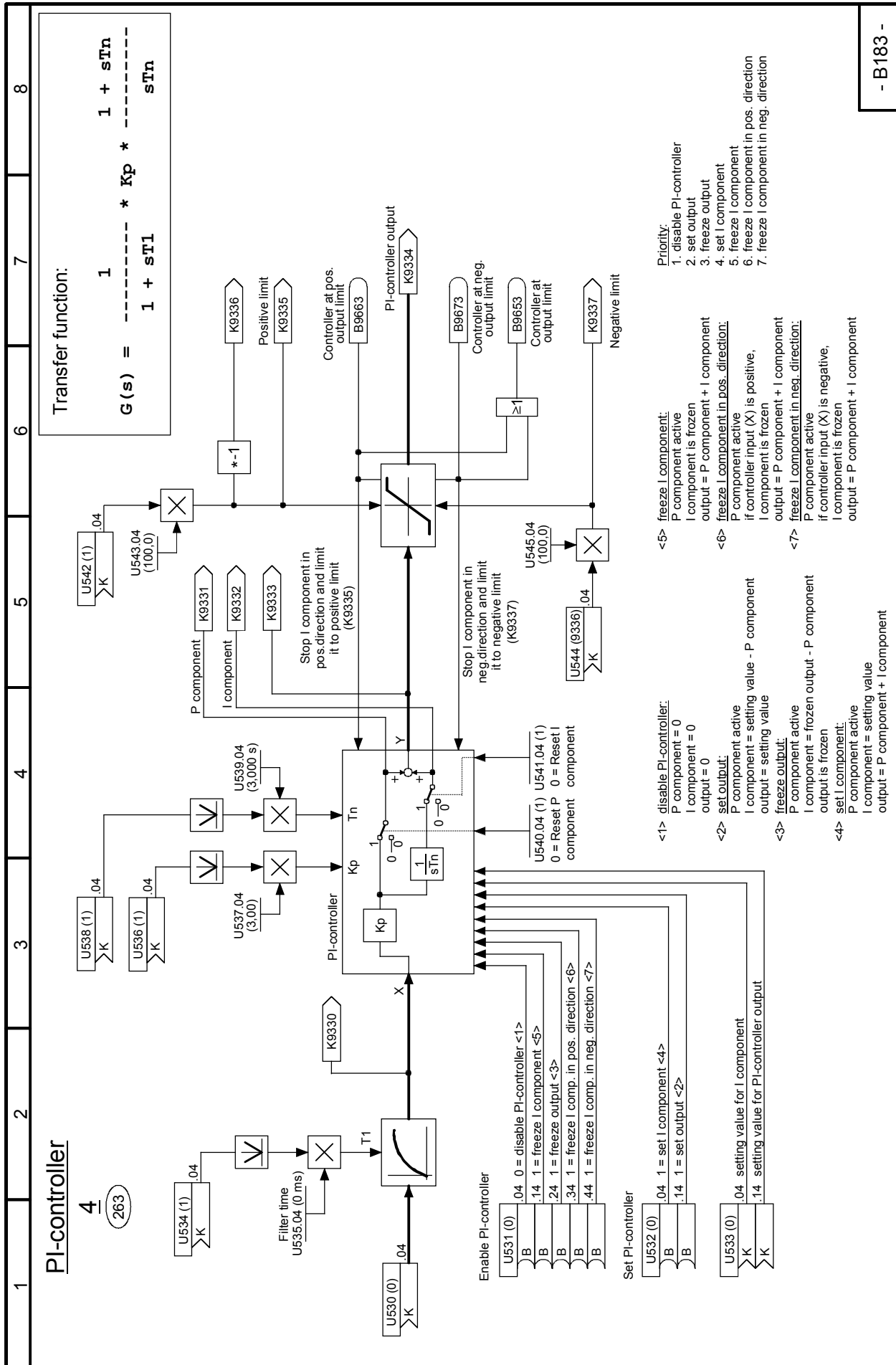




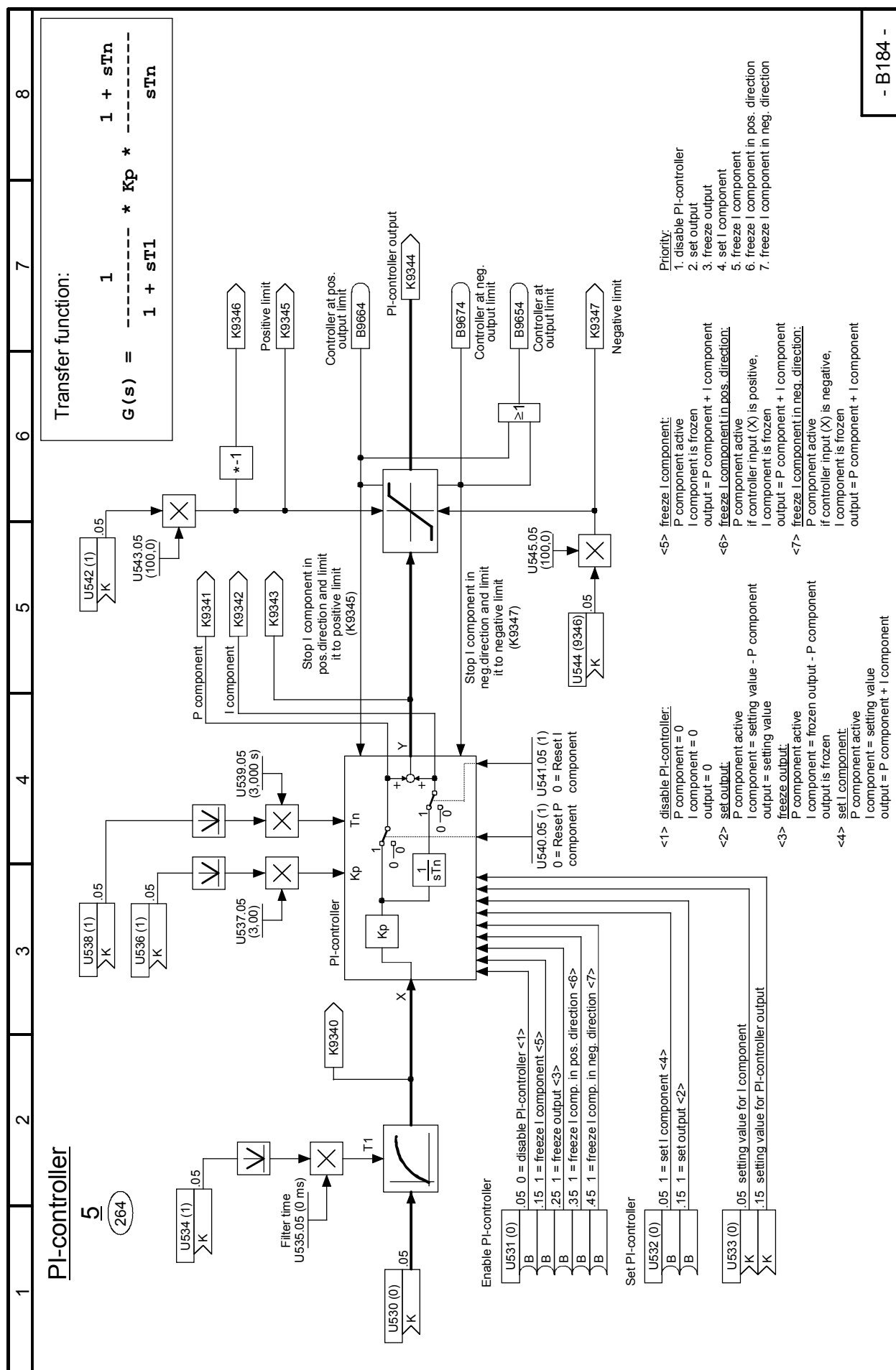
## Sheet B182 PI controller 3



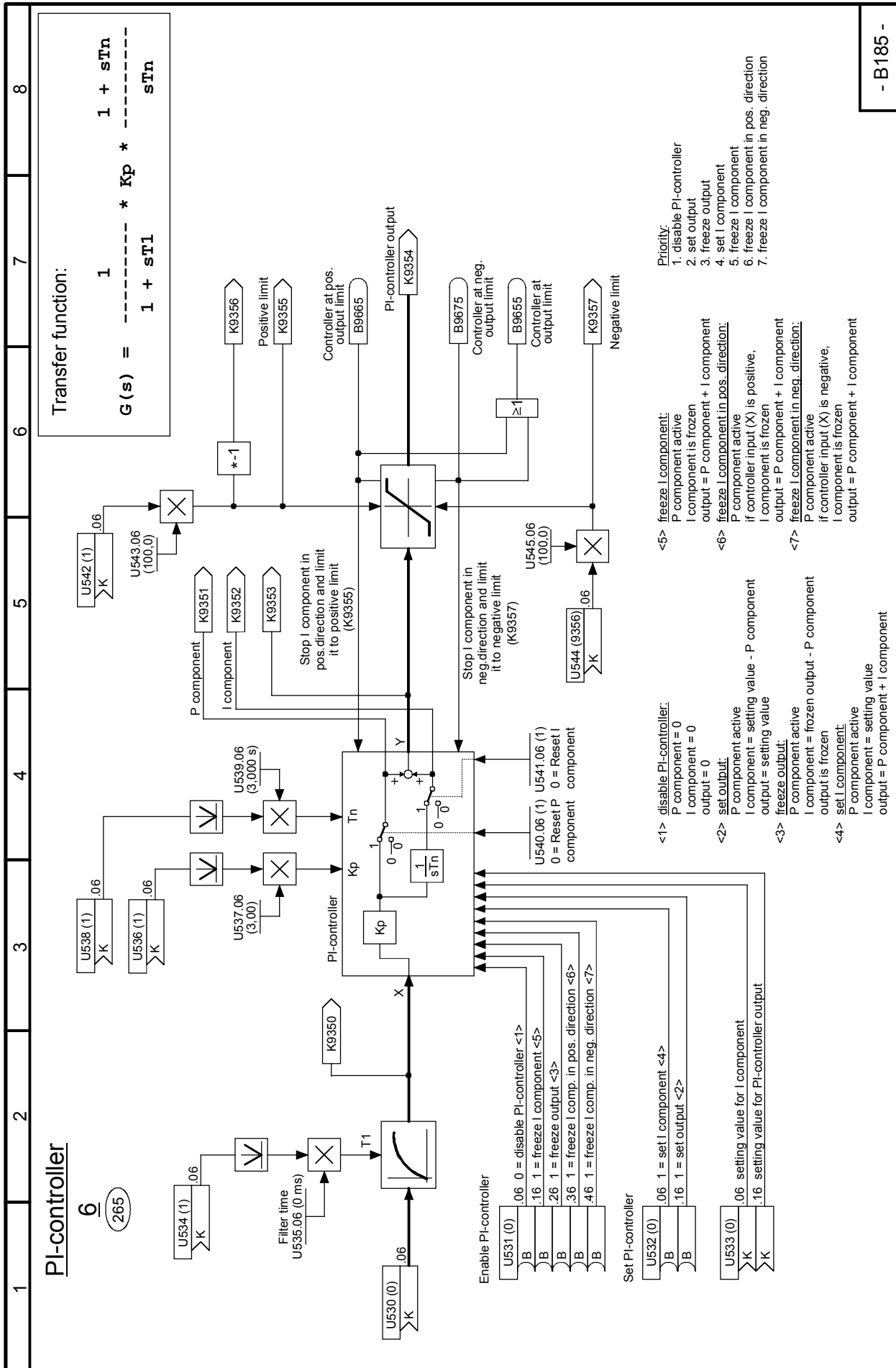
## Sheet B183 PI controller 4

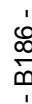


**Sheet B184 PI controller 5**



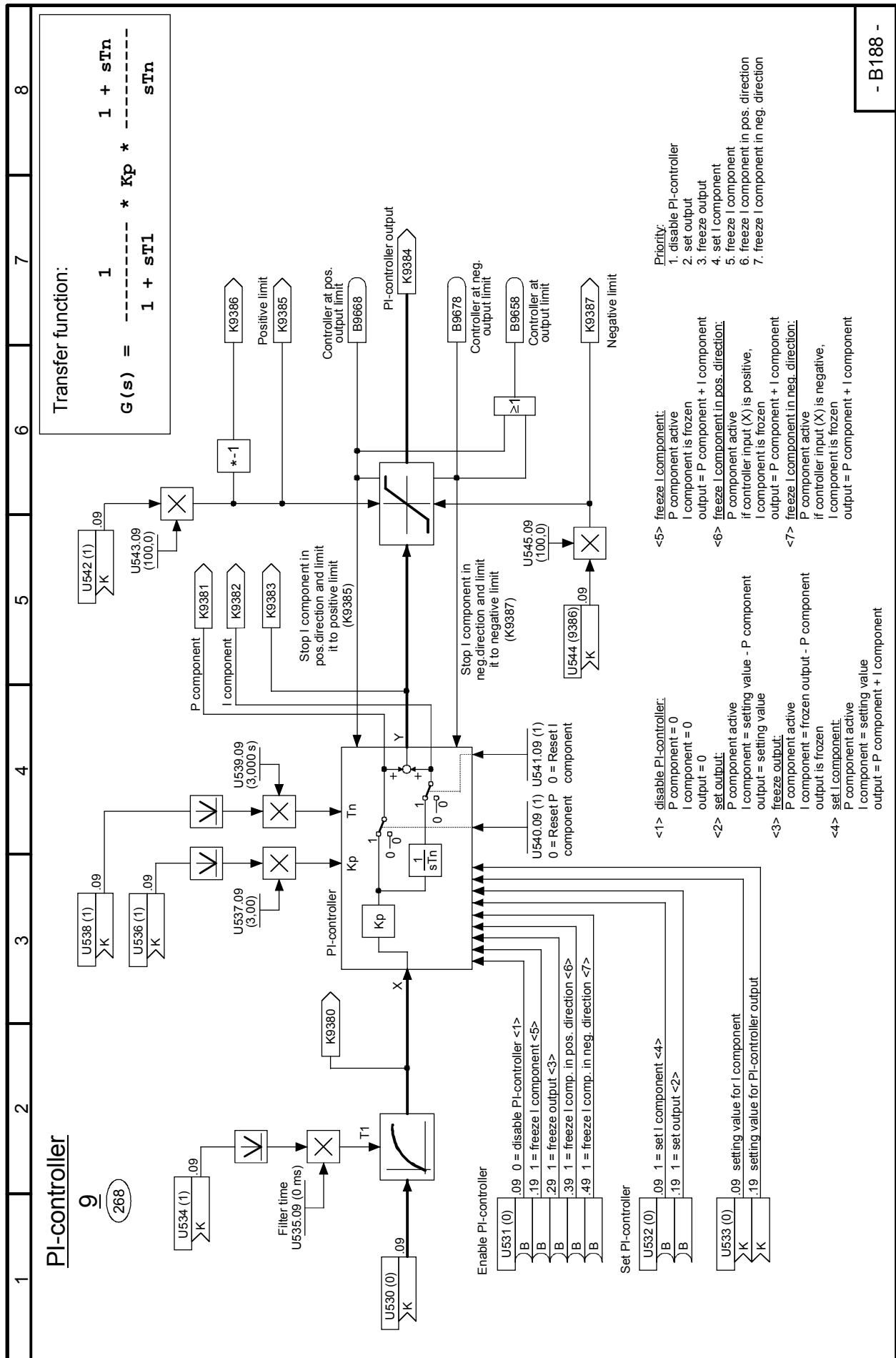
## Sheet B185 PI controller 6





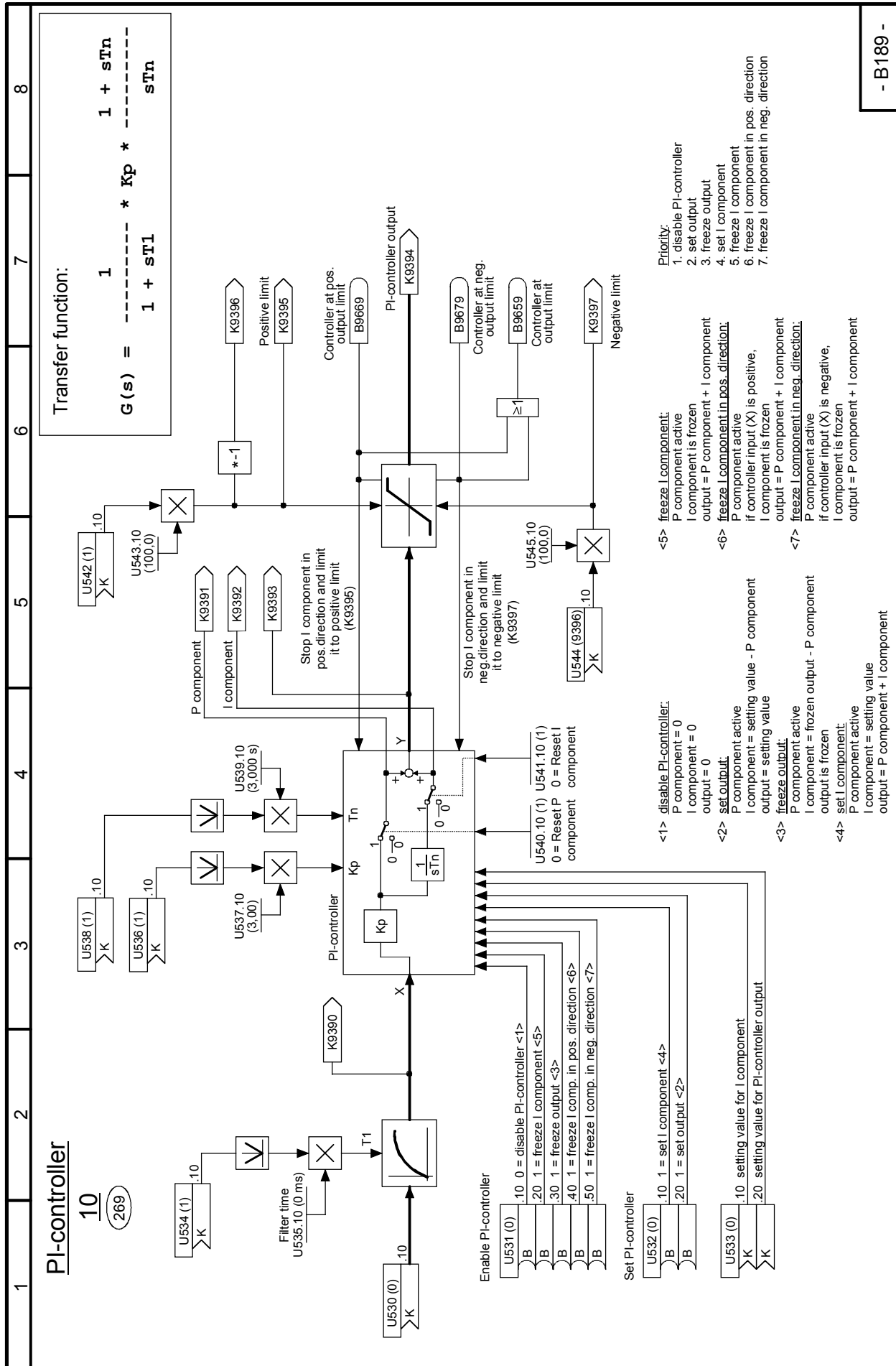


## Sheet B188 PI controller 9



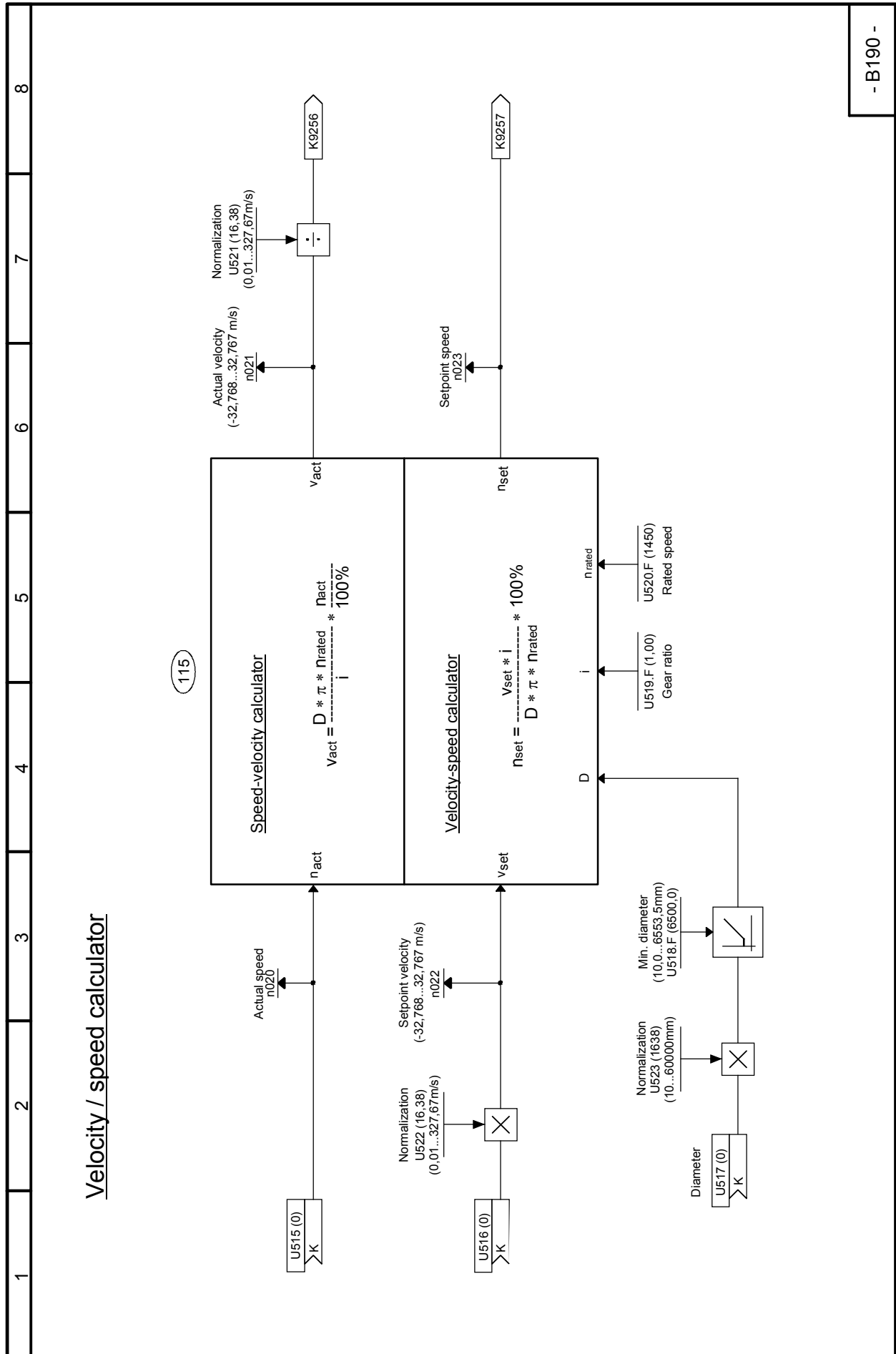


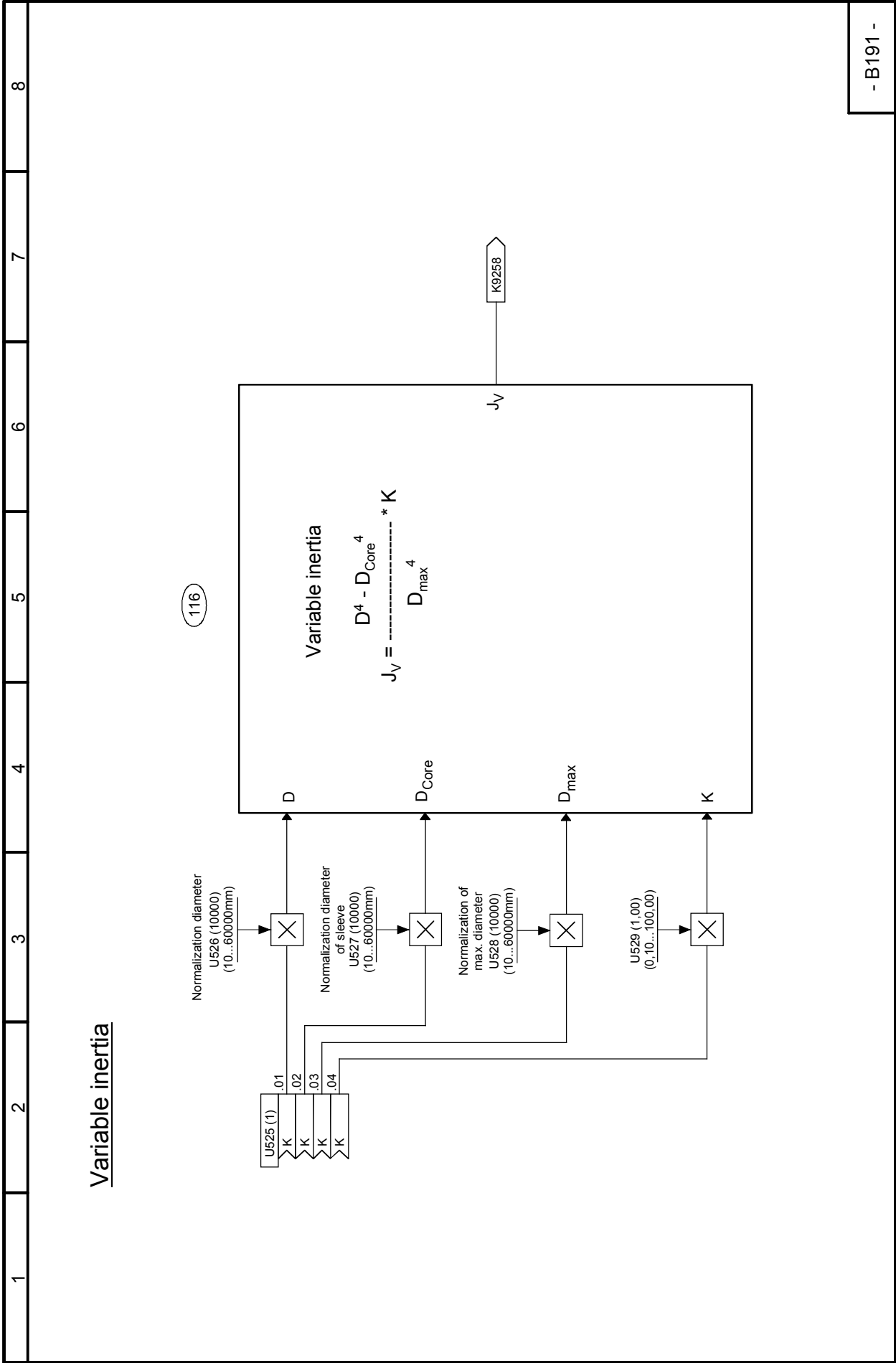
## Sheet B189 PI controller 10



- B189 -

## Sheet B190 Velocity / speed calculator

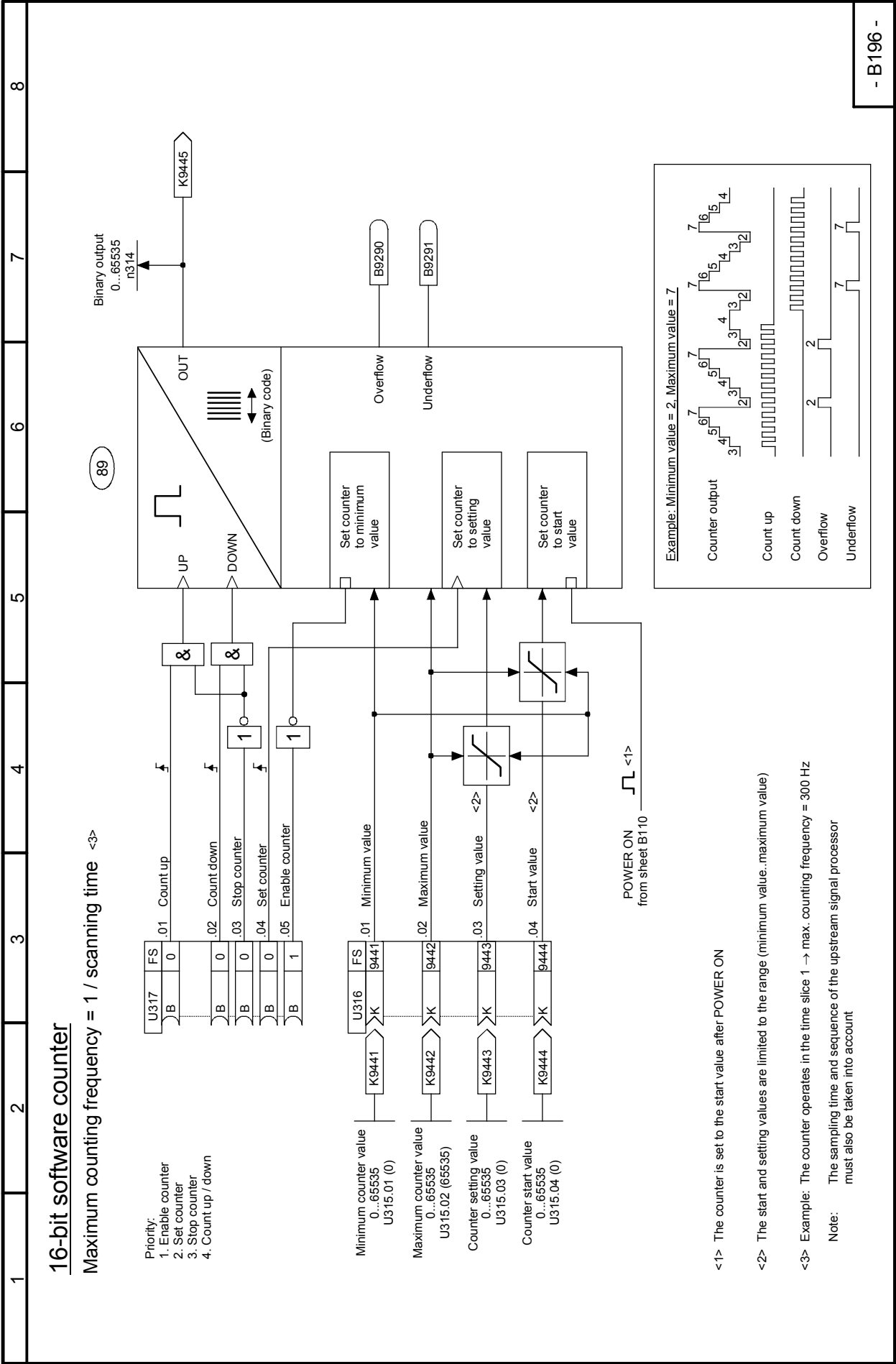




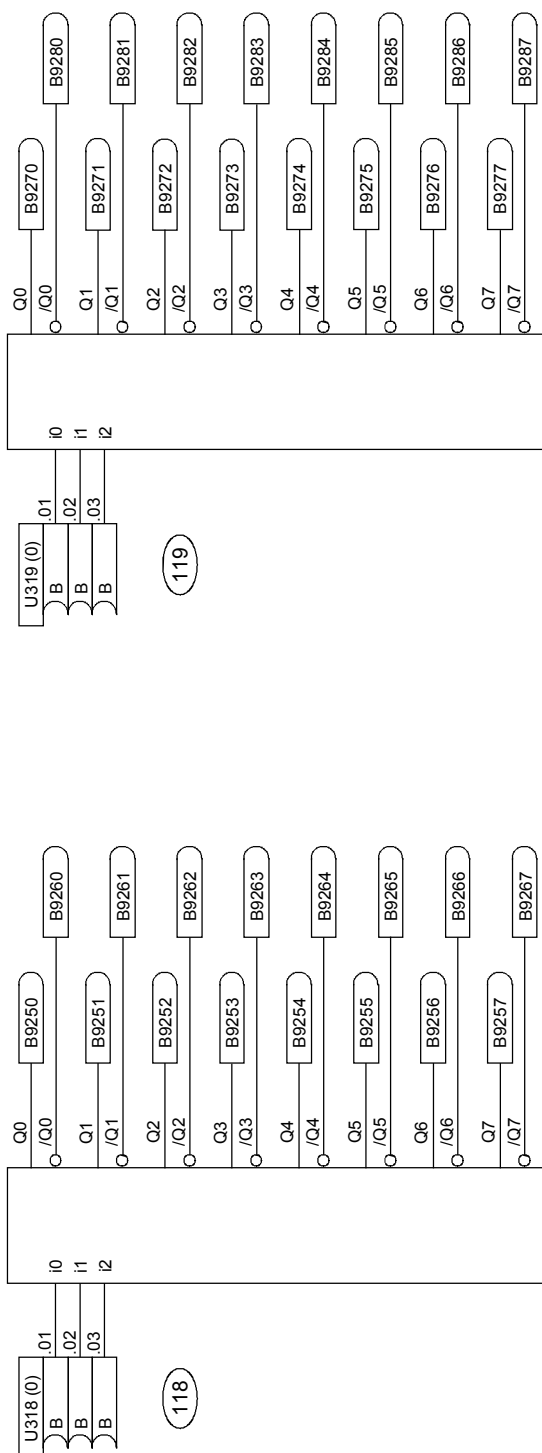
## 88



10



## 2 decoders / demultiplexers, binary to 1 of 8

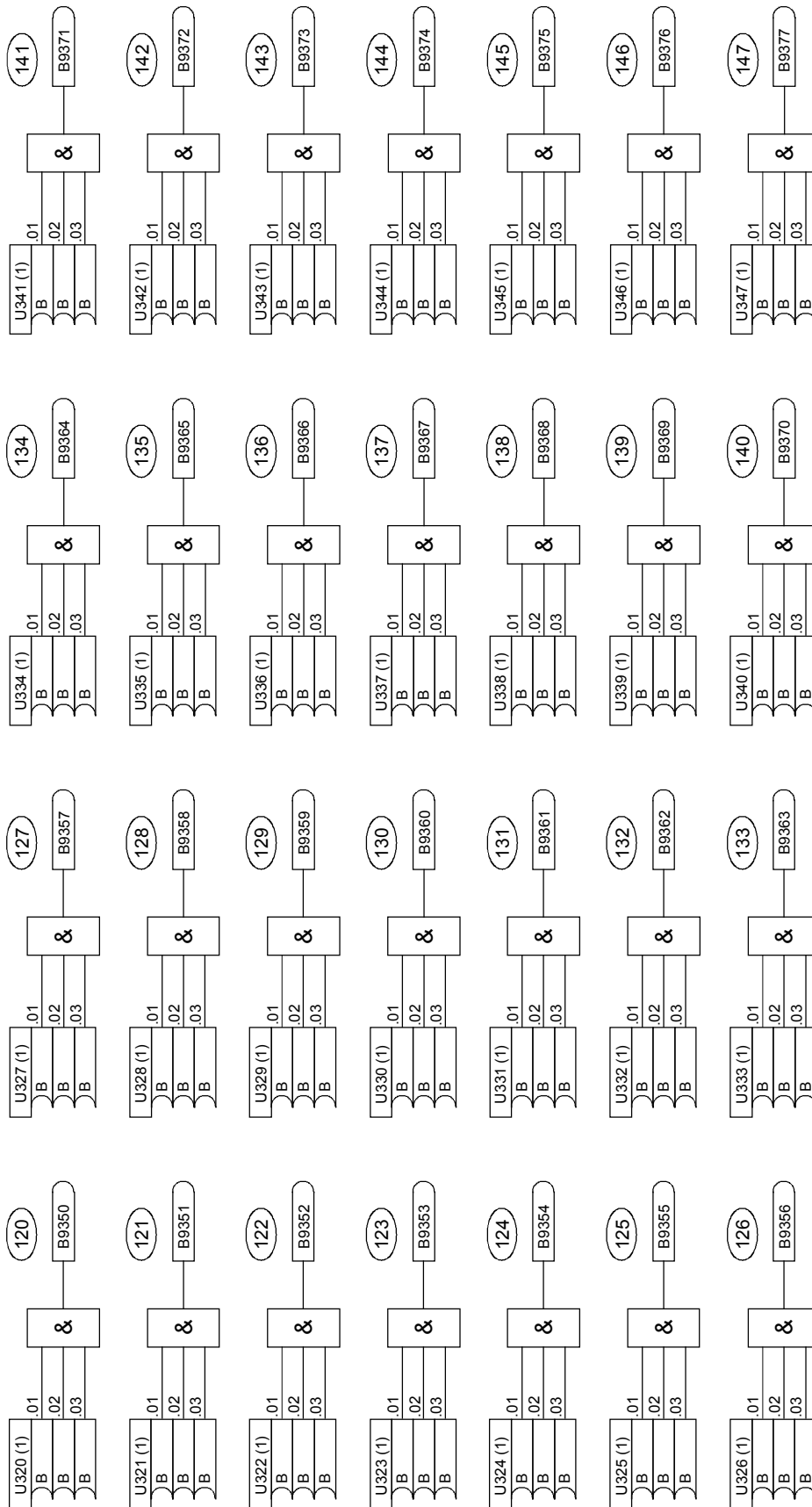


|          | Q0 | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | /Q0/Q1 | /Q2/Q3 | /Q4/Q5 | /Q6/Q7 |
|----------|----|----|----|----|----|----|----|----|--------|--------|--------|--------|
| 12:11-10 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0      | 1      | 1      | 1      |
| 000      | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1      | 1      | 1      | 1      |
| 001      | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 1      | 0      | 1      | 1      |
| 010      | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 1      | 1      | 1      | 1      |
| 011      | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 1      | 1      | 0      | 1      |
| 100      | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 1      | 1      | 1      | 1      |
| 101      | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 1      | 1      | 1      | 0      |
| 110      | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1      | 1      | 1      | 1      |
| 111      | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1      | 1      | 1      | 1      |

## Sheet B205 AND elements

- B205 -

## 28 AND elements with 3 inputs each



## Sheet B206 OR elements, EXCLUSIVE OR elements

| 1                                                       | 2                                                       | 3                                                       | 4                                                       | 5                                                       | 6                                                       | 7                                                       | 8                                                       |
|---------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|
| 20 OR elements with 3 inputs each                       |                                                         |                                                         |                                                         | 4 EXCLUSIVE OR elements with 2 inputs each              |                                                         |                                                         |                                                         |
| <div>U350 (0)<br/>B<br/>B<br/>B<br/>150<br/>B9380</div> | <div>U351 (0)<br/>B<br/>B<br/>B<br/>151<br/>B9381</div> | <div>U352 (0)<br/>B<br/>B<br/>B<br/>152<br/>B9382</div> | <div>U353 (0)<br/>B<br/>B<br/>B<br/>153<br/>B9383</div> | <div>U354 (0)<br/>B<br/>B<br/>B<br/>154<br/>B9384</div> | <div>U355 (0)<br/>B<br/>B<br/>B<br/>155<br/>B9385</div> | <div>U356 (0)<br/>B<br/>B<br/>B<br/>156<br/>B9386</div> | <div>U357 (0)<br/>B<br/>B<br/>B<br/>157<br/>B9387</div> |
| <div>U358 (0)<br/>B<br/>B<br/>B<br/>158<br/>B9388</div> | <div>U359 (0)<br/>B<br/>B<br/>B<br/>159<br/>B9389</div> | <div>U360 (0)<br/>B<br/>B<br/>B<br/>160<br/>B9390</div> | <div>U361 (0)<br/>B<br/>B<br/>B<br/>161<br/>B9391</div> | <div>U362 (0)<br/>B<br/>B<br/>B<br/>162<br/>B9392</div> | <div>U363 (0)<br/>B<br/>B<br/>B<br/>163<br/>B9393</div> | <div>U364 (0)<br/>B<br/>B<br/>B<br/>164<br/>B9394</div> | <div>U365 (0)<br/>B<br/>B<br/>B<br/>165<br/>B9395</div> |
| <div>U366 (0)<br/>B<br/>B<br/>B<br/>166<br/>B9396</div> | <div>U367 (0)<br/>B<br/>B<br/>B<br/>167<br/>B9397</div> | <div>U368 (0)<br/>B<br/>B<br/>B<br/>168<br/>B9398</div> | <div>U369 (0)<br/>B<br/>B<br/>B<br/>169<br/>B9399</div> | <div>U370 (0)<br/>B<br/>B<br/>B<br/>170<br/>B9195</div> | <div>U371 (0)<br/>B<br/>B<br/>B<br/>171<br/>B9196</div> | <div>U372 (0)<br/>B<br/>B<br/>B<br/>172<br/>B9197</div> | <div>U373 (0)<br/>B<br/>B<br/>B<br/>173<br/>B9198</div> |

- B206 -

- B206 -

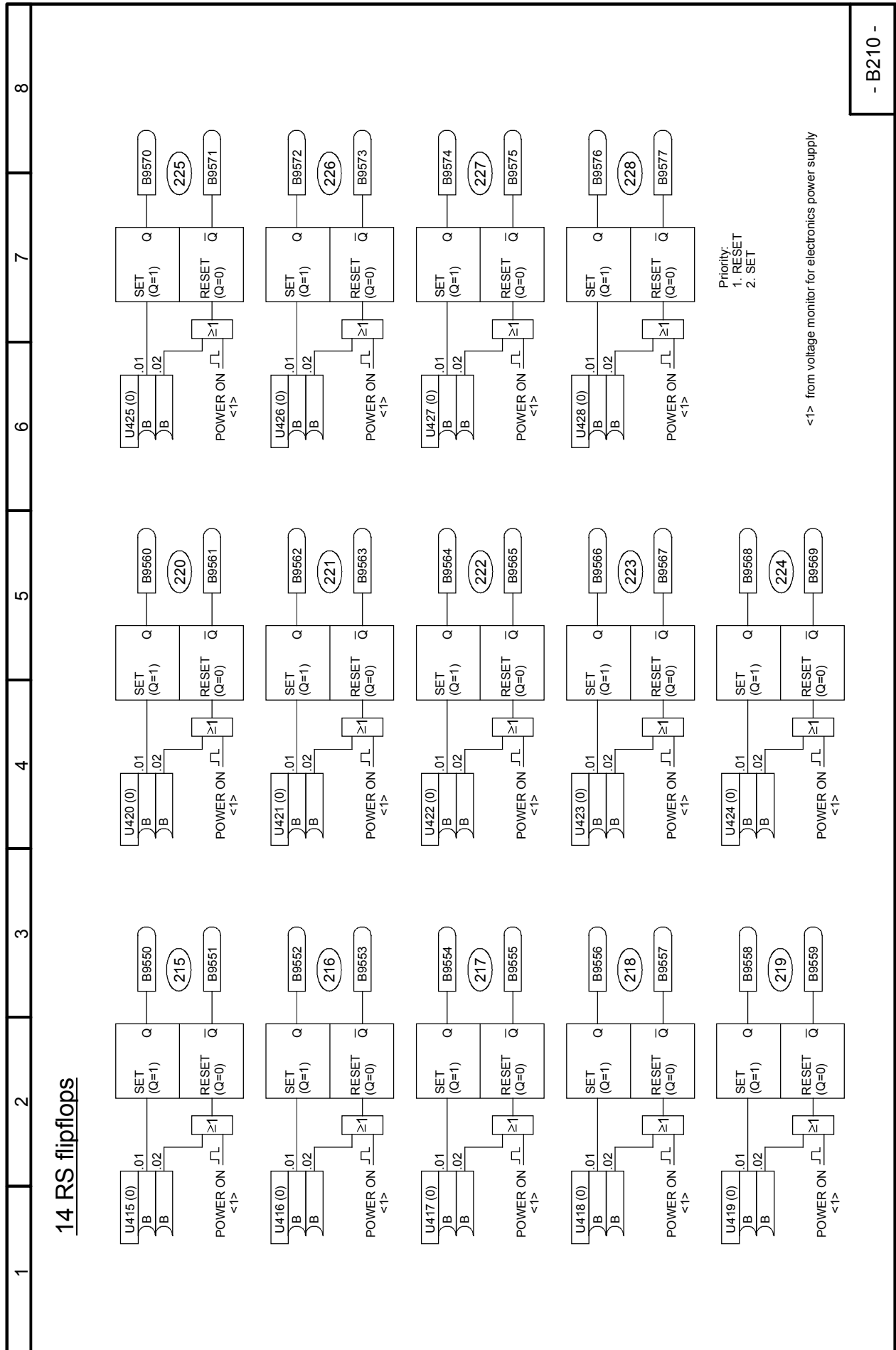


## Sheet B207 Inverters, NAND elements

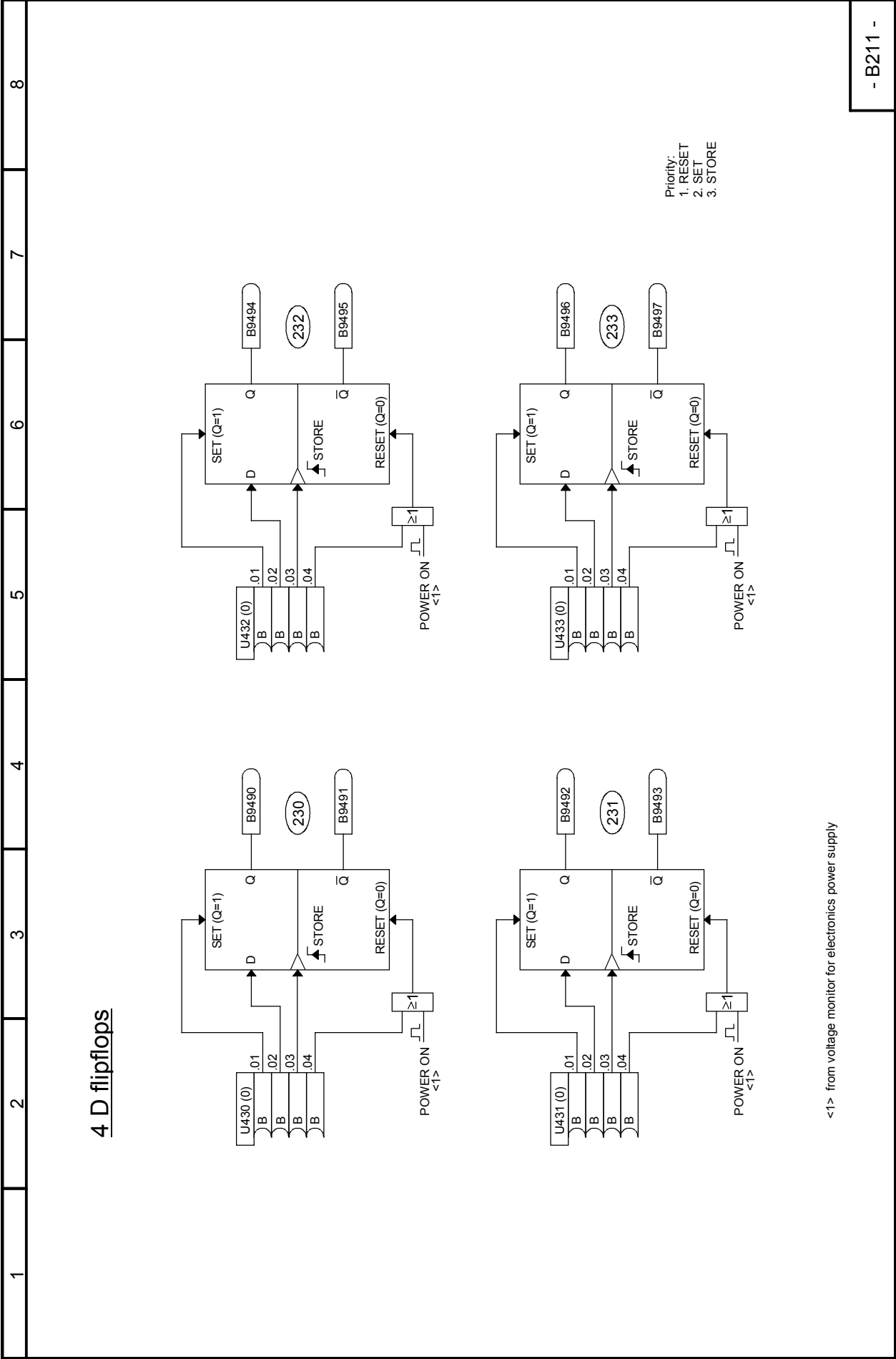
| 1                          | 2 | 3 | 4 | 5                                                 | 6 | 7 | 8 |
|----------------------------|---|---|---|---------------------------------------------------|---|---|---|
| <p><u>16 inverters</u></p> |   |   |   | <p><u>12 NAND elements with 3 inputs each</u></p> |   |   |   |

- B207 -

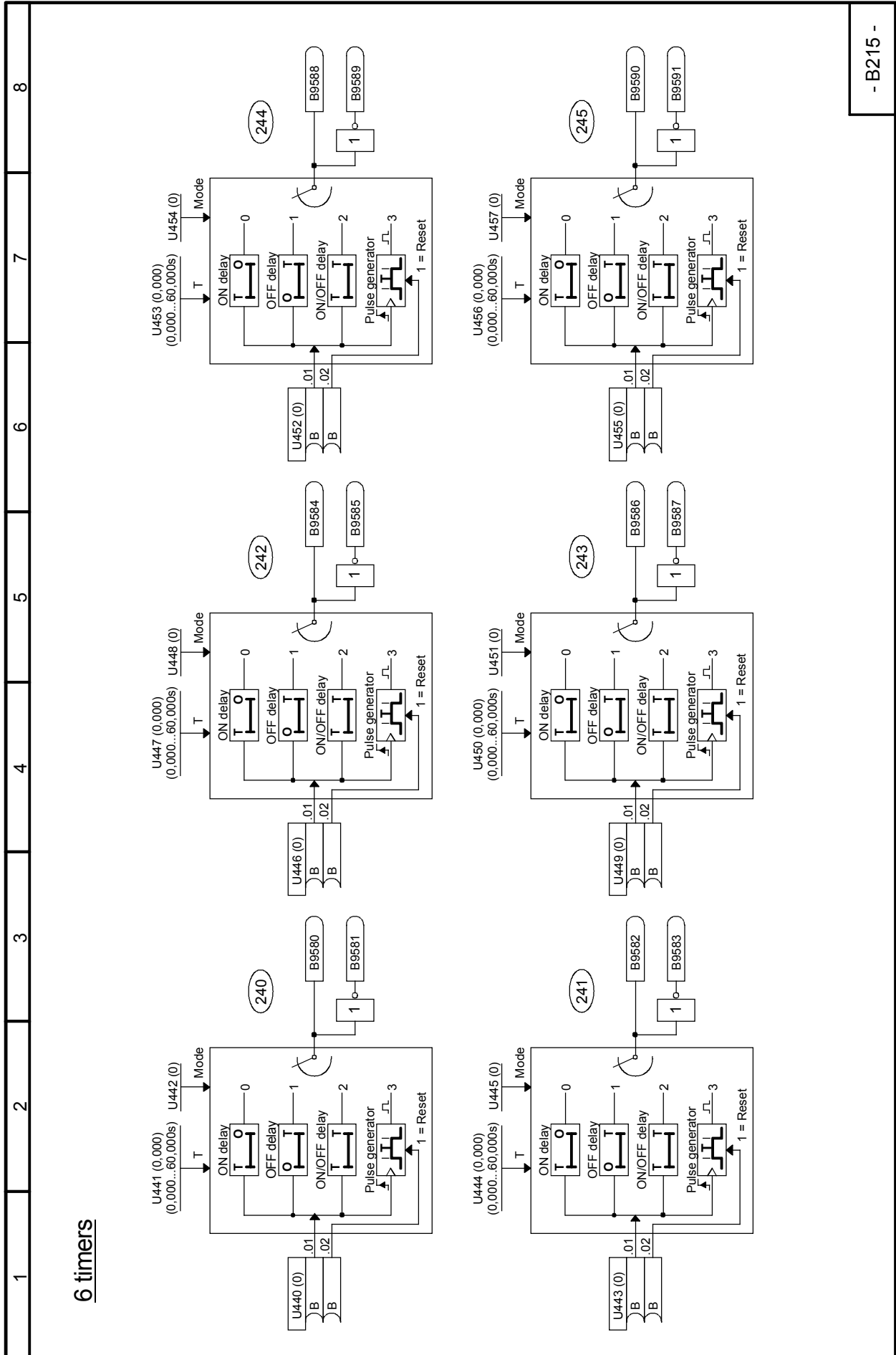
## Sheet B210 RS flipflops



- B210 -

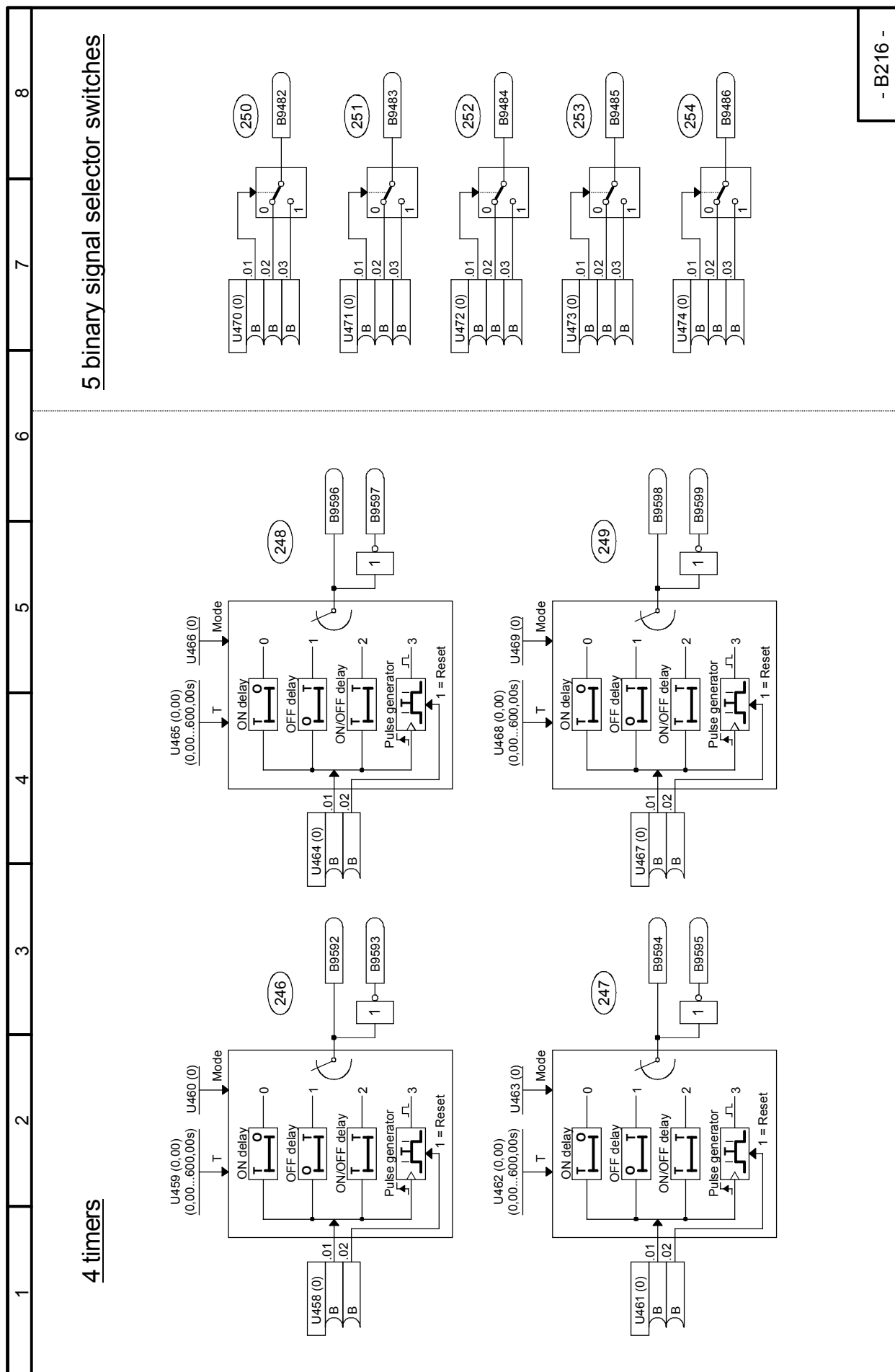


## Sheet B215 Timers (0.000...60.000s)



- B215 -

## Sheet B216 Timers (0.00...600.00s), Binary signal selector switches



- B216 -

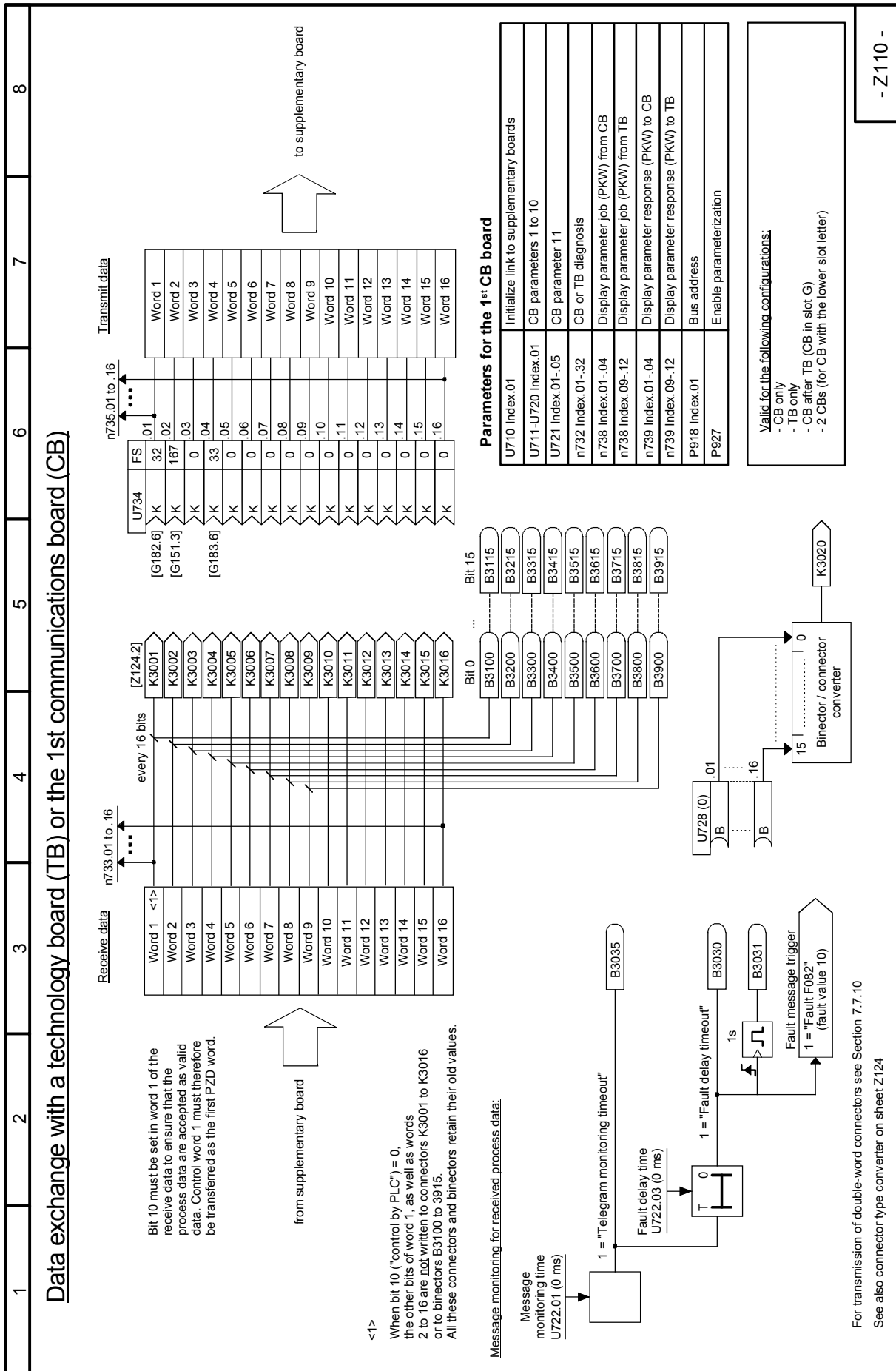
# Optional supplementary boards Sheets Z100 to Z156

## Sheet Z100 Table of contents

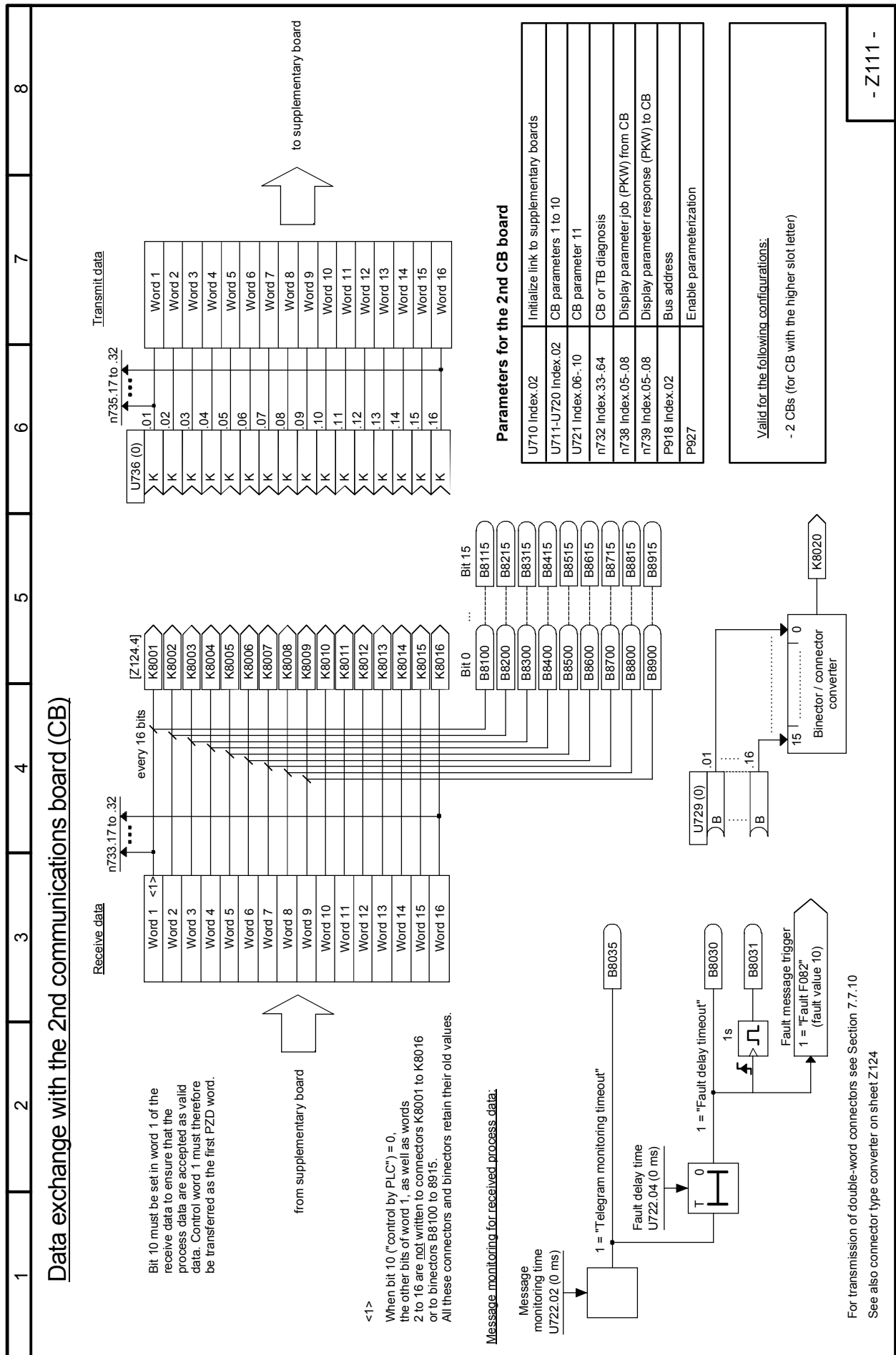
|                                                                                     |   |   |   |              |   |   |   |
|-------------------------------------------------------------------------------------|---|---|---|--------------|---|---|---|
| 1                                                                                   | 2 | 3 | 4 | 5            | 6 | 7 | 8 |
| <h2>Function diagram SIMOREG 6RA70 - Contents of optional supplementary boards</h2> |   |   |   |              |   |   |   |
| <u>Content</u>                                                                      |   |   |   | <u>Sheet</u> |   |   |   |
| Data exchange with a technology board (TB) or the 1st communication board (CB)      |   |   |   | Z110         |   |   |   |
| Data exchange with the 2nd communication board (CB)                                 |   |   |   | Z111         |   |   |   |
| 1st EB1 analog inputs                                                               |   |   |   | Z112         |   |   |   |
| 1st EB1 analog outputs                                                              |   |   |   | Z113         |   |   |   |
| 1st EB1 bidirectional inputs/outputs, digital inputs                                |   |   |   | Z114         |   |   |   |
| 2nd EB1 analog inputs                                                               |   |   |   | Z115         |   |   |   |
| 2nd EB1 analog outputs                                                              |   |   |   | Z116         |   |   |   |
| 2nd EB1 bidirectional inputs/outputs, digital inputs                                |   |   |   | Z117         |   |   |   |
| 1st EB2 analog input, digital inputs, relay outputs                                 |   |   |   | Z118         |   |   |   |
| 2nd EB2 analog input, digital inputs, relay outputs                                 |   |   |   | Z119         |   |   |   |
| SBP pulse encoder evaluation                                                        |   |   |   | Z120         |   |   |   |
| SIMOLINK board configuration, diagnosis                                             |   |   |   | Z121         |   |   |   |
| SIMOLINK board receiving, transmitting                                              |   |   |   | Z122         |   |   |   |
| OP1S operator panel                                                                 |   |   |   | Z123         |   |   |   |
| Interfaces: connector-type converters                                               |   |   |   | Z124         |   |   |   |
| SCB1 with SCI1 as slave 1: binary inputs                                            |   |   |   | Z130         |   |   |   |
| SCB1 with SCI1 as slave 2: binary inputs                                            |   |   |   | Z131         |   |   |   |
| SCB1 with SCI1 as slave 1: binary outputs                                           |   |   |   | Z135         |   |   |   |
| SCB1 with SCI1 as slave 2: binary outputs                                           |   |   |   | Z136         |   |   |   |
| SCB1 with SCI2 as slave 1: binary inputs                                            |   |   |   | Z140         |   |   |   |
| SCB1 with SCI2 as slave 2: binary inputs                                            |   |   |   | Z141         |   |   |   |
| SCB1 with SCI2 as slave 1: binary outputs                                           |   |   |   | Z145         |   |   |   |
| SCB1 with SCI2 as slave 2: binary outputs                                           |   |   |   | Z146         |   |   |   |
| SCB1 with SCI1 as slave 1: analog inputs                                            |   |   |   | Z150         |   |   |   |
| SCB1 with SCI1 as slave 2: analog inputs                                            |   |   |   | Z151         |   |   |   |
| SCB1 with SCI1 as slave 1: analog outputs                                           |   |   |   | Z155         |   |   |   |
| SCB1 with SCI1 as slave 2: analog outputs                                           |   |   |   | Z156         |   |   |   |

- Z100 -

# Sheet Z110 Data exchange with a technology board (TB) or the 1<sup>st</sup> communications board (CB)

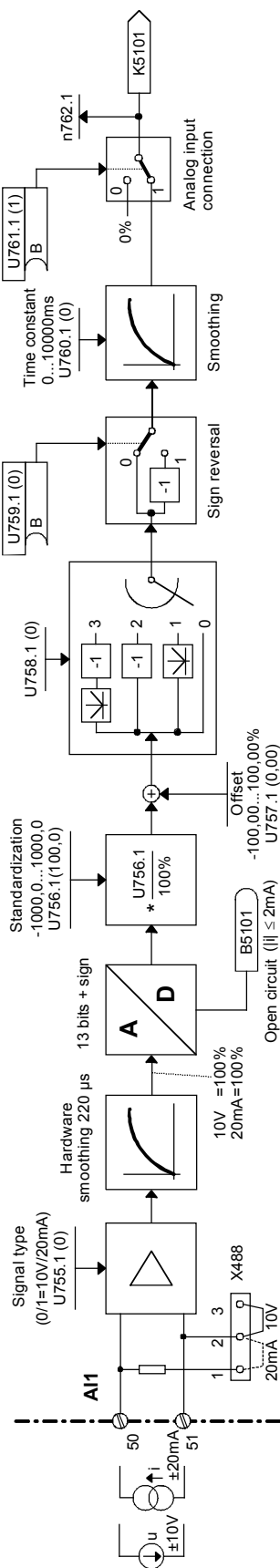


# Sheet Z111 Data exchange with the 2<sup>nd</sup> communications board (CB)

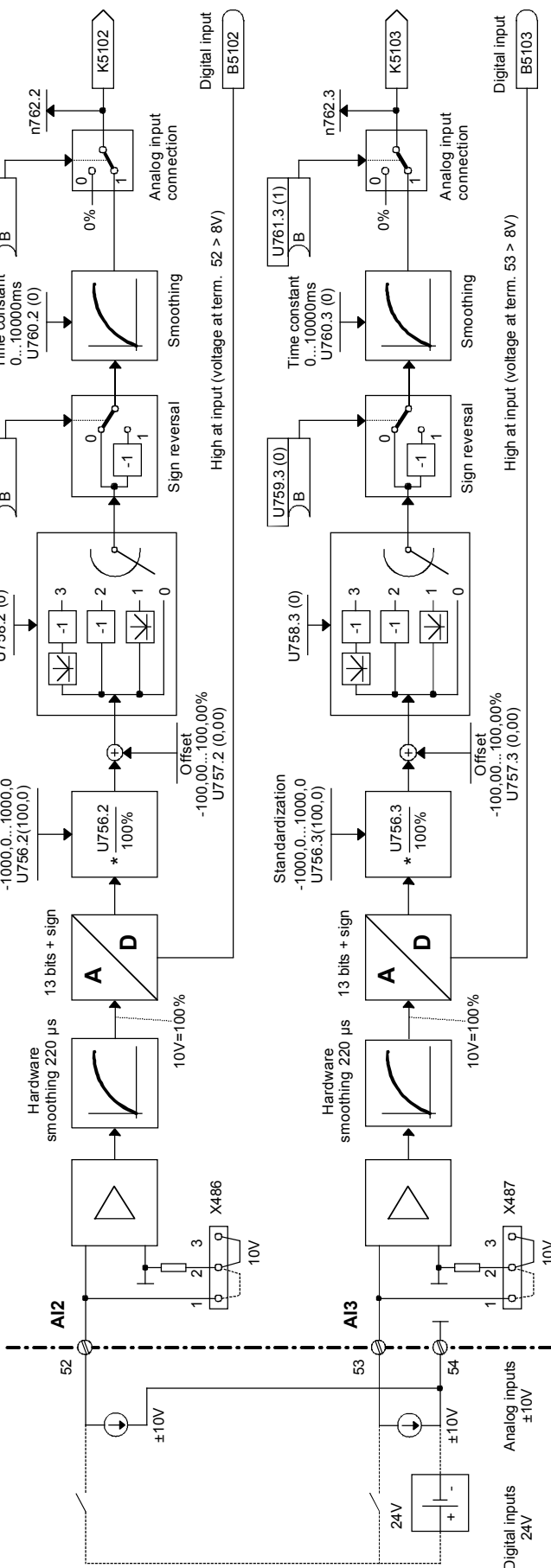




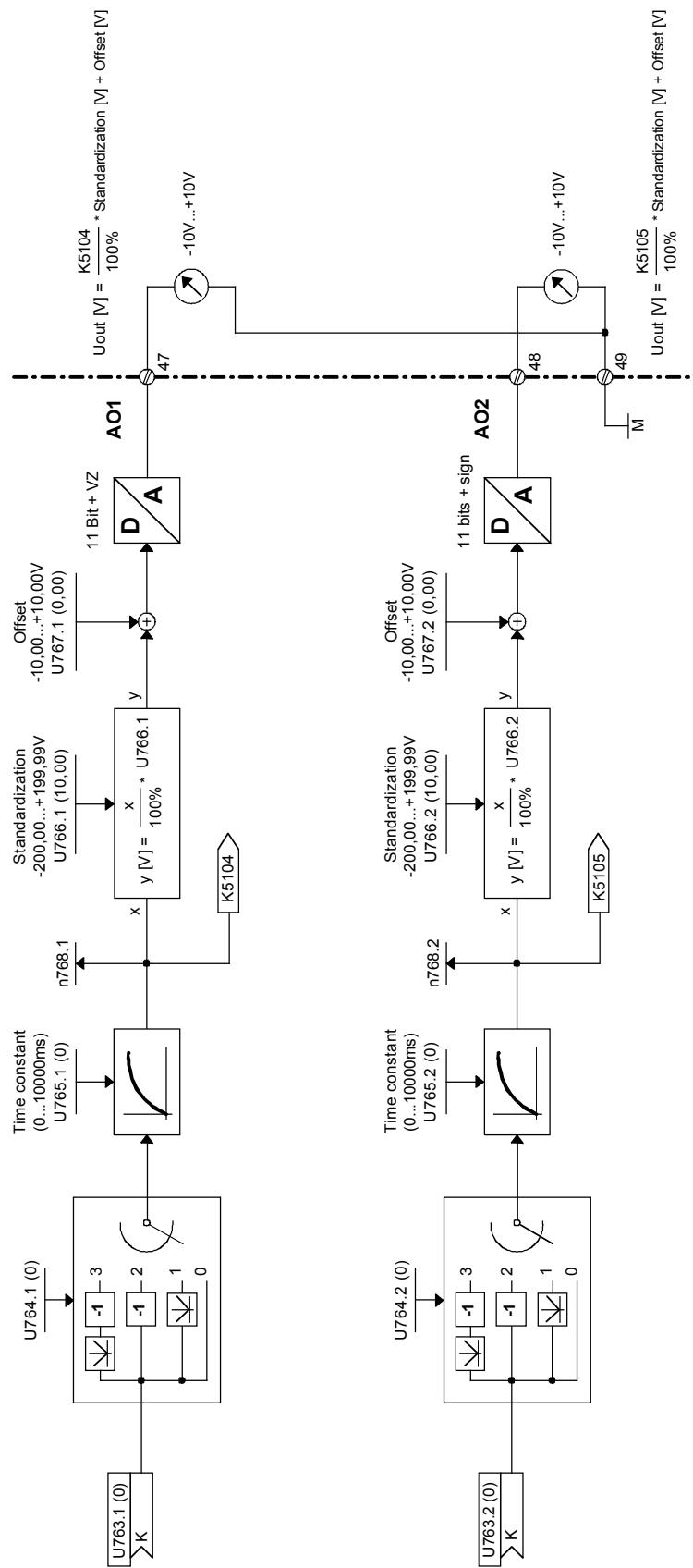
### 1st EB1: Analog input 1 (differential input)



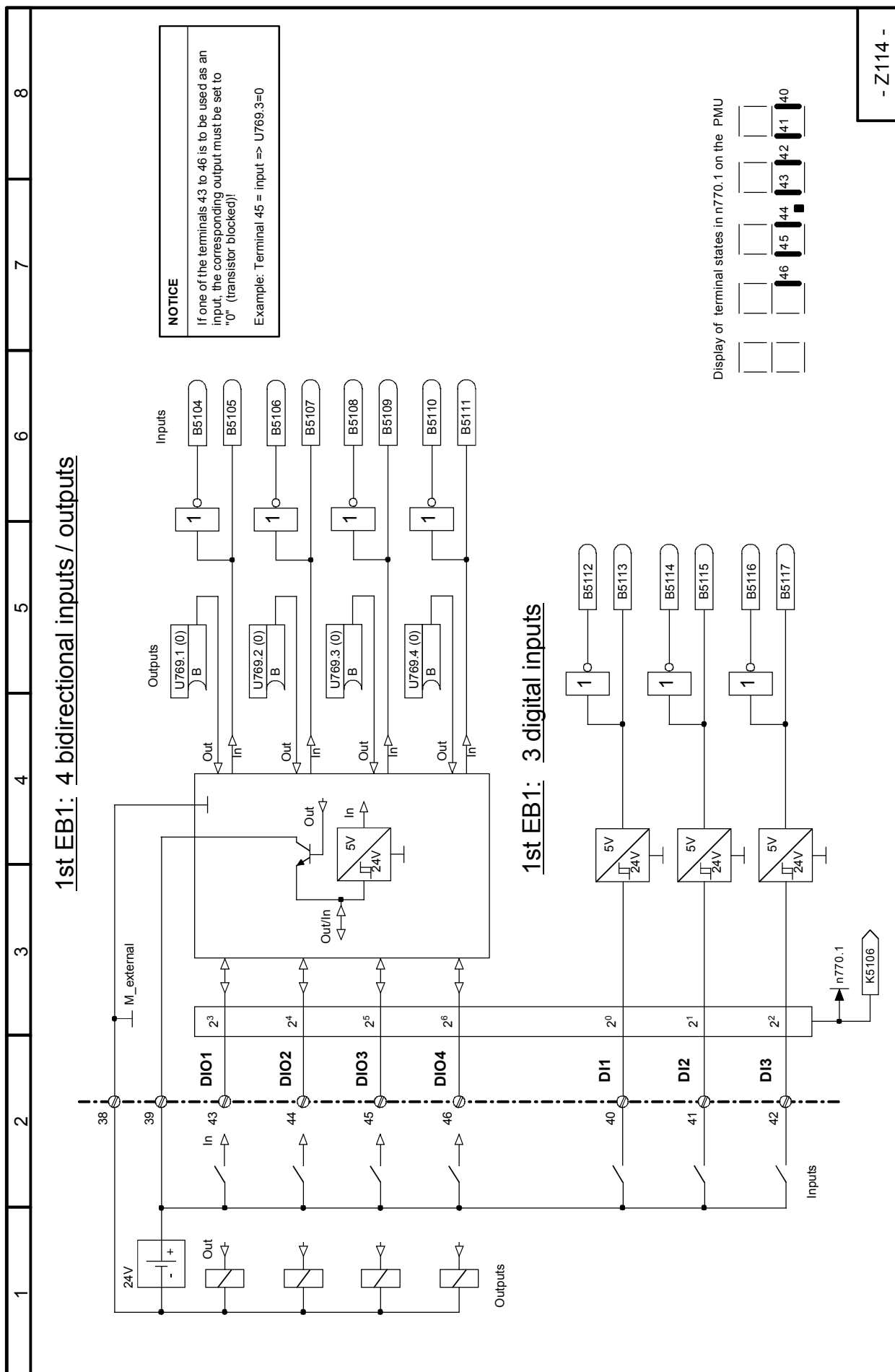
### 1st EB1: Analog inputs (to ground) also usable as digital inputs

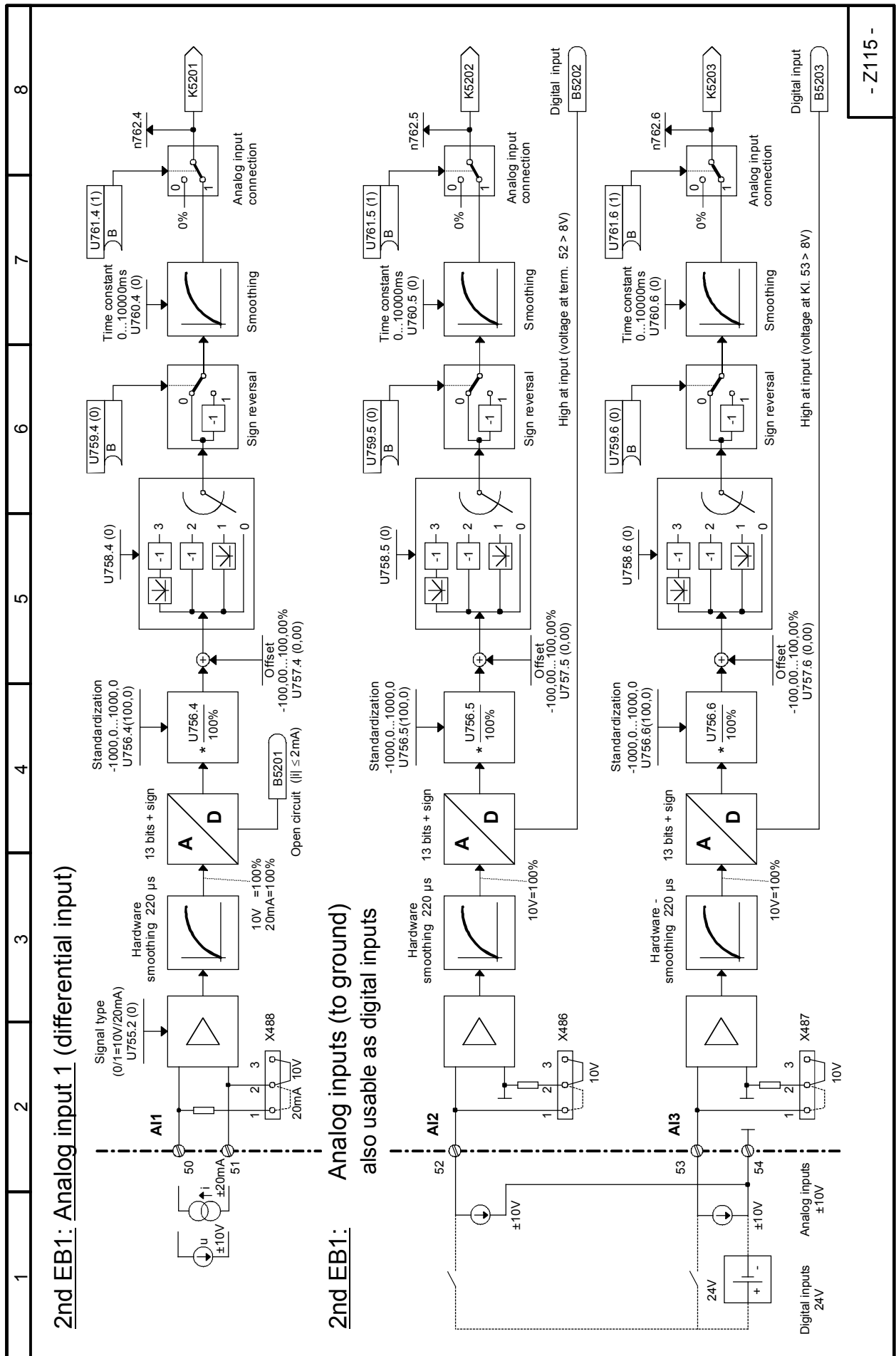


- Z112 -

Sheet Z113 1<sup>st</sup> EB1: Analog outputs1st EB1: Analog outputs

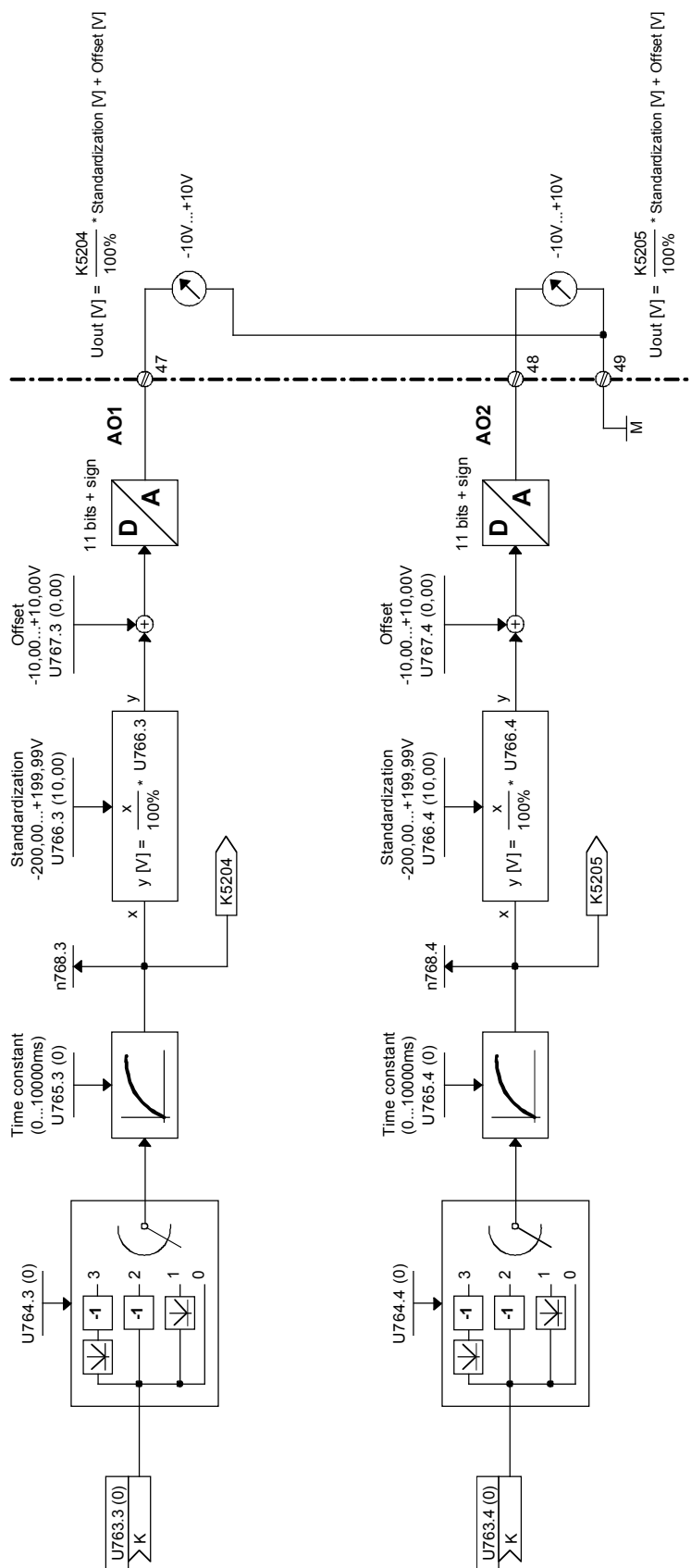
- Z113 -

**Sheet Z114 1<sup>st</sup> EB1: 4 bidirectional inputs- / outputs, 3 digital inputs**


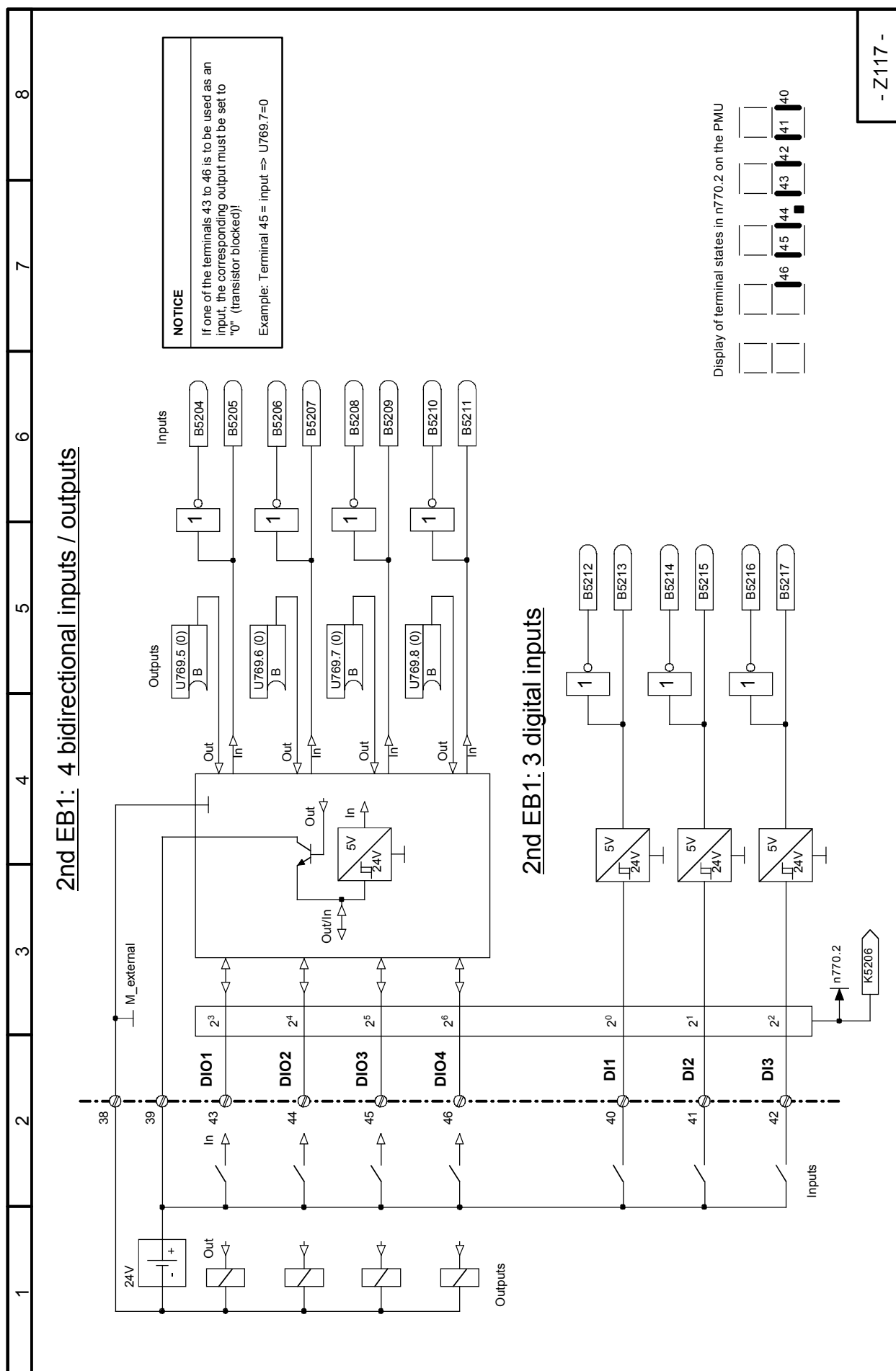
Sheet Z115 2<sup>nd</sup> EB1: Analog inputs

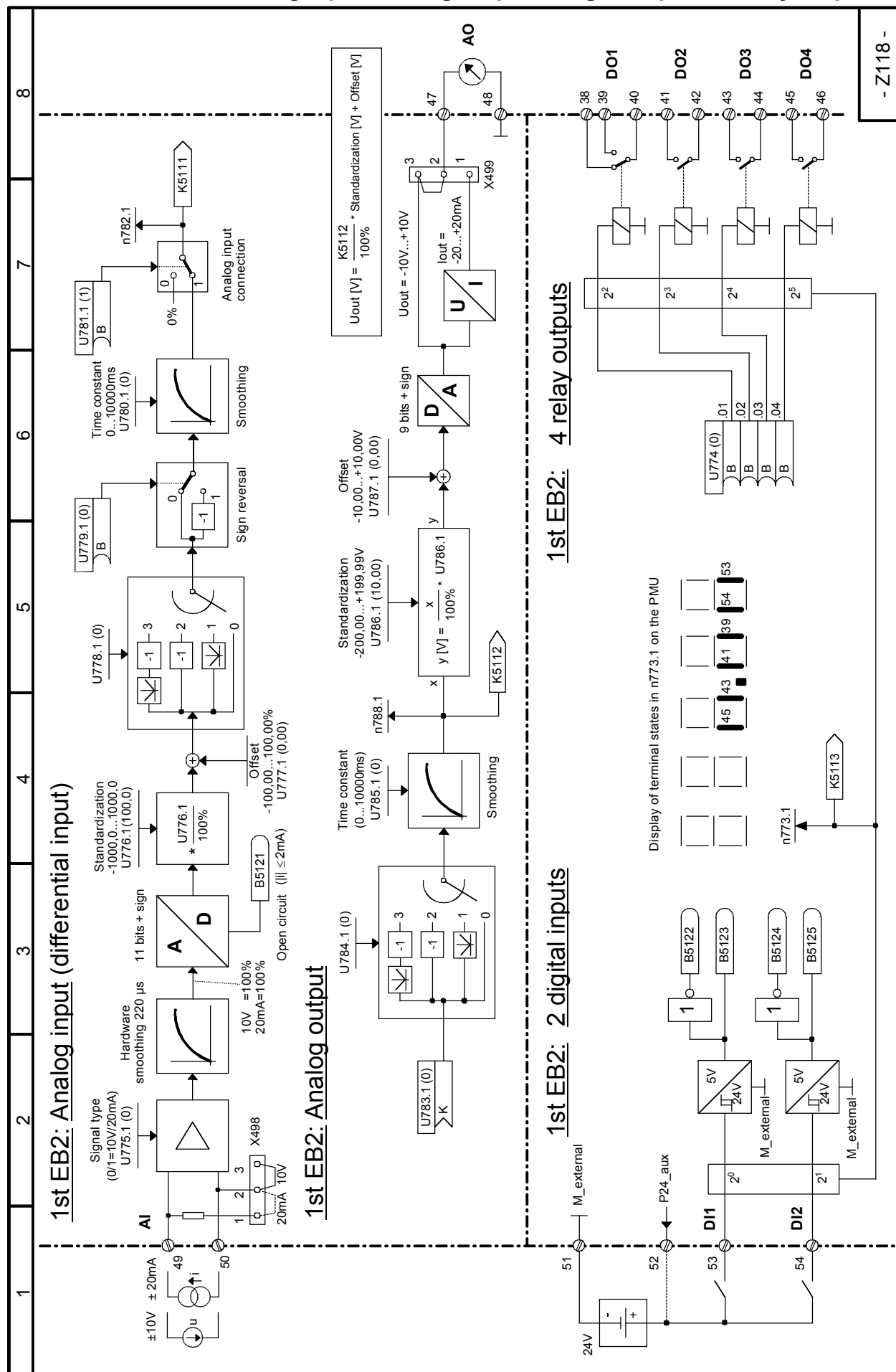
Sheet Z116 2<sup>nd</sup> EB1: Analog outputs

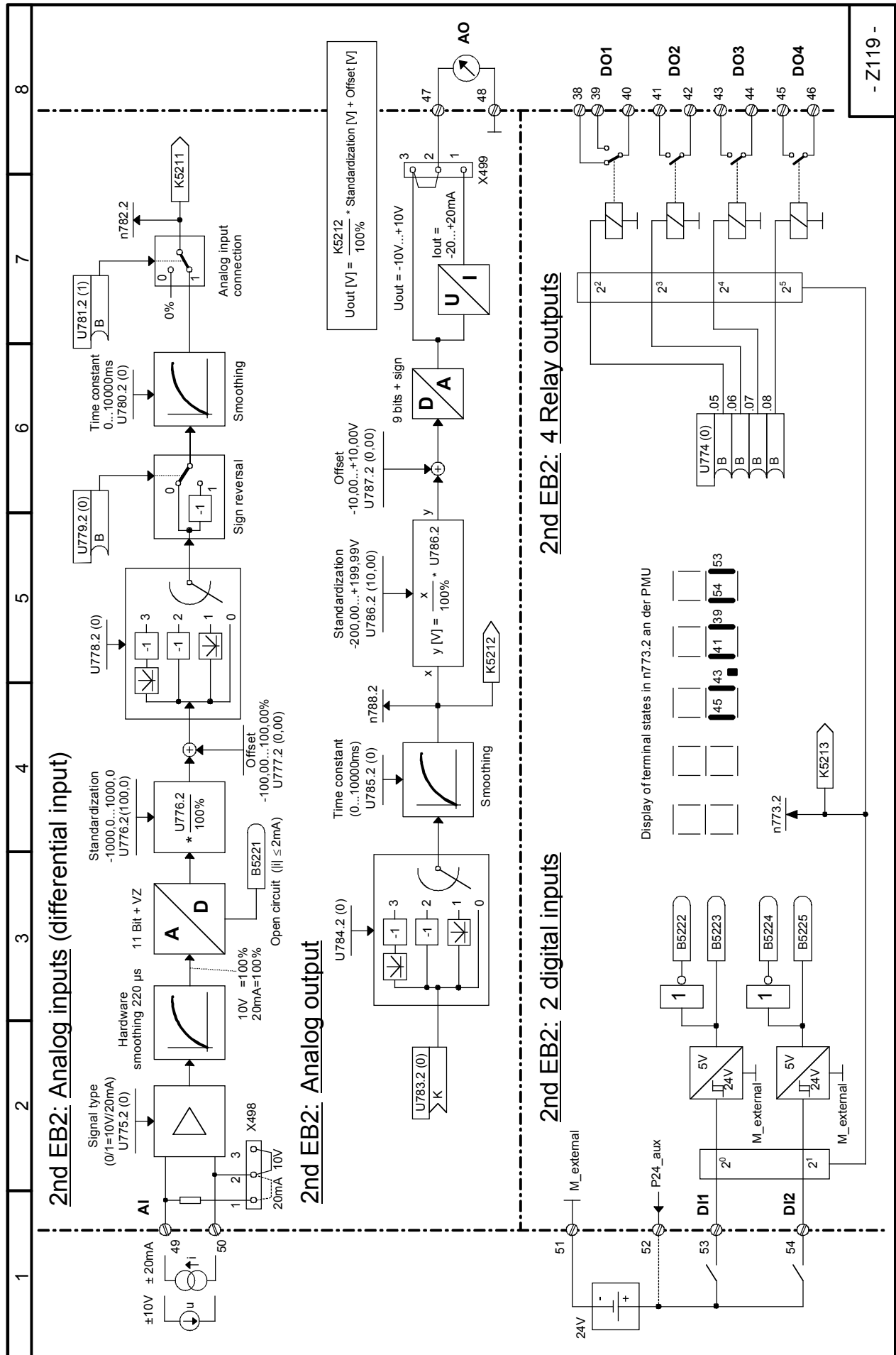
## 2nd EB1: Analog outputs



- Z116 -



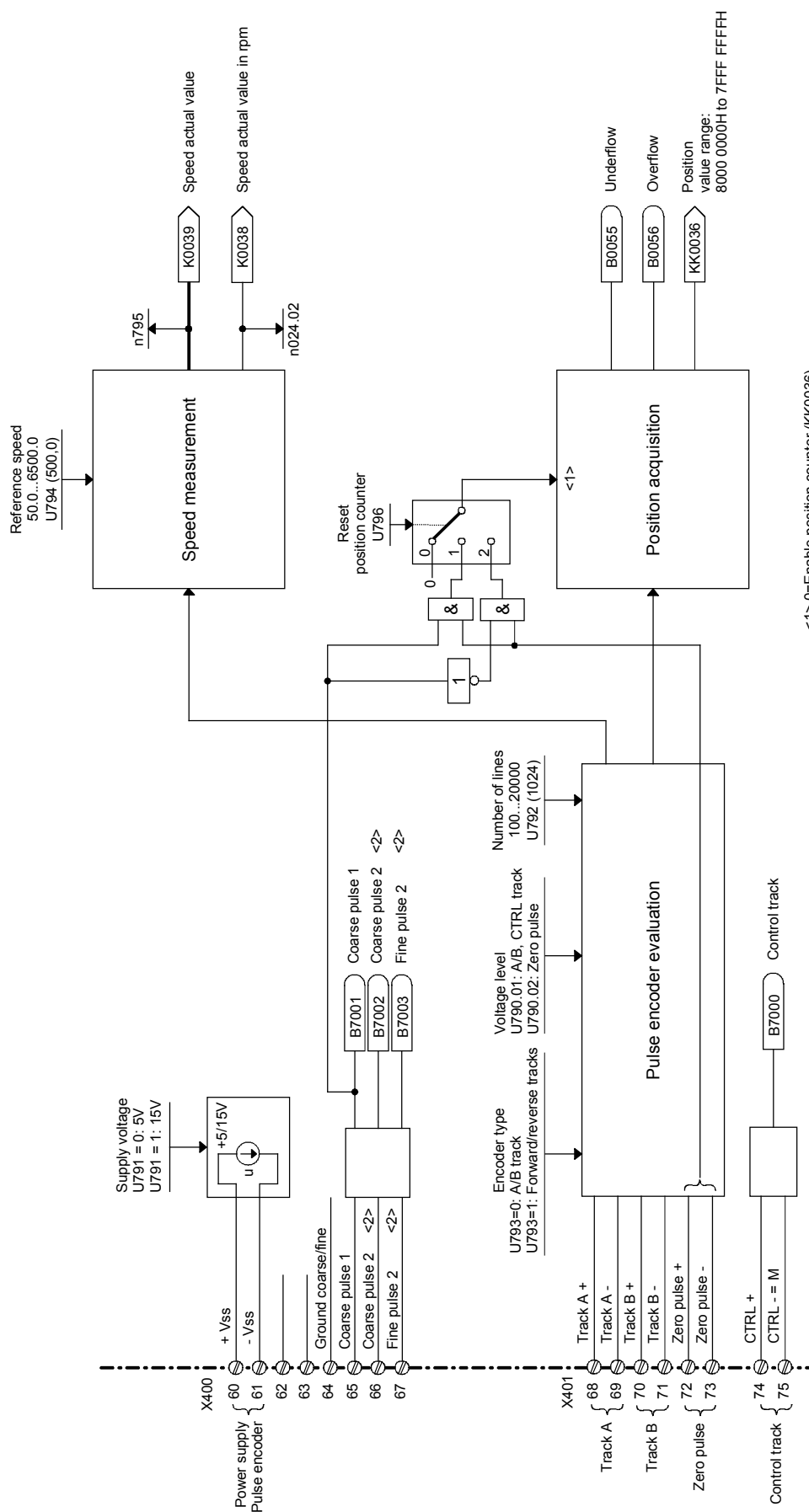


**Sheet Z119 2<sup>nd</sup> EB2: Analog input, Analog output, 2 digital inputs, 4 relay outputs**




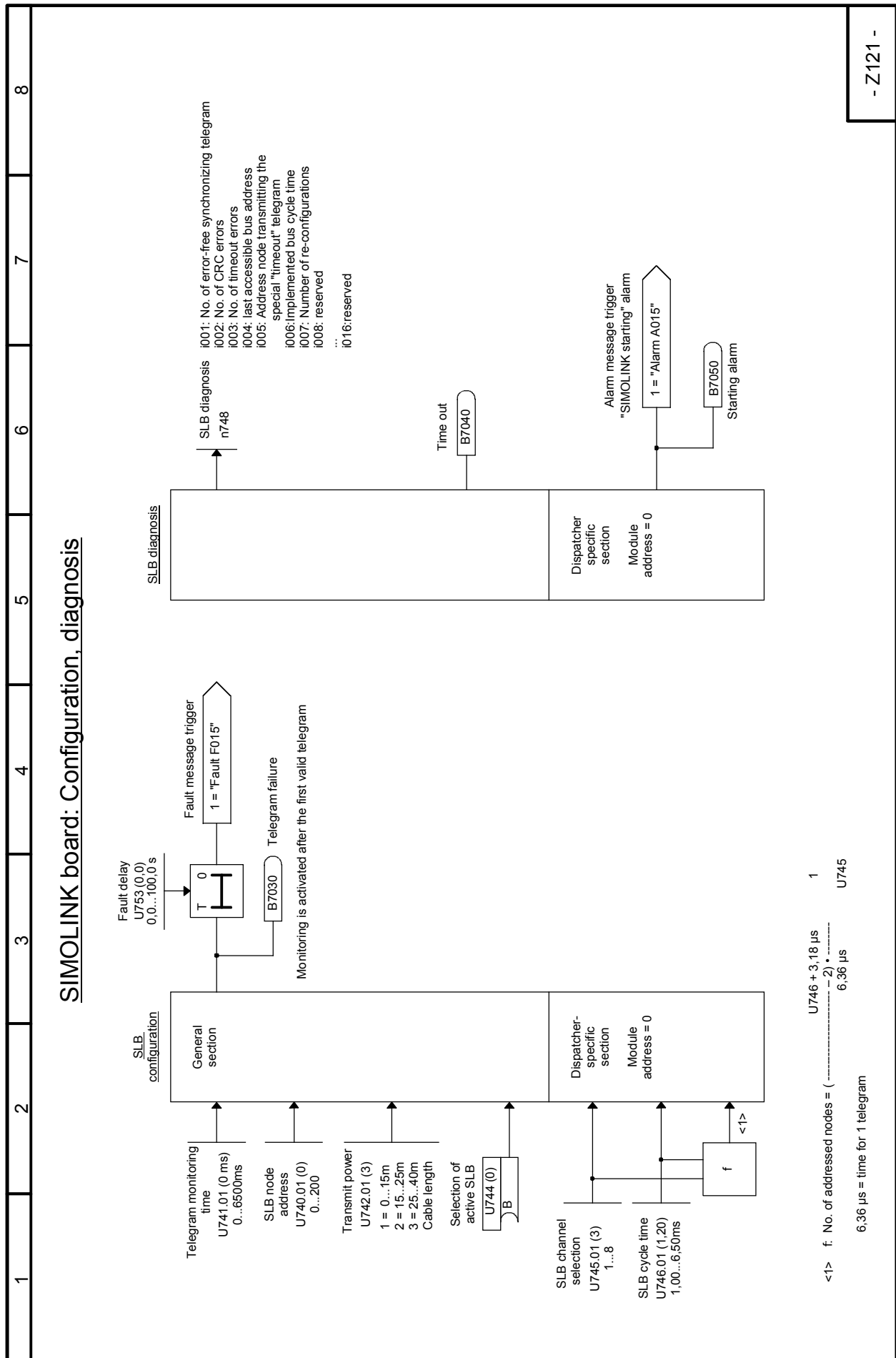
## Sheet Z120 SBP pulse encoder evaluation

## SBP pulse encoder evaluation

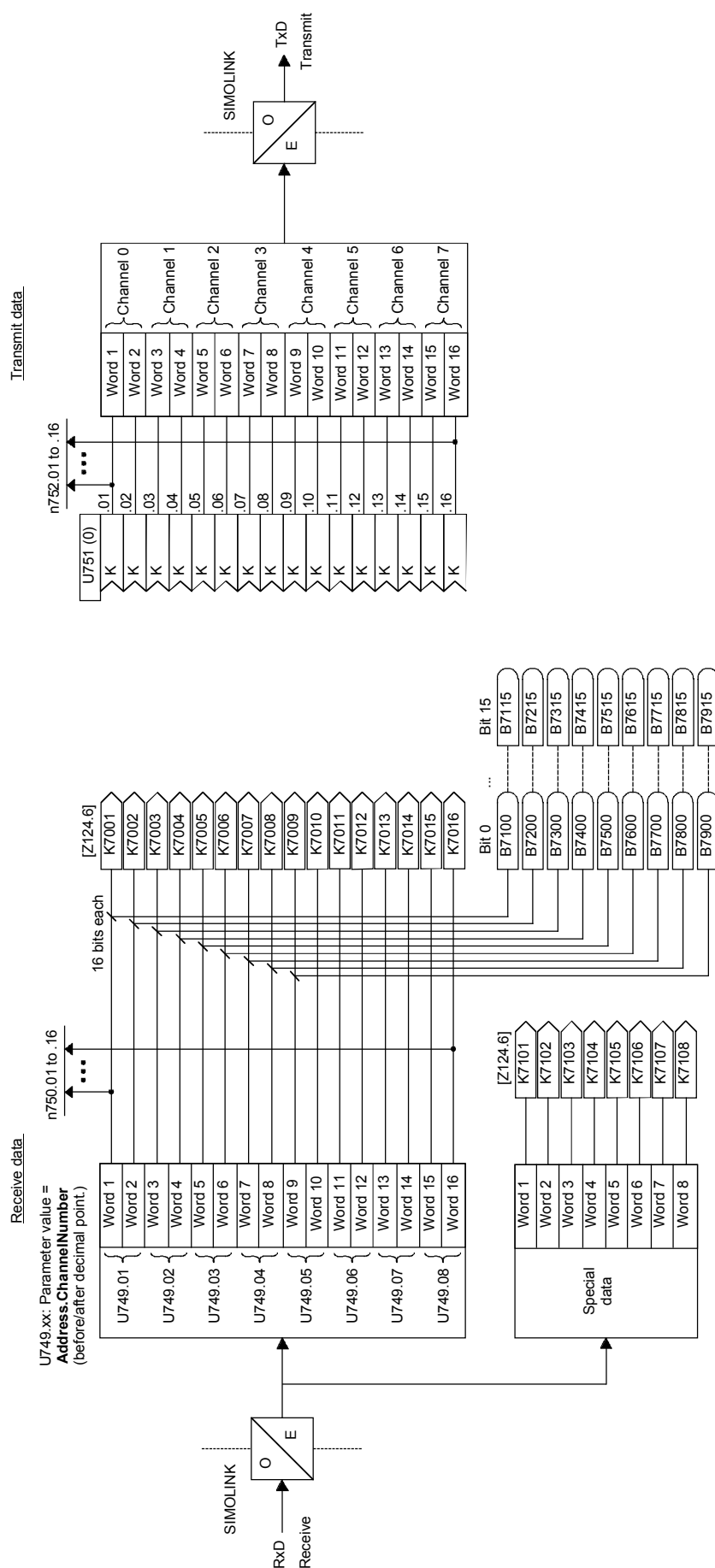


- Z120 -

## Sheet Z121 SIMOLINK board: Configuration, diagnosis

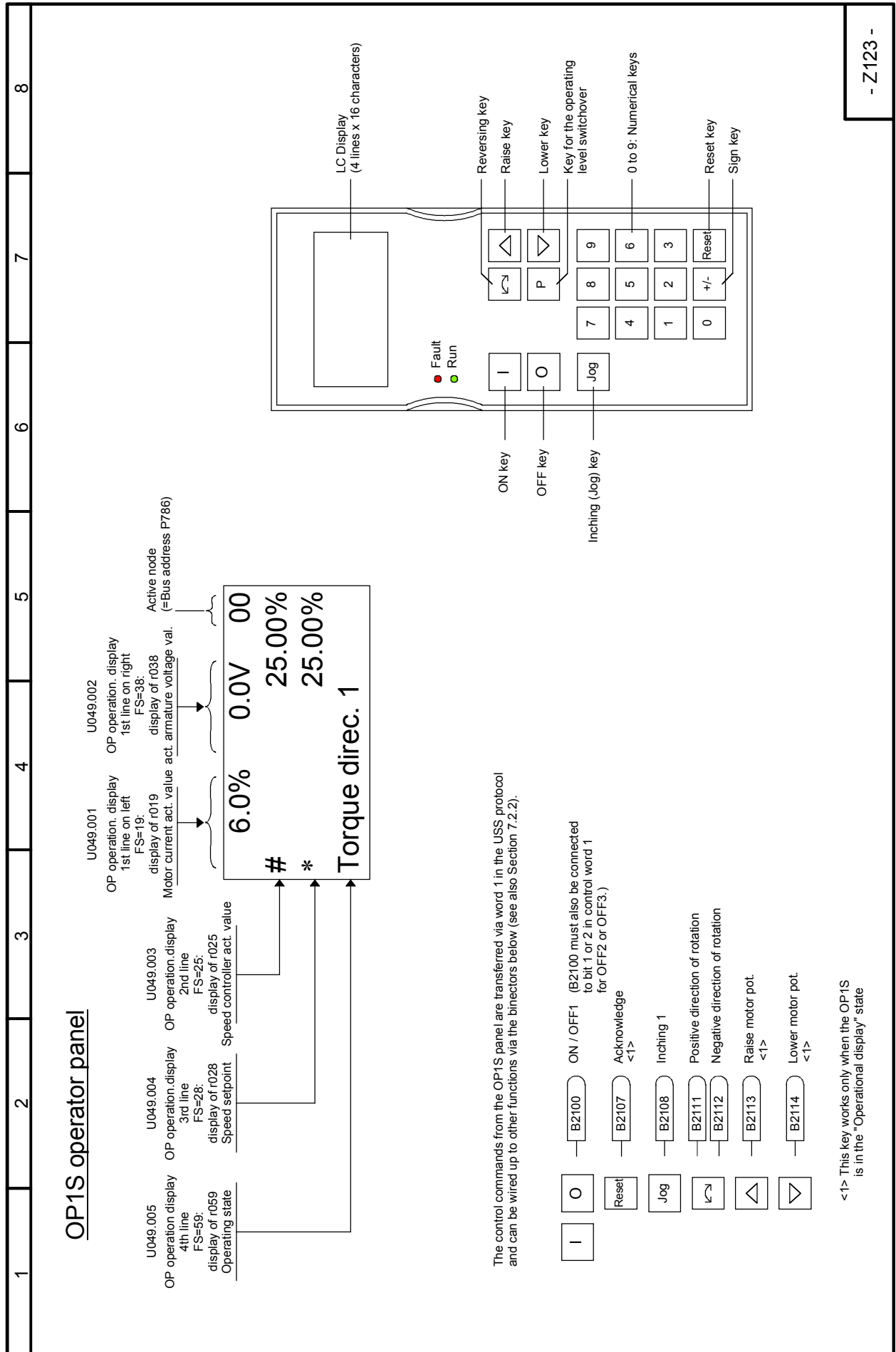


### SIMOLINK board: Receiving, transmitting

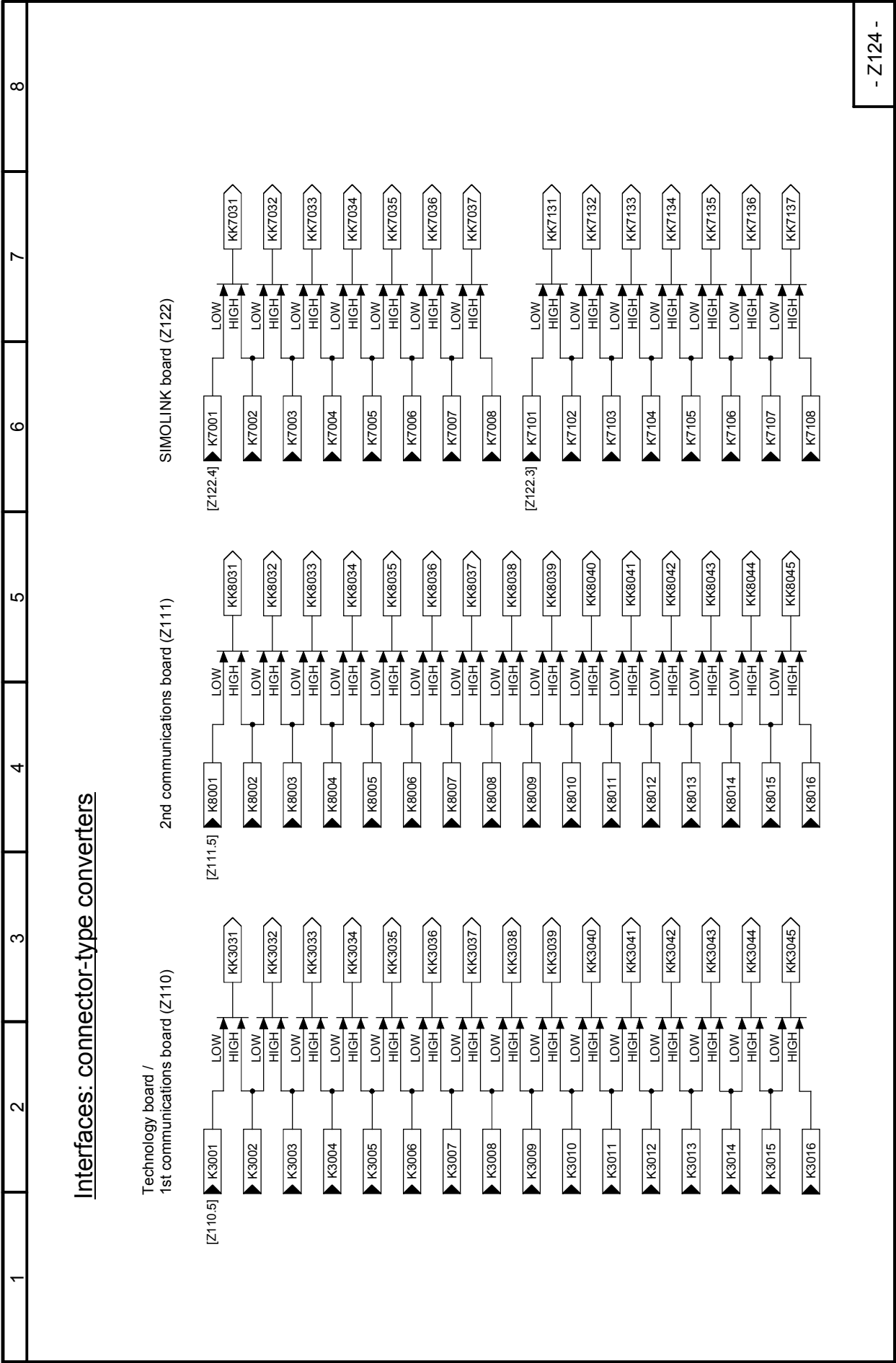


For transmission of double-word connectors see Section 7.7.4 "Procedure for starting up SIMOLINK boards"  
See also connector type converter on sheet Z124

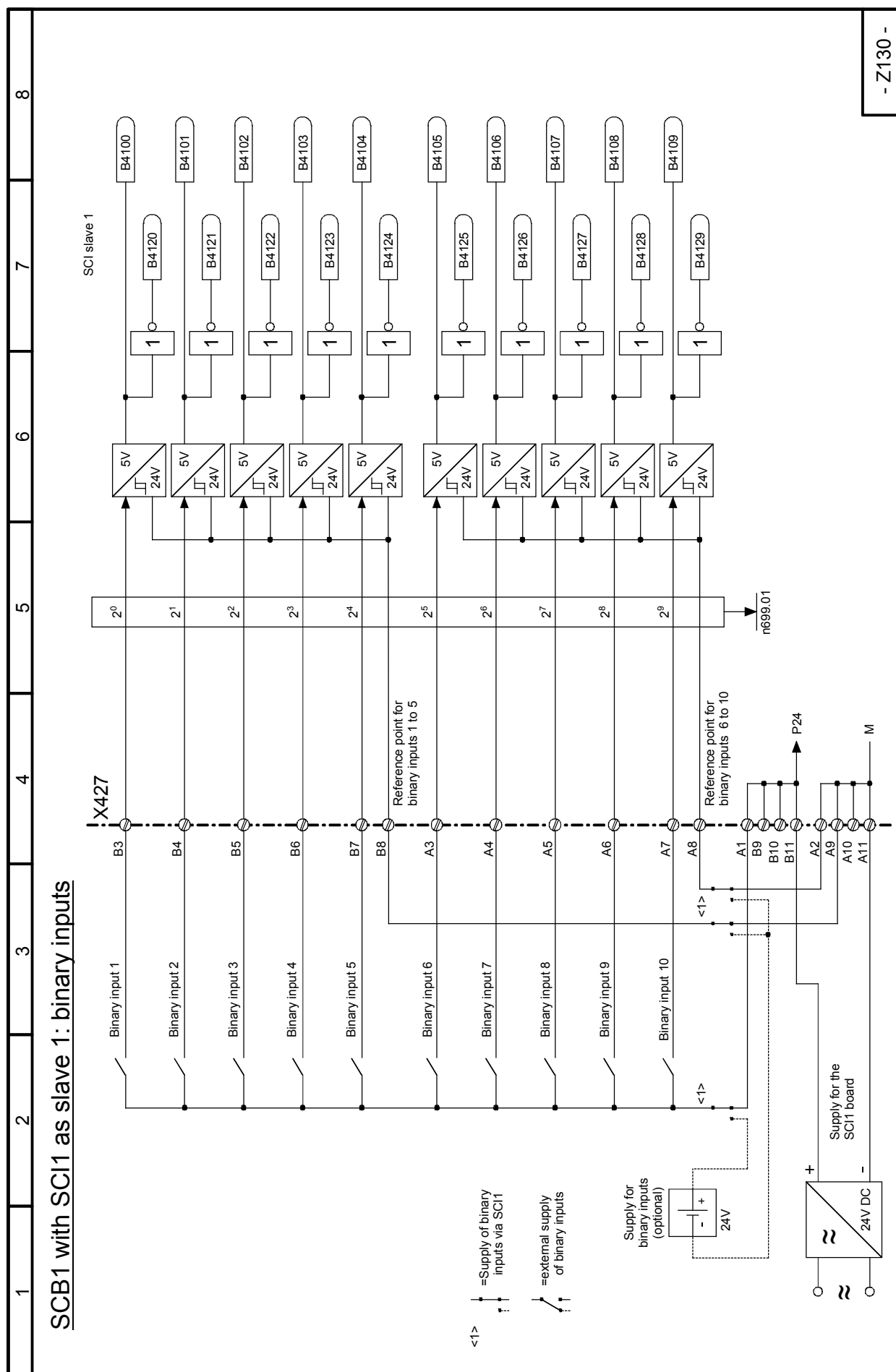
## Sheet Z123 OP1S operator panel



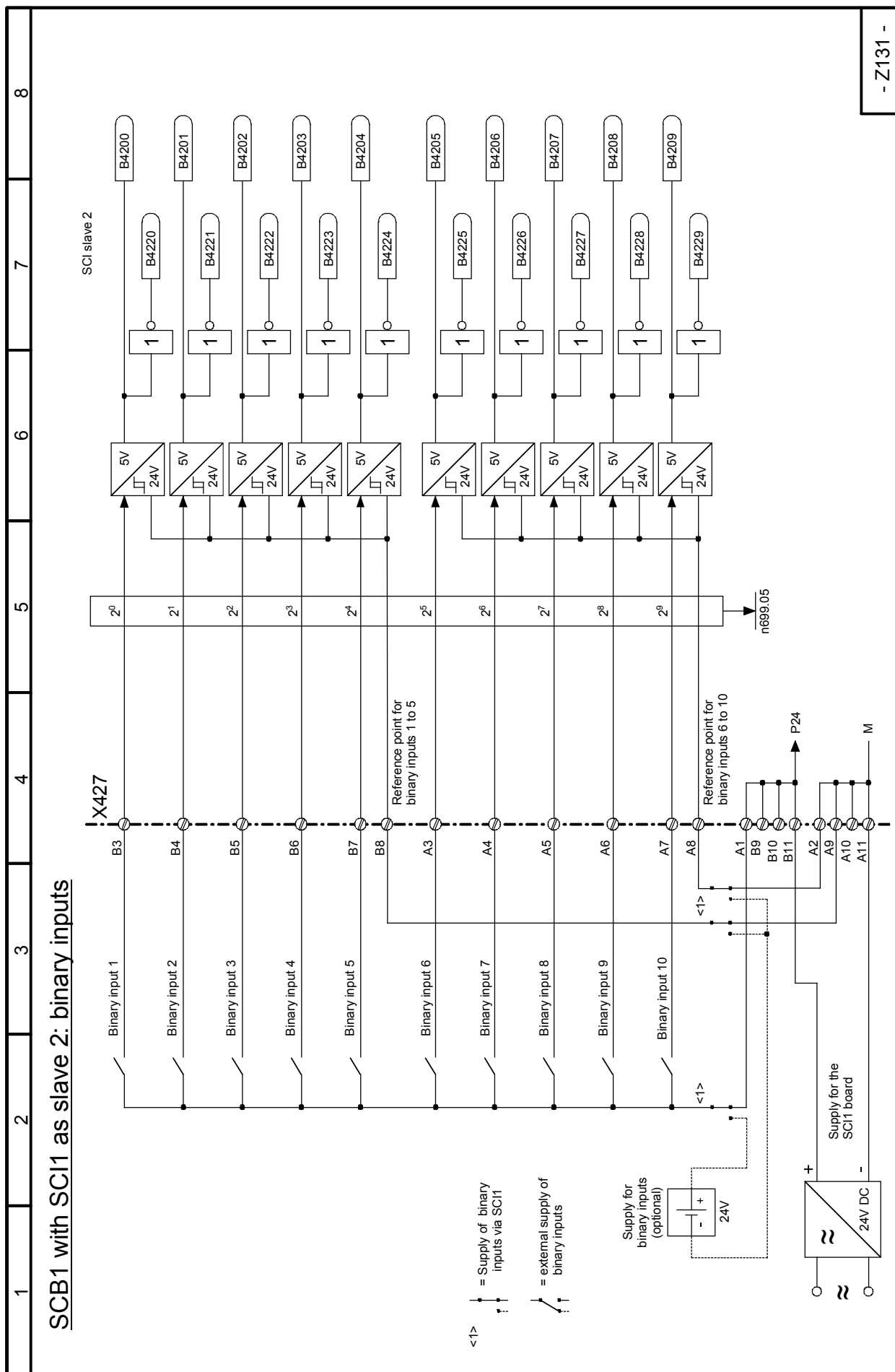
Sheet Z124 Interfaces: connector-type converters



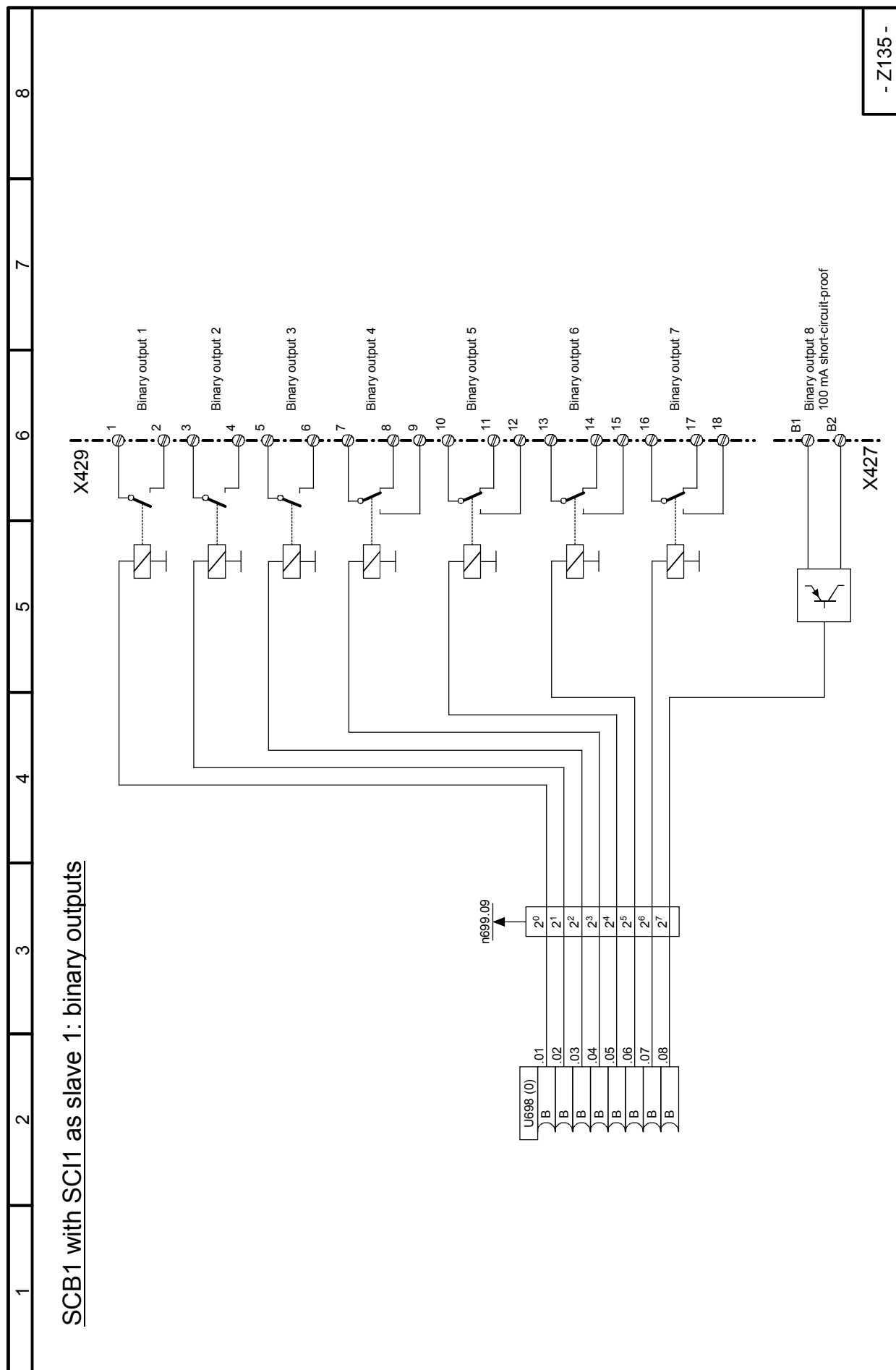
**Sheet Z130 SCB1 with SCI1 as slave 1: binary inputs**



## Sheet Z131 SCB1 with SCI1 as slave 2: binary inputs

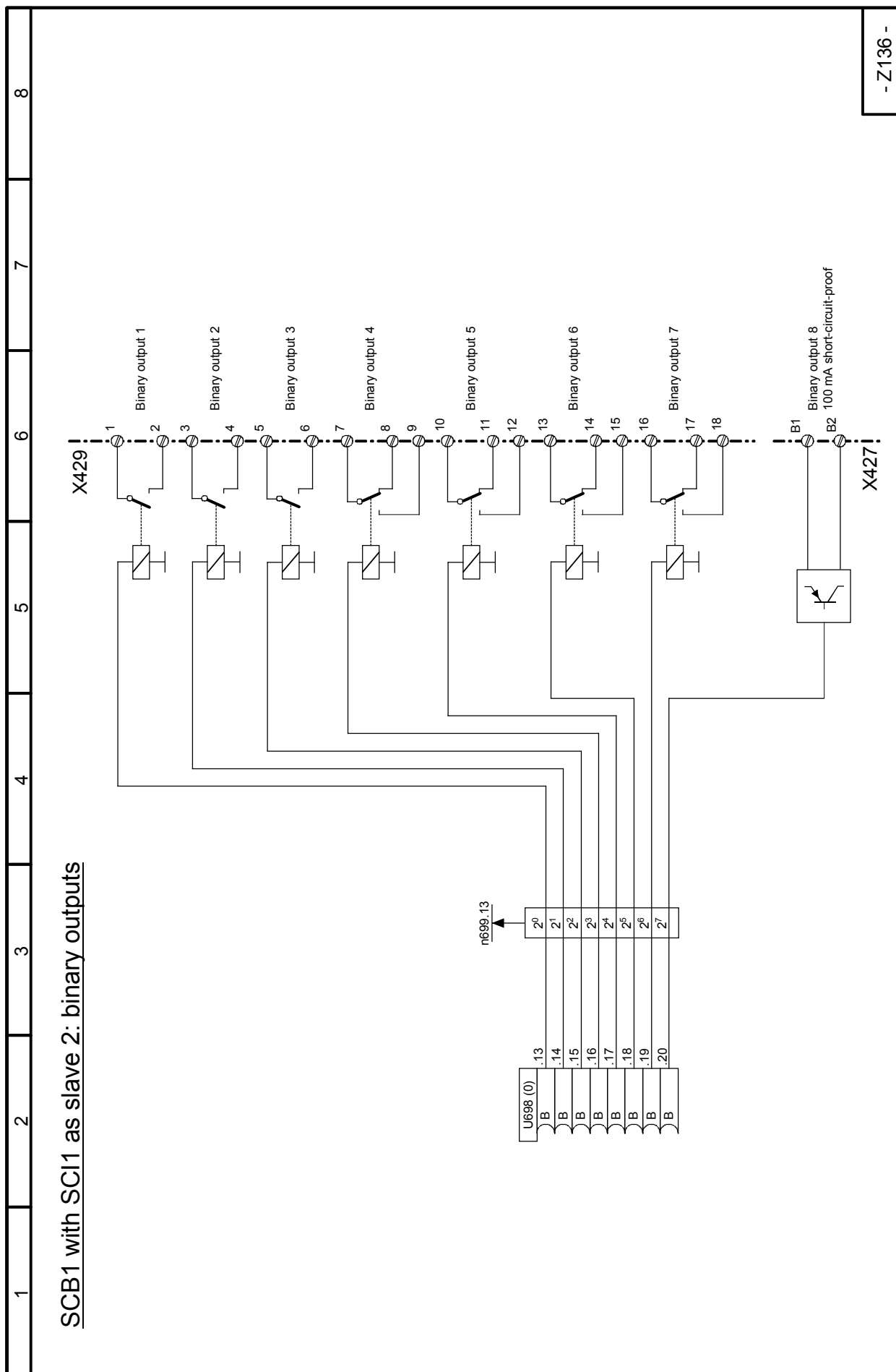


## Sheet Z135 SCB1 with SCI1 as slave 1: binary outputs



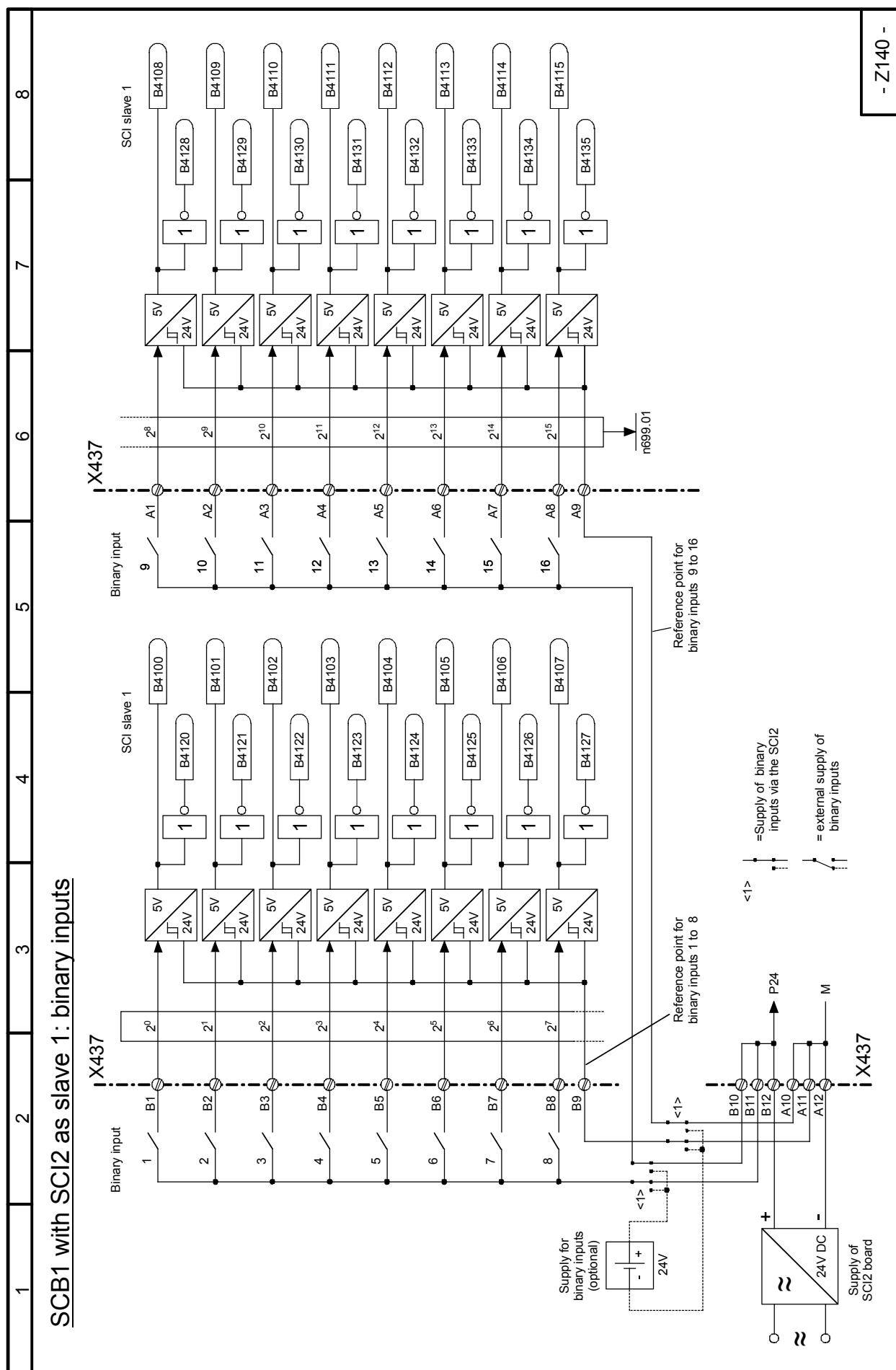


## Sheet Z136 SCB1 with SCI1 as slave 2: binary outputs



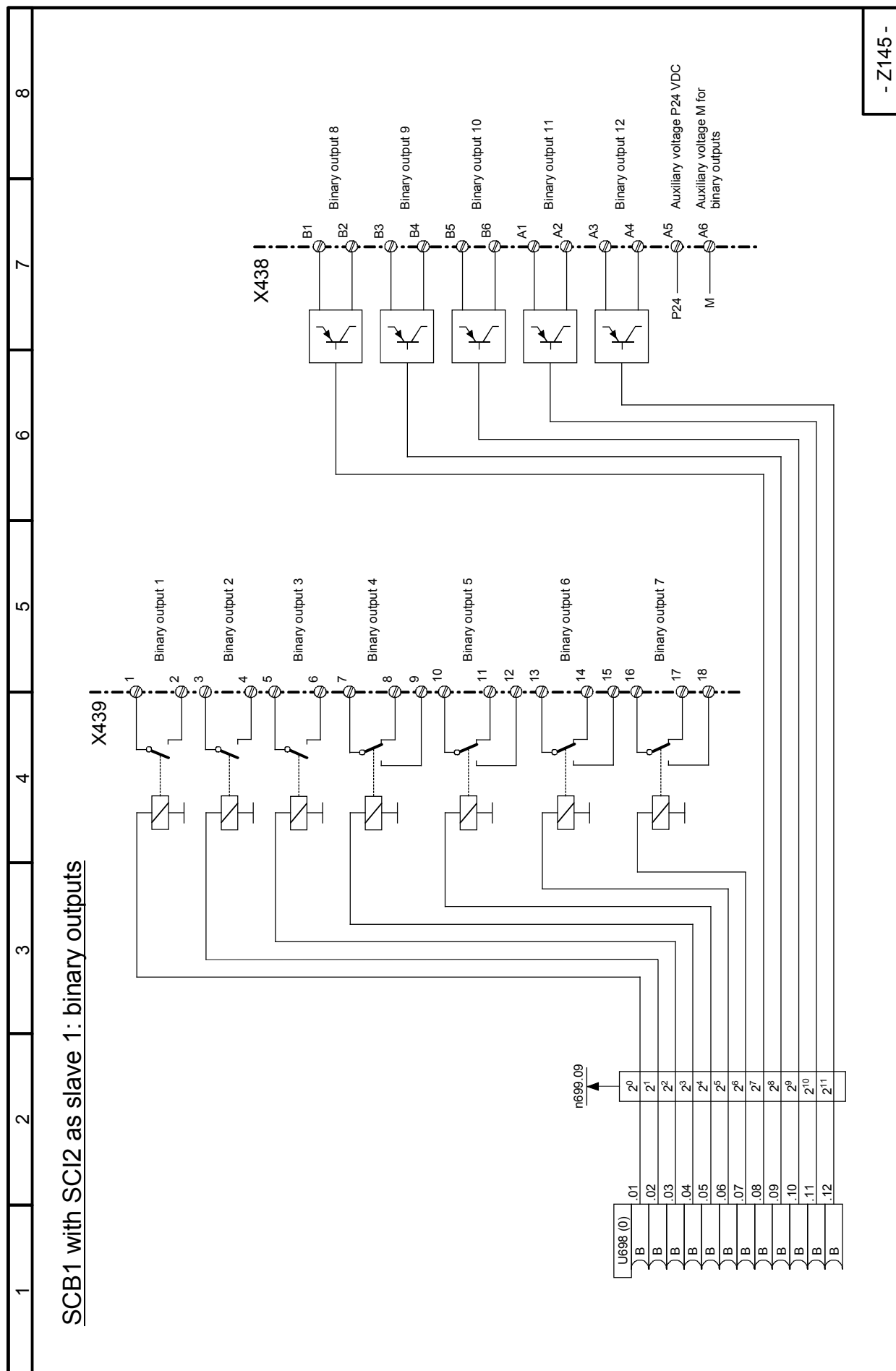
- Z136 -

- Z140 -

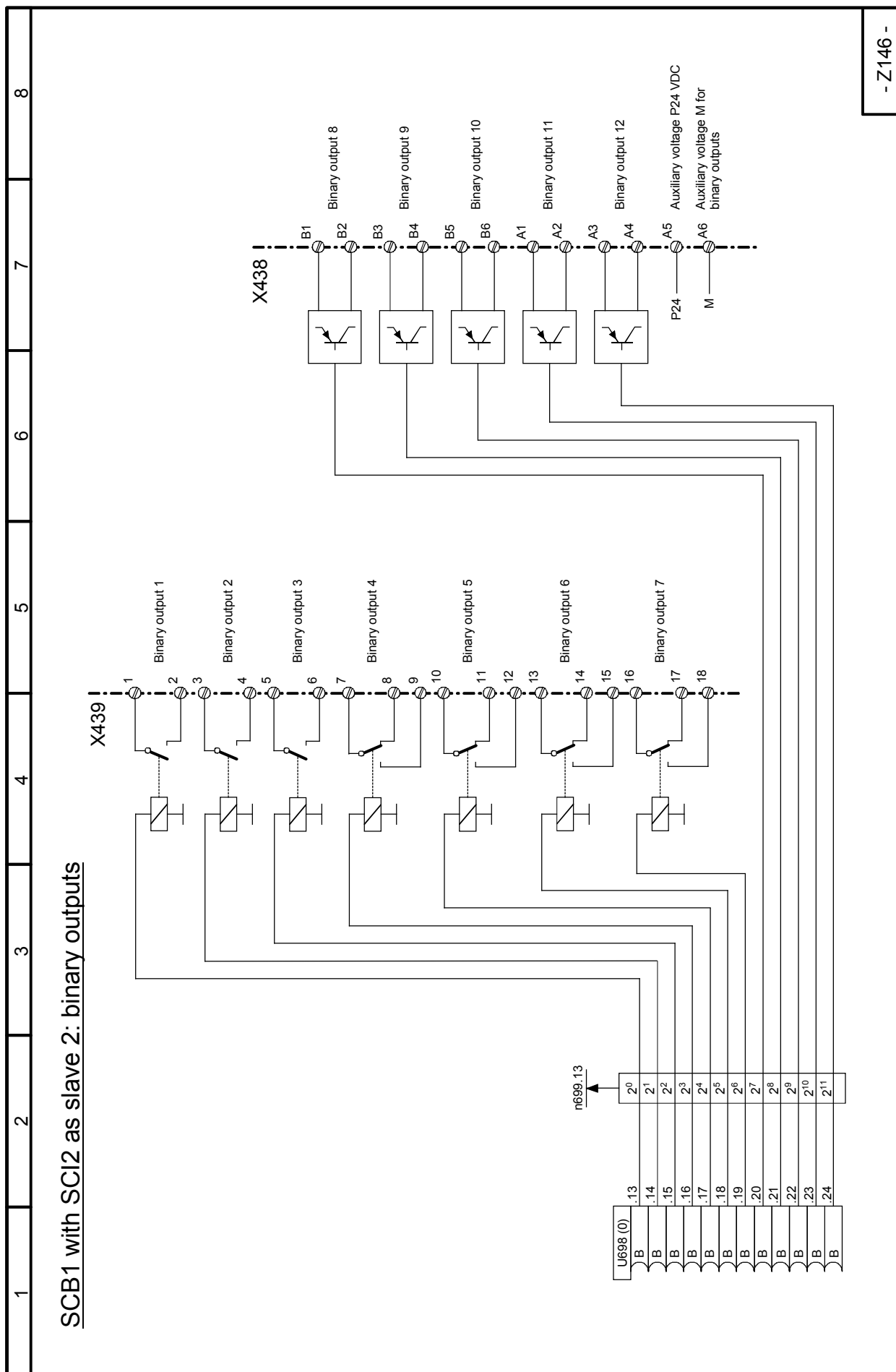




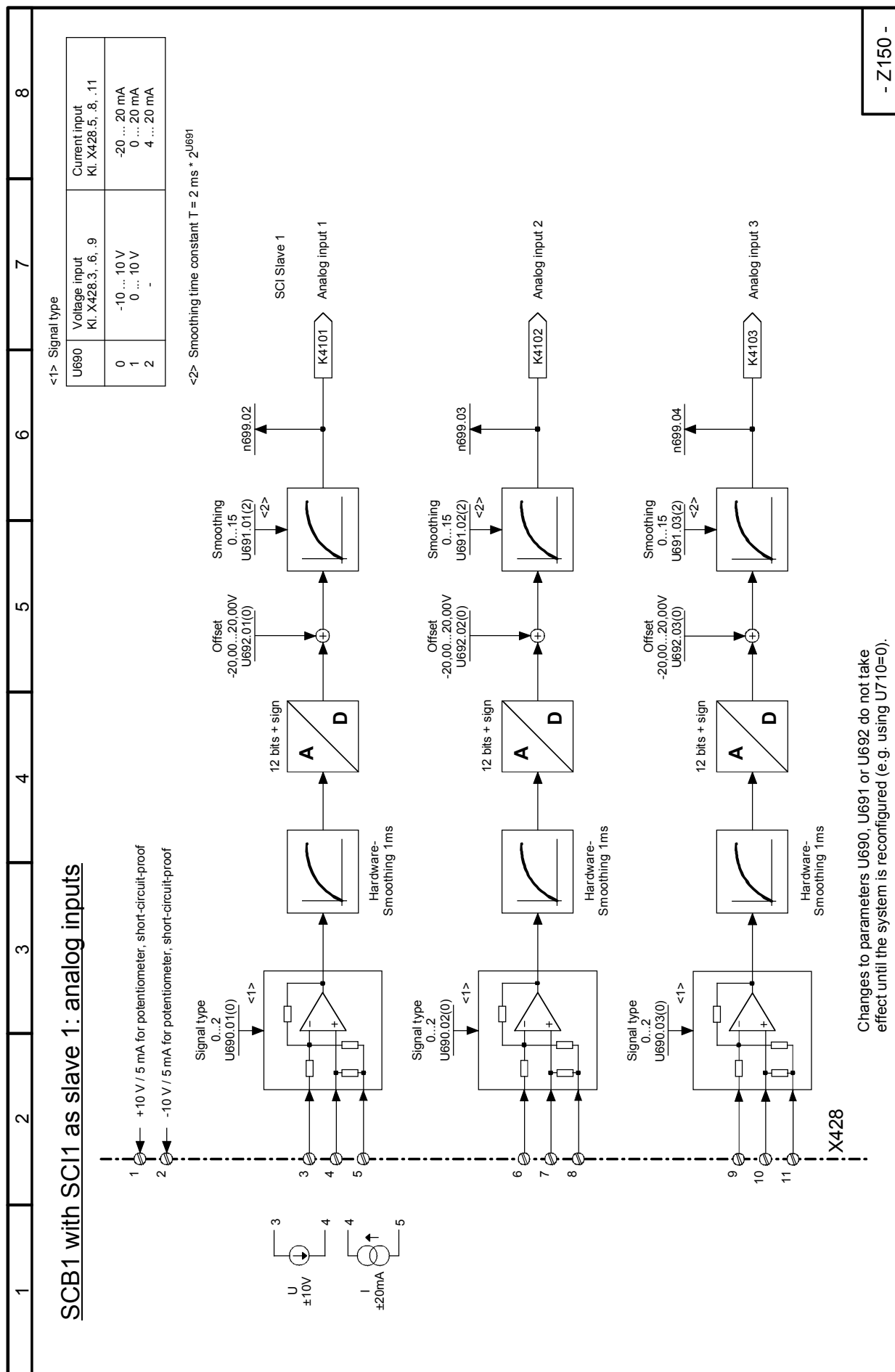
## Sheet Z145 SCB1 with SCI2 as slave 1: binary outputs



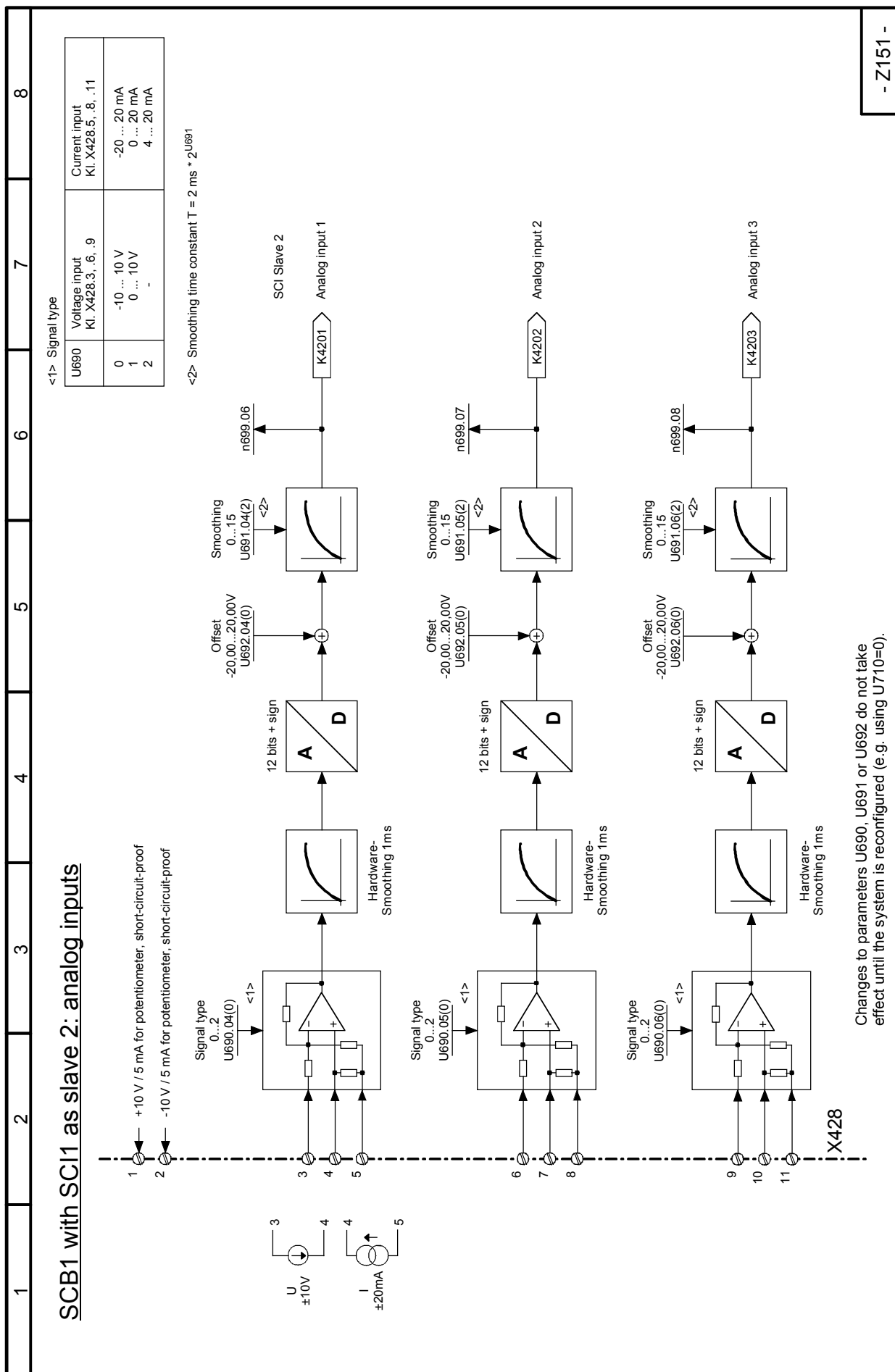
## Sheet Z146 SCB1 with SCI2 as slave 2: binary outputs



## Sheet Z150 SCB1 with SCI1 as slave 1: analog inputs

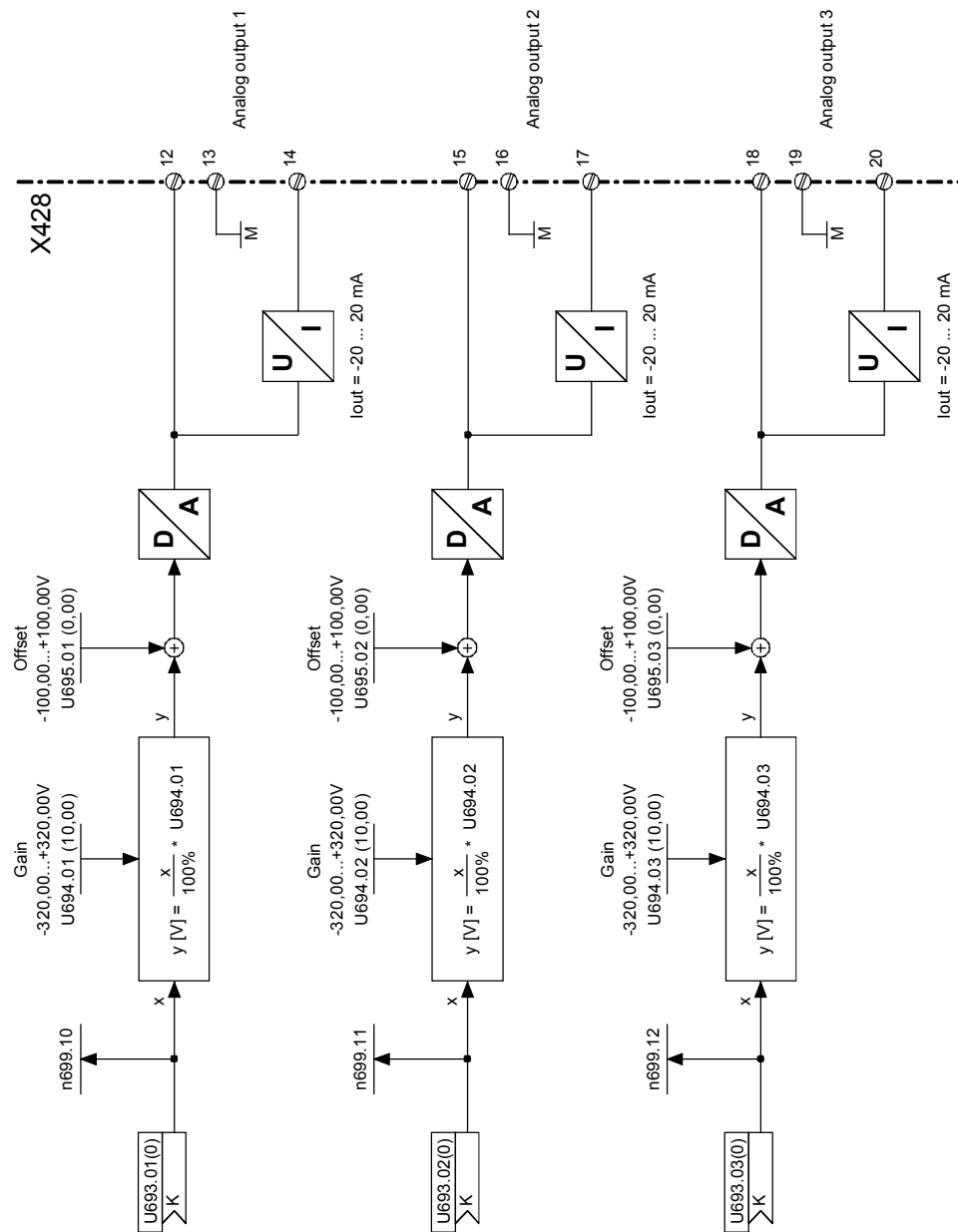


## Sheet Z151 SCB1 with SCI1 as slave 2: analog inputs



## Sheet Z155 SCB1 with SCI1 as slave 1: analog outputs

## SCB1 with SCI1 as slave 1: analog outputs



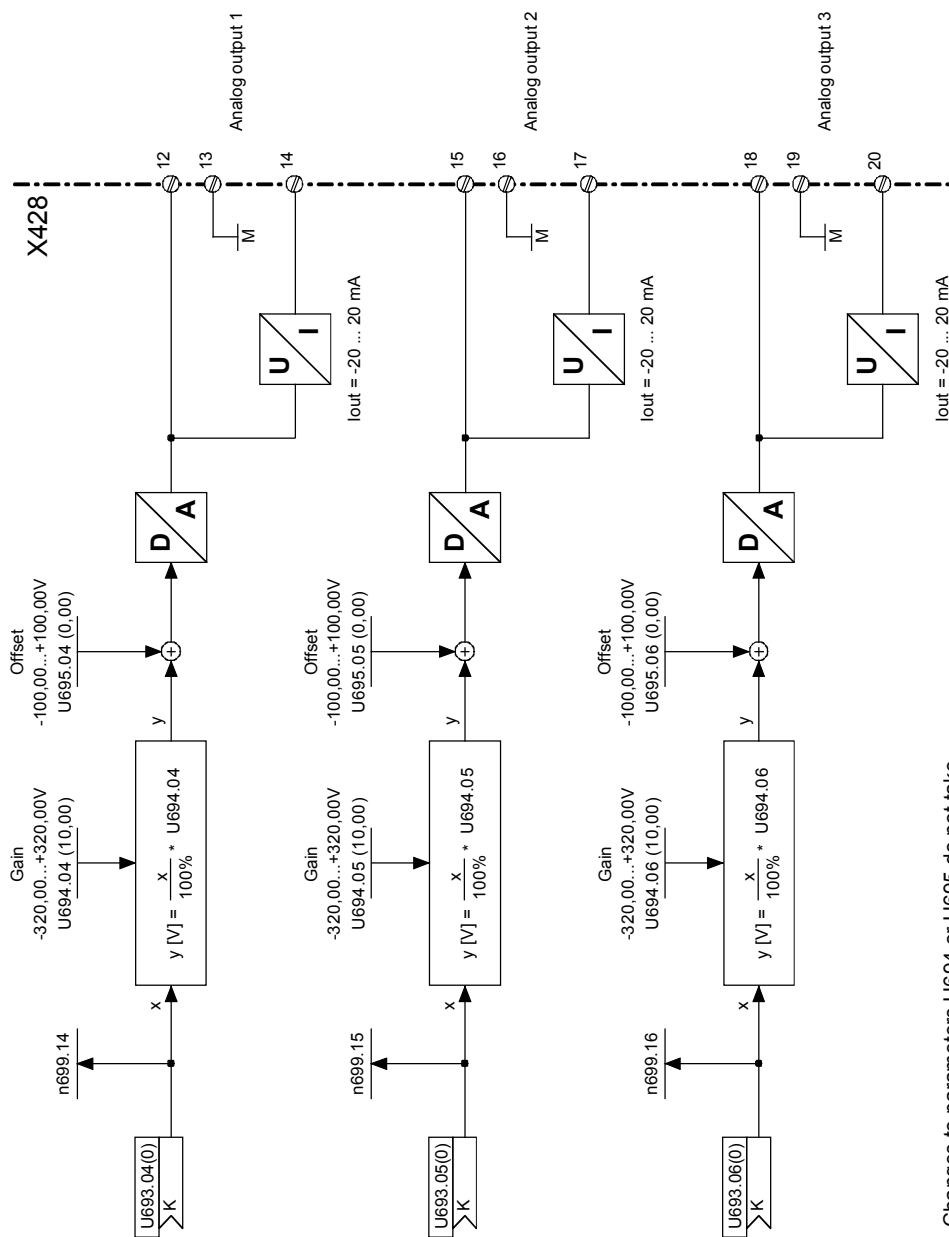
Changes to parameters U694 or U695 do not take effect until the system is reconfigured (e.g. using U710=0).

- Z155 -



## Sheet Z156 SCB1 with SCI1 as slave 2: analog outputs

## SCB1 with SCI1 as slave 2: analog outputs



Changes to parameters U694 or U695 do not take effect until the system is reconfigured (e.g. using U710=0).

- Z156 -

## 9 Function descriptions

### NOTE

The available scope of converter functions is shown in the function diagrams (block diagrams) in Section 8.

Section 9 does not attempt to provide a complete description of all these functions, but to explain in further detail certain individual features, which cannot be adequately illustrated in graphic form, and provide examples of their application.

### 9.1 General explanations of terms and functionality

#### Function blocks

Although the illustrated function blocks have been implemented in digital form (as software modules), the function diagrams can be "read" in a similar way to the circuit diagrams of analog equipment.

#### Configurability

The converter is characterized by the optional configurability of the function blocks provided. "Optional configurability" means that the connections between individual function blocks can be selected by means of parameters.

#### Connectors

All output variables and important computation quantities within the function blocks are available in the form of "connectors" (e.g. for further processing as input signals to other function blocks). The quantities accessed via connectors correspond to output signals or measuring points in an analog circuit and are identified by their "connector number" (e.g. K0003 = connector 3).

Special cases: K0000 to K0008 are fixed values with signal levels corresponding to 0, 100, 200, -100, -200, 50, 150, -50 and -150%.

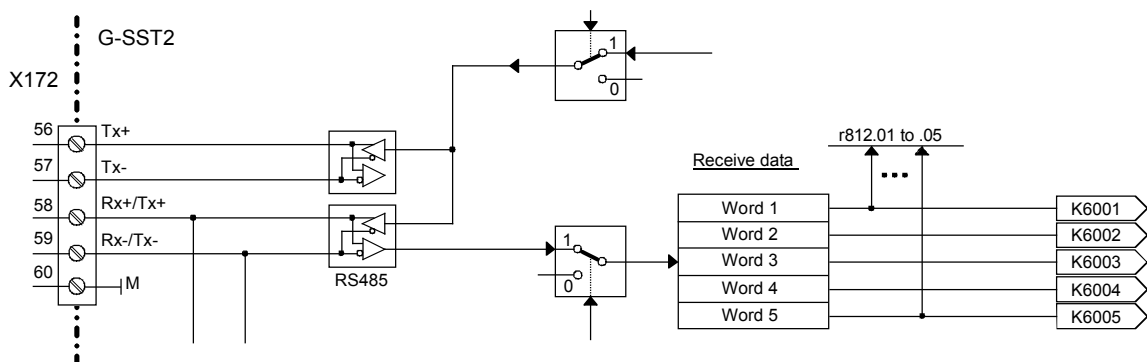
K0009 is assigned to different signal quantities. Which signal quantity it actually refers to is dependent on the selector switch (parameter) at which connector number 9 is set. A description can be found under the relevant parameter number in the Parameter List. If the Parameter List or block diagram does not contain any reference to a special function in relation to selection of connector K0009, then the selector switch (parameter) concerned must not be set to "9".

The internal numerical representation of connectors in the software is generally as follows: 100% corresponds to 4000 hexadecimal = 16384 decimal. The resolution is 0.006% (step change).

Connectors have a value range of -200% to +199.99%.

For a list of available connectors, please refer to Section 12.

Example: The data received via peer-to-peer 2 are available at connectors K6001 to K6005 (Section 8, Sheet G173)



### Double-word connectors (SW 1.9 and later)

Double-word connectors are connectors with a 32-bit value range (i.e. LOW word and HIGH word with a double-word value range of 00000000Hex to FFFFFFFFHex).

-100 % to +100 % corresponds to connector values of C0000000 Hex to 40000000 Hex (= -1073741824 to +1073741824 decimal). This means that the value range in the upper 16 bits (HIGH word) of a double-word connector is the same as for a "normal" connector (C000 Hex to 4000 Hex or -16384 to +16384 decimal for -100 % to +100 %). The extra 16 bits in the LOW word as compared to a "normal connector" afford, therefore, an improved resolution of the connector value by a factor of 65536. For information about how to use double-word connectors see also the section in "The following rules apply to the selection of double-word connectors" below.

Double-word connector symbol in function diagrams:



### Binectors

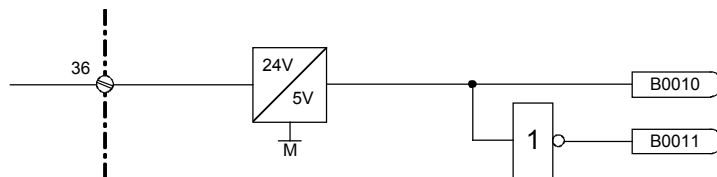
All binary output quantities and important binary output signals of the function blocks are available as "Binectors" (connectors for binary signals). Binectors can assume states log. "0" and log. "1". The quantities accessed via binectors correspond to output signals or measuring points in a digital circuit and are identified by their "Binector number" (e. g. B0003 = binector 3).

Special cases: B0000 = Fixed value log. "0"

B0001 = Fixed value log. "1"

A list of available binectors can be found in Section 12.

**Example:** The status of terminal 36 is available at B0010 and, in inverted form, at binector B0011

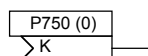


### Selection switches, connections

(see also Section "Data sets")

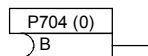
The inputs of function blocks are defined at "selection switches" by setting the appropriate selection parameters. The input is defined by entering the number of the connector or binector to be applied as the input quantity in the parameter for the relevant selection switch.

Representation in function diagrams (examples):



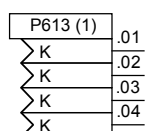
Selection of a connector

Parameter number = P750, factory setting = 0 (i. e. fixed value 0%)



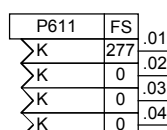
Selection of a binector

Parameter number = P704, factory setting = 0 (i. e. fixed value 0)



Selection of connectors ("indexed" parameter with 4 indices)

Parameter number = P613, factory setting = 1 (i. e. fixed value 100%; this factory setting applies to all the indices of P613)

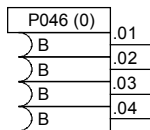


Selection of connectors ("indexed" parameter with 4 indices)

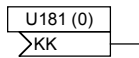
Parameter number = P611

Factory setting for index .01 = 277 (i. e. connection with connector K0277)

Factory setting for indices .02 to .04 = 0 (i. e. fixed value 0%)



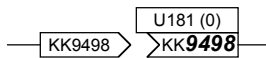
Selection of binectors ("indexed" parameter with 4 indices)  
 Parameter number = P046, factory setting = 0 (i. e. fixed value 0, this factory setting applies to all the indices of P046)



Selection of a double-word connector (SW 1.9 and later)  
 Parameter number = U181, factory setting = 0 (i.e. fixed value 0%)

The selected setting can be entered in the empty field (fields). The value in brackets next to the parameter number is the factory setting of the selection parameter.

The following rules apply to the selection of double-word connectors (SW 1.9 and later):



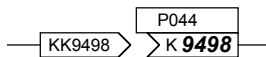
Double-word connector to double-word connector selection:

The double word for subsequent processing comprises:  
 LOW word = LOW word of double-word connector (KK9498)  
 HIGH word = HIGH word of double-word connector (KK9498)



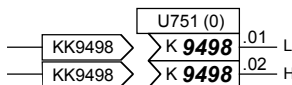
Connector to double-word connector selection:

The double word for subsequent processing comprises:  
 LOW word = 0  
 HIGH word = selected connector (K0401)

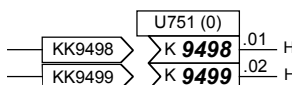


Double-word connector to connector selection:

HIGH word of the double-word connector (KK9498) is connected to another block,  
 the LOW word of the double-word connector (KK9498) is not used



There are exceptions in the selection of transmission data for the serial interfaces and in the transmission of optional expansion modules (technology and communications modules, SIMOLINK module):  
 If the same double-word connector is entered in two contiguous indices of the selection parameter, the entire value (the LOW and HIGH word) will be used.



If different double-word connectors are entered in two contiguous indices of the selection parameter, in both cases only the HIGH word of the two double-word connectors will be used.

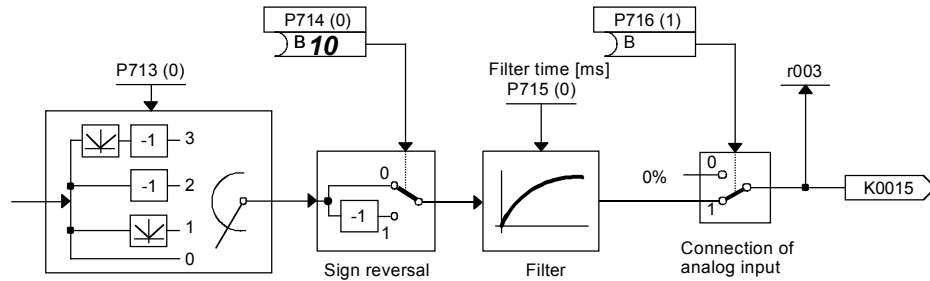
Examples: Some examples of how to handle connectors and binectors are given below.

**Example 1:** As a function of the status of terminal 36 (B0010 - see Section 8, Sheet G110), analog selectable input 1 (terminals 6 and 7) must be made available, either with the correct sign or inverted sign, at the function block output (= connector K0015). This output value must then be injected as an additional setpoint and output simultaneously at analog output terminal 14.

The following settings need to be made to create the correct links:

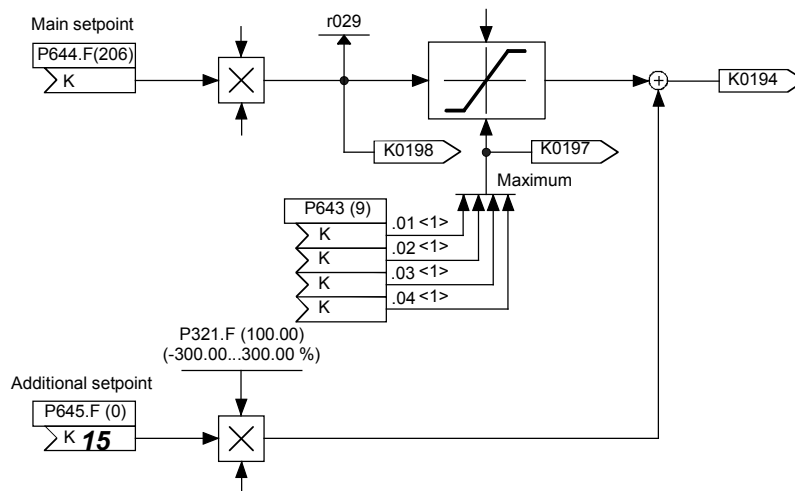
1. P714 = 10: Selects binector B0010 (status of terminal 36) as the control signal for sign reversal. Parameter P716 remains set at 1 (= fixed value 1, delivery state), thereby ensuring that the analog input is switched in continuously.

Section 8, Sheet G113:



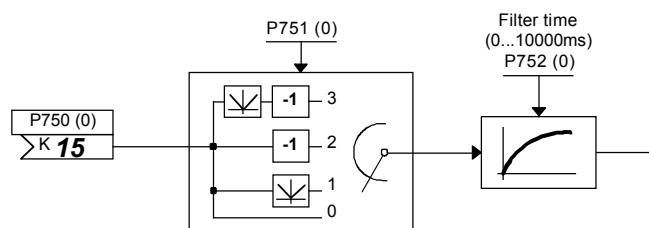
2. P645 = 15: Applies connector K0015 to the additional setpoint input when the setpoint is processed

Section 8, Sheet G135:



3. P750 = 15: Applies connector K0015 to the input of the function block for the analog output terminal 14. This example of K0015 illustrates how it is possible to apply a connector as an input signal to any number of function blocks.

Section 8, Sheet G115:



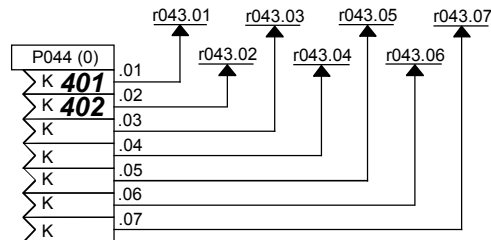
Example 2: The contents of connectors K0401 and K0402 must be output on the connector displays (parameter r043)

The following settings need to be made to create the correct links:

P044.index01 = 401: Links connector K0401 to the 1<sup>st</sup> connector display

P044.index02 = 402: Links connector K0402 to the 2<sup>nd</sup> connector display

#### Section 8, Sheet G121:



The following values are now displayed in parameter r043:

r043.index01: Contents of connector K0401

r043.index02: Contents of connector K0402

r043.index03

to

r043.index07: Parameter P044.index.03 to 07 remain at the works setting (0) (value in brackets next to parameter number) in this example, i. e. the contents of connector K0000 (=fixed value 0) are displayed on r043.index.03 to .07.

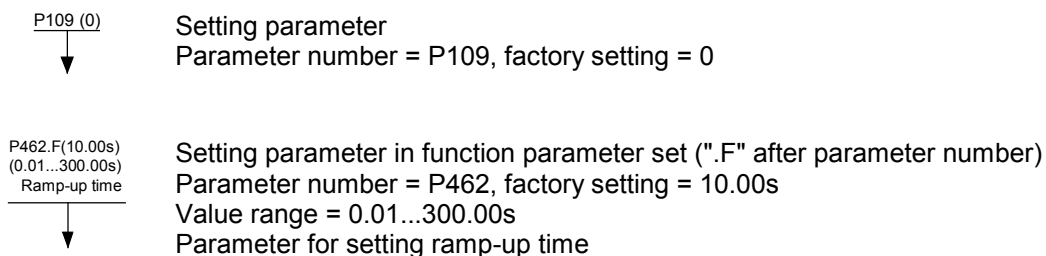
#### Setting parameters

(see also Section "Data sets")

In addition to the parameters that are used to select a signal (connector, binector), there are also parameters which define an operating mode or the parameter value of some function.

Representation in function diagrams:

Apart from parameter numbers, the function diagrams may also contain the factory setting, function and value range of parameters as supplementary information.



Examples: P700 in Section 8, Sheet G113 defines the signal type of the analog input (voltage input  $\pm 10V$ , current input 0...20mA, current input 4...20mA).

P705 in Section 8, Sheet G113 defines the filter time for the analog input (adjustable in ms).

Parameters P520 to P530 in Section 8, Sheet G153 determine the shape of the friction characteristic.

P465 in Section 8, Sheet G126 determines whether the time settings must be multiplied by a factor of 1 or 60.

**Data sets**

See also Section "Switch over parameter sets"

Switch over function parameters (function data sets):

4 different sets of some parameters (function parameters) are available and can be selected by means of the "Switch over function parameters" function. The switchover operation is controlled by control word 2 (bits 16 and 17, see Section 8, Sheets G181 and G175). Index .01, .02, .03 or .04 of these parameters is operative depending on the status of the control bit.

The parameters of this parameter set are identified by an ".F" next to the parameter number in the function diagrams and by "FDS" under the parameter number in the tabulated parameter list.

The parameters belonging to the function parameter set must not be confused with other parameters which, by chance, also have 4 indices. The latter parameters are not affected by the "Switch over function parameters" function.

Switch over binector and connector parameters (Bico data sets):

2 different sets of some selection switches are available and can be selected by means of the "Switch over binector and connector parameters" function. The switchover function is controlled by control word 2 (bit 30, see Section 8, Sheets G181 and G175). The status of the control bit determines whether index.01 or index .02 of the parameter is operative.

The parameters of the Bico data set are identified by a ".B" next to the parameter number in the function diagrams and by "BDS" under the parameter number in the tabulated parameter list.

The parameters belonging to the Bico data set must not be confused with other parameters which, by chance, also have 2 indices. The latter parameters are not affected by the "Switch over binector and connector parameters" function.

**Display parameters**

The values of certain signals can be output using display parameters (r parameters, n parameters). Connector displays (Section 8, Sheet G121) can be used to link all connectors with display parameters so that they can be displayed.

Representation in function diagrams:

Apart from the parameter number, the function diagrams may also include a function description for the parameter as supplementary information.



Display parameter

Parameter number = r316

Display of RFG (ramp-function generator) status

## 9.2 Computation cycles, time delay

Functions associated with analog inputs, analog outputs, binary inputs, binary outputs and interfaces, as well as function blocks associated with the motorized potentiometer, setpoint generation, ramp-function generator and closed-loop speed and armature current controls, are called up and calculated in synchronism with the armature firing pulses (i.e. every 3.333 ms at a line frequency of 50 Hz).

Function blocks associated with the closed-loop EMF and field current controls (shown in Section 8, Sheets G165 and G166) are called and calculated in synchronism with the field firing pulses (i.e. every 10 ms at a line frequency of 50 Hz).

The parameter settings are processed in a further computation cycle with a cycle time of 20 ms. The execution of optimization runs is also controlled from this cycle.

With regard to the transfer of parameter values via interfaces, it is important to remember that some transferred parameters must be converted to this 20 ms cycle before they can be applied, for example, in the armature firing pulse cycle.

## 9.3 Switch-on, shutdown, enabling

### 9.3.1 OFF2 (voltage disconnection) - control word 1, bit 1

The OFF2 signal is low active (log."0" state = voltage disconnection).

The following operating modes are possible:

P648 = 9: The control bits in control word 1 are input bit-serially. OFF2 is generated from the AND operation between the binectors selected with P655, P656 and P657 (see Section 8, Sheet G180).

P648 ≠ 9: The connector selected via P648 is used as control word 1. Bit 1 of this word then controls the OFF2 function.

#### Sequence of operations for "Disconnect voltage":

1. Input "Disconnect voltage" command
2. Disable ramp-function generator, n and I controllers
3.  $I_{set} = 0$  is applied
4. The pulses are disabled when  $I = 0$
5. Output signal "Close operating brake" (binector B0250 = 0, when P080 = 2)
6. Converter reaches operating state o10.0 or higher
7. An "older" actual field current value (K0265) is input as the field current setpoint upper limit (function is "released" in operating states of  $\leq o5$ )
8. The "Line contactor closed" relay drops out
9. Drive coasts to a standstill (or is braked by the operating brake)
10. Parameterizable delay time (P258) runs down
11. The field is reduced to a parameterizable value (P257)
12. When  $n < n_{min}$  (P370, P371) has been reached, the "Close holding brake" signal is output (binector B0250 = 0, when P080 = 1)

### 9.3.2 OFF3 (Fast stop) - control word 1, bit 2

The OFF3 signal is LOW active (log."0" state = fast stop).

The following operating modes are possible:

P648 = 9: The control bits in control word 1 are input bit-serially. OFF3 is generated from the AND operation between the binectors selected with P658, P659 and P660 (see Section 8, Sheet G180).

P648 ≠ 9: The connector selected via P648 is used as control word 1. Bit 2 of this word then controls the OFF3 function.

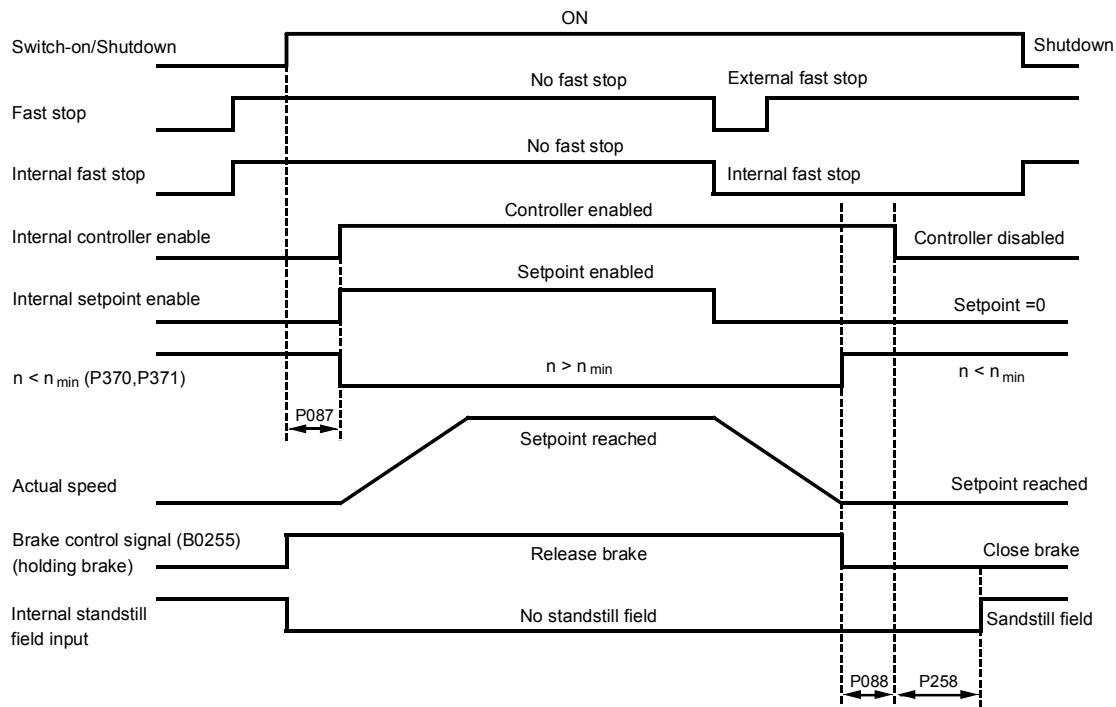
#### Sequence of operations for "Fast stop":

1. Input "Fast stop" command (e.g. binary input wired up to "Fast stop")
2. Ramp-function generator is disabled
3. Enter  $n_{set} = 0$
4. up to SW 1.84: Decelerate along current limit  
from SW 1.90: Decelerate along reversal ramp acc. to P296, P297, P298
5. Wait until  $n < n_{min}$  (P370, P371)
6. Output signal "Close operating or holding brake" (binector B0250 = 0)
7. Wait for brake closing time (P088) to run down
8. Enter  $I_{set} = 0$
9. Ramp-function generator and n controller are disabled
10. The pulses are disabled when  $I = 0$
11. The "Line contactor closed" relay drops out
12. Converter reaches operating state o9.0 or higher
13. Delay time for field current reduction (P087) runs down
14. The field is reduced to a parameterizable value in P257

#### Sequence of operations for cancellation of "Fast stop":

1. Stop applying "Fast stop" command
2. Enter "Standstill" command (e.g. via "Switch-on/shutdown" terminal)
3. Converter exits operating state o8





P087 Brake release time (positive in this example)

P088 Brake closing time

P258 Delay for automatic field current reduction

- The "Fast stop" command need only be applied as a short pulse ( $> 10$  ms). It is then stored internally. The memory can be reset only by applying the "Shutdown" command.
- All "Fast stop" commands are ANDed by the SIMOREG CM, i.e. all commands must be set to "No fast stop" before the function can be deactivated.
- When  $n < n_{\min}$  (P370, P371) is reached for the first time, an internal interlock is activated which prevents the drive from attempting to brake again if the motor is turned by external forces. The  $n < n_{\min}$  signal then disappears again.

### 9.3.3 Switch-on / shutdown (ON / OFF) terminal 37 - control word 1, bit 0

The "Switch-on / shutdown" (ON / OFF) function is controlled via the "Switch-on command of ON / OFF1" (= ANDing between signal from terminal 37 and binector selected in parameter P654, level- or edge-triggered, see below) and bit 0 of connector selected as the control word in P648.

The following operating modes are possible:

- P648 = 9: The control bits in control word 1 are input bit-serially. "ON / OFF" is controlled via the "Switch-on command of ON / OFF1".
- P648  $\neq$  9: The connector selected in P648 is used as control word 1. Bit 0 of the control word is ANDed with the "Switch-on command of ON / OFF1" to produce the "ON / OFF" command (ON only if both signals are log. "1").
- P445 = 0: The "Switch-on command of ON / OFF1" is generated as an AND operation between the signal from terminal 37 and the binector selected in P654 (level-triggered, 0 = shutdown, 1 = switch-on).
- P445 = 1: Edge triggering of "Switch-on command of ON / OFF1":  
The switch-on command is stored on the 0  $\rightarrow$  1 transition (see Section 8, Sheet G130).  
The binector selected in P444 must be in the log. "1" state. The memory is reset when this binector switches to the log. "0" state.

In the following example circuit, the ON key (NO contact) is connected to terminal 37 and the shutdown key (NC contact) to terminal 36. Connector K3003 (= Receive data from 1<sup>st</sup> CB/TB, word 3) is used as control word 1.

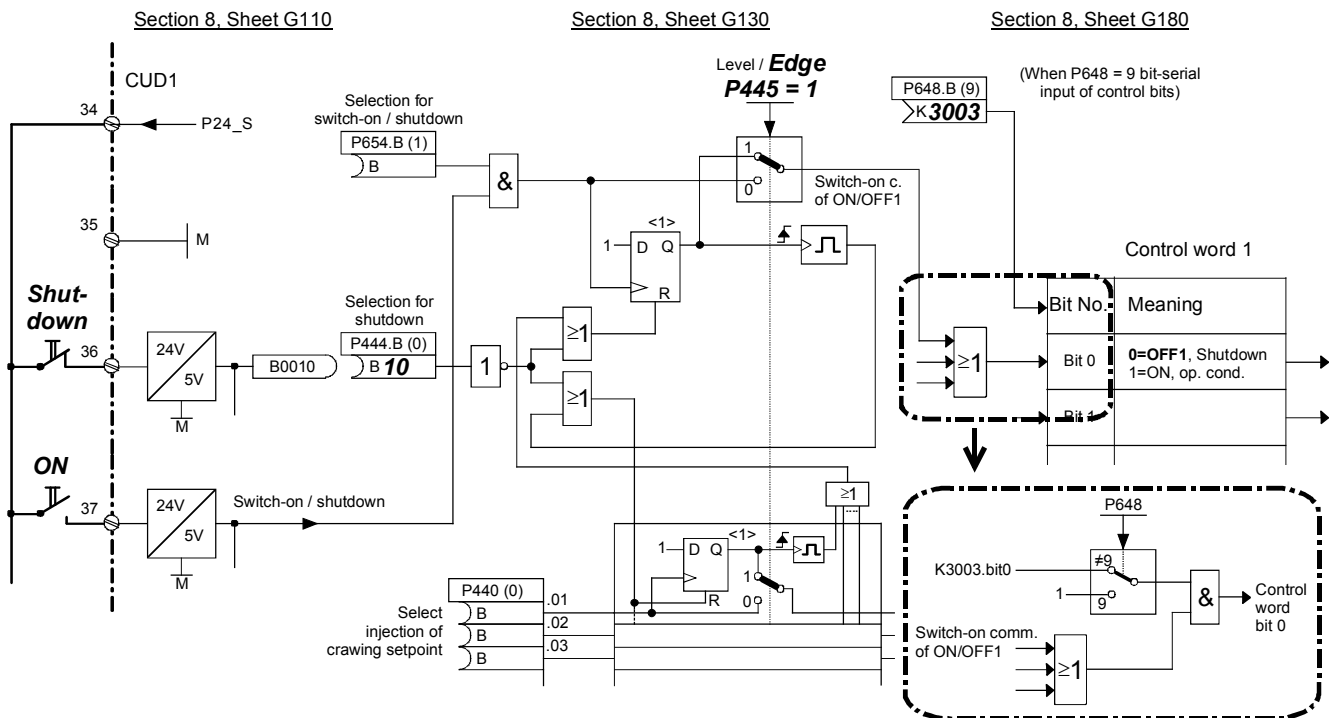
The following parameter values must be set:

P444=10 Connects binector 10 (= status of terminal 36) to the reset input of the memory for the ON signal (and to the reset input of the memory for the CRAWL command)

P445=1 Selects edge triggering of "Switch-on command of ON / OFF1" (and injection of the crawling setpoint)

P648=3003 Connector K3003 is assigned status of control word 1.

The combination of the control bit for ON/OFF from the DPRAM control word (K3003.bit0 in this example) and the switch-on command from the converter terminal is shown in the boxes with dot-dash line borders.



#### Sequence of operations for switching on drive:

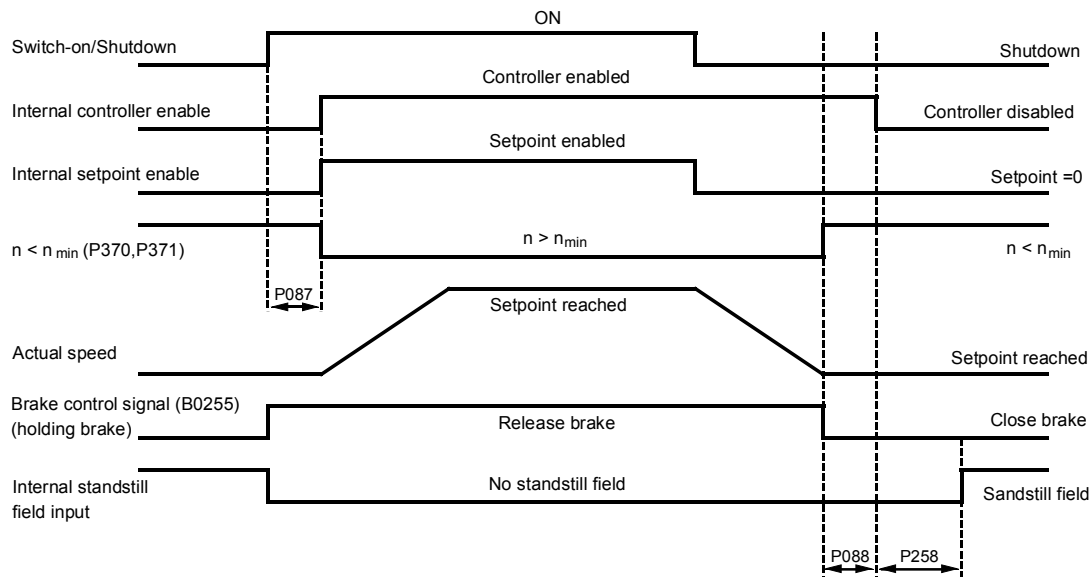
1. Enter the "Switch-on" command (e.g. via terminal "Switch-on/shutdown")
2. The converter exits operating state 07
3. The "Line contactor closed" relay picks up
4. The field current reduction command is cancelled

If "Enable operation" signal is applied:

5. With a positive brake release time (P087), output signal "Release holding or operating brake" (binector B0250 = 1) and wait for P087 in operating state 01.0, with a negative brake release time (P087 negative), go to step 6 immediately, brake remains closed (binector B0250 = 0)
6. Ramp-function generator, n controller and I controller are enabled
7. When a negative brake release time (P087) has run down, output signal "Release holding or operating brake" (binector B0250 = 1).

**Sequence of operations for shutting down drive:**

1. Enter the "Shutdown" command (e.g. via terminal "Switch-on / shutdown")
2. Decelerate along ramp-function generator ramp
3. Wait until  $n < n_{\min}$  (P370, P371)
4. Output signal "Close holding or operating brake" (binector B0250 = 0)
5. Wait for brake closing time (P088) to run down
6. Input  $i_{\text{set}} = 0$
7. Ramp-function generator and  $n$  controller are disabled
8. The pulses are disabled when  $I = 0$
9. The "Line contactor closed" relay drops out
10. The converter reaches operating state o7.0 or higher
11. Delay for field current reduction (P258) runs down
12. The field is reduced to a parameterizable value (P257)



P087 Brake release time (positive in this example)

P088 Brake closing time

P258 Delay for automatic field current reduction

- When  $n < n_{\min}$  (P370, P371) is reached for the first time, an internal interlock is activated which prevents the drive from attempting to brake again if the motor is turned by external forces. The  $n < n_{\min}$  signal then disappears again.
- Changing the parameter setting between level and edge triggering affects the "Switch-on", "Shutdown" and "Crawl" commands.
- The "Switch-on" and "Crawl" commands are applied alternately when edge triggering is selected, i.e. a "Switch-on" edge at terminal 37 cancels a "Crawl" function triggered beforehand, and a "Crawl" edge at a binector selected in P440 cancels an active "Switch-on" edge.
- The converter cannot be restarted automatically after a brief failure of the electronics power supply when edge triggering is selected.
- In order to ensure that "Shutdown" still works after "rewiring of parameters", if lower current or torque limits are applied or when additional setpoints are injected, certain functions are automatically deactivated when the "Shutdown" command is entered. All torque limits are made inoperative while the drive brakes down to  $n < n_{\min}$ . Of all the current limits, only the system current limit (P171 and P172) and the speed-dependent current limit remain operative.

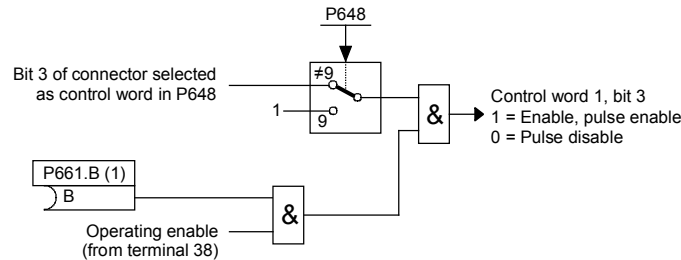
### 9.3.4 Operating enable (enable) terminal 38 - control word 1, bit 3

The Enable signal is HIGH active (log."1" state = Enable).

The following operating modes are possible:

- P648 = 9: The control bits in control word 1 are input bit-serially. The operating enable command is generated from the AND operation between the enable signal from terminal 38 and the binector selected in P661 (see Section 8, Sheet G180).
- P648 ≠ 9: The connector selected in P648 is used as control word 1. Bit 3 of this connector is ANDed with the signal that is generated as for P648=9 to produce the operating enable signal.

To ensure that the "Operating enable" function can be activated, the conditions defined in the following diagram must be fulfilled:



#### Sequence of operations for enabling operation (if a switch-on command is applied):

1. Enter the "Enable operation" command
2. With a positive brake release time (P087), output a "Release holding or operating brake" signal (binector B0250 = 1) and wait for P087 to run down in operating state 01.0, with a negative brake release time (P087 negative), go to step 3 immediately, brake remains closed (binector B0250 = 0)
3. Ramp-function generator, n and I controllers are enabled
4. Converter reaches operating state I, II or --
5. When a negative brake release time (P087) has run down, output signal "Release holding or operating brake" (binector B0250 = 1).

#### Sequence of operations for cancellation of operating enable:

1. Cancel "Enable operation" command
2. Disable ramp-function generator, n and I controllers
3. Enter  $I_{\text{set}} = 0$
4. The pulses are disabled when  $I = 0$
5. Output signal "Close operating brake" (binector B0250 = 0, when P080 = 2)
6. The converter reaches operating state 0.10 or higher
7. Drive coasts to a standstill (or is braked by the operating brake)
8. When  $n < n_{\text{min}}$  (P370, P371) is reached, the signal "Close holding brake" is output (binector B0250, when P080 = 1)

## 9.4 Ramp-function generator

See also Section 8, Sheet G136

### NOTICE

The following conditions must be fulfilled for the ramp-function generator to work:

- Ramp-function generator enable = 1 (control word 1.bit 4 = 1)
- Enable setpoint = 1 (control word 1.bit 6 = 1)

### 9.4.1 Definitions

**Ramp-up** = Acceleration from low, positive to high, positive speeds (e.g. from 10% to 90%) or from low, negative to high, negative speeds (e.g. from -10% to -90%)

**Ramp-down** = Deceleration from high, positive to low, positive speeds (e.g. from 90% to 10%) or from high, negative to low, negative speeds (e.g. from -90% to -10%)

On transition from negative to positive speeds, e.g. -10% to +50%:

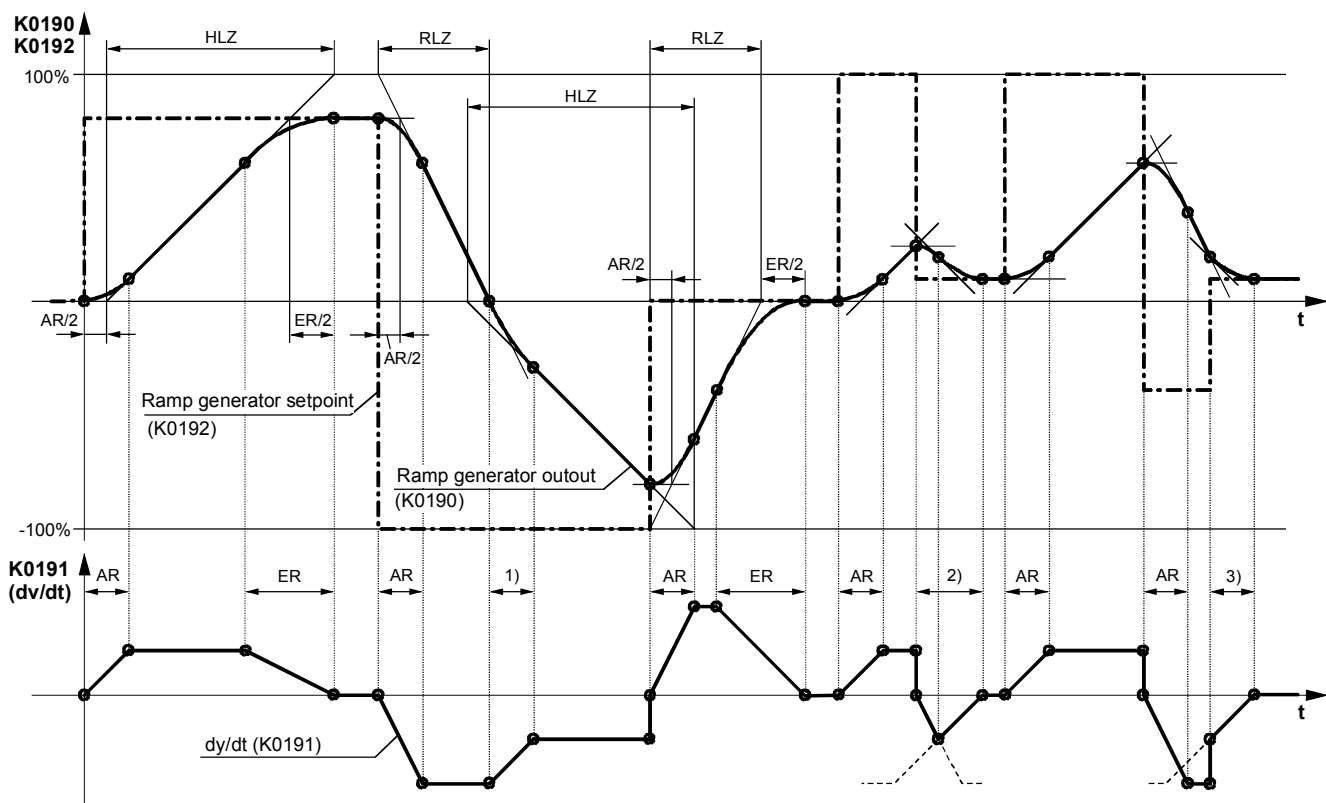
From -10% to 0 = ramp-down and

From 0 to +50% = ramp-up and vice versa

**Ramp-up time** refers to the time required by the ramp-function generator to reach the 100% output value, with a lower and upper transition rounding of 0 and a step change in the input quantity from 0 to 100% or from 0 to -100%. The rate of rise at the output is the same in response to smaller step changes in the input quantity.

**Ramp-down time** refers to the time required by the ramp-function generator to reach the 100% output value, with a lower and upper transition rounding of 0 and a step change in the input quantity from 100% to 0 or from -100% to 0. The rate of rise at the output is the same in response to smaller step changes in the input quantity.

### 9.4.2 Operating principle of ramp-function generator



HLZ ... Ramp-up time (H303, H307, H311),

RLZ ... Ramp-down time (H304, H308, H312)

AR ... Lower transition rounding (H305, H309, H313), ER ... Upper transition rounding (H306, H310, H314)

1) Transition from ramp-down gradient to ramp-up gradient

2) The lower rounding switches to the upper rounding before the maximum ramp-down gradient is reached

3) Due to the input step change, only the last part of the upper transition rounding is executed here

### 9.4.3 Control signals for ramp-function generator

The ramp-function generator operating mode can be preset by the following control signals:

Ramp-function generator start (control word 1.bit 5):

- 1 = Setpoint is injected at ramp-function generator input
- 0 = Ramp-function generator is stopped at current value (generator output is injected as generator input).

Enable setpoint (control word 1.bit 6):

- 1 = Setpoint enabled at ramp-function generator input
- 0 = Ramp-function generator setting 1 is activated and 0 applied at the input (generator output is reduced to 0)

Set ramp-function generator:

- 1 = The ramp-function generator output is set to the setting value (selected in P639)

Enable ramp-function generator (control word 1.bit 4):

- 0 = Ramp generator disabled, generator output is set to 0
- 1 = Ramp-function generator enabled

Ramp-up integrator operation (parameter P302):

See below and Section 11, Parameter List, parameter P302

Enable switchover of ramp-up integrator (select via P646):

See below

Ramp-function generator settings 2 and 3

See below

Ramp-function generator tracking ON (parameter P317):

See below and Section 11, Parameter List, parameter P317

Set ramp-function generator on shutdown (parameter P318):

See Section 11, Parameter List, parameter P318

Bypass ramp-function generator:

- 1 = Ramp-function generator operates with ramp-up/ramp-down time of 0

The function is controlled via the binector selected in P641.

The ramp generator can also be bypassed in INCHING, CRAWLING and INJECTION OF FIXED SETPOINT modes.

### 9.4.4 Ramp-function generator settings 1, 2 and 3

Selection via binectors selected in parameters P637 and P638

| Status of binector<br>Selected via parameter |      | R-F generator<br>setting                                          | Effective<br>ramp-up<br>time | Effective<br>ramp-<br>down time | Effective<br>lower<br>rounding | Effective<br>upper<br>rounding |
|----------------------------------------------|------|-------------------------------------------------------------------|------------------------------|---------------------------------|--------------------------------|--------------------------------|
| P637                                         | P638 |                                                                   |                              |                                 |                                |                                |
| 0                                            | 0    | 1                                                                 | P303                         | P304                            | P305                           | P306                           |
| 1                                            | 0    | 2                                                                 | P307                         | P308                            | P309                           | P310                           |
| 0                                            | 1    | 3                                                                 | P311                         | P312                            | P313                           | P314                           |
| 1                                            | 1    | Not permitted, activates fault message F041 (selection not clear) |                              |                                 |                                |                                |

The ramp-function generator settings preset via the binectors selected in P637 and P638 have priority over the generator setting specified via the ramp-up integrator.

### 9.4.5 Ramp-up integrator

The ramp-up integrator is activated by setting P302 = 1, 2 or 3. After an "ON" command ("Switch-on", "Inching", "Crawling"), ramp-function generator setting 1 (P303 to P306) is applied until the ramp-function generator output reaches the required setpoint for the first time.

The remaining sequence of operations is controlled by the "Enable switchover of ramp-up integrator" function (binector selected in P646).

Enable switchover of ramp-up integrator = 1:

As soon as the ramp-function generator output reaches the required setpoint for the first time after the "ON" command, the ramp generator setting selected in P302 is activated automatically.

Enable switchover of ramp-up integrator = 0:

Ramp-function generator setting 1 (P303 to P306) remains active after the generator output has reached its setpoint until the "Enable switchover of ramp-up integrator" function is switched to 1.

The ramp-function generator setting selected in P302 is then activated.

When the enable signal for ramp-up integrator switchover is cancelled ( $\rightarrow 0$ ), ramp-function generator setting 1 is activated again and, with a new enable command ( $\rightarrow 1$ ), this setting continues to remain active until the generator output has reached its setpoint again. The ramp generator setting selected in P302 is then activated again.

When a "Shutdown" command is given, the drive is shut down according to setting 1.

Note:

Activation of "Ramp-function generator setting 2" (P307 to P310, selected in P637), or "Ramp-function generator setting 3" (P311 to P314, selected in P368), has priority over the generator setting selected by means of the "Ramp-up integrator" function.

### 9.4.6 Ramp-function generator tracking

The ramp-function generator output (K0190) is limited to the following values when ramp-function generator tracking is activated:

$$\frac{-M_{\text{limit}} * 1.25}{K_p} + n_{\text{act}} < \text{RFG output} < \frac{+M_{\text{limit}} * 1.25}{K_p} + n_{\text{act}}$$

When P170 = 1 (torque control), the following equation applies:

$$\frac{-I_{A,\text{limit}} * \Phi_{\text{motor}} * 1.25}{K_p} + n_{\text{act}} < \text{RFG output} < \frac{+I_{A,\text{limit}} * \Phi_{\text{motor}} * 1.25}{K_p} + n_{\text{act}}$$

When P170 = 0 (current control), the following equation applies:

$$\frac{-I_{A,\text{limit}} * 1.25}{K_p} + n_{\text{act}} < \text{RFG output} < \frac{+I_{A,\text{limit}} * 1.25}{K_p} + n_{\text{act}}$$

|                        |                                                  |
|------------------------|--------------------------------------------------|
| $\Phi_{\text{motor}}$  | Normalized motor flux (1 at rated field current) |
| $n_{\text{act}}$       | Actual speed value (K0167)                       |
| $+ M_{\text{limit}}$   | Lowest positive torque limit (K0143)             |
| $- M_{\text{limit}}$   | Lower negative torque limit (K0144)              |
| $+ I_{A,\text{limit}}$ | Lowest positive current limit (K0131)            |
| $- I_{A,\text{limit}}$ | Lowest negative current limit (K0132)            |
| $K_p$                  | Effective speed controller gain                  |

However, if the value added to  $n_{\text{act}}$  were to correspond to less than 1%, then +1% or -1% would be added.

The purpose of the "Ramp-function generator tracking" function is to ensure that the ramp generator value cannot deviate excessively from the actual speed value once the torque or current limit has been reached.

Note:

When ramp-function generator tracking is selected, the filter time for the speed setpoint should be set to a low value in P228 (preferably to 0).



### 9.4.7 Limitation after ramp-function generator

Since the input signal can be freely selected, this limiter stage can be used completely independently of the ramp-function generator.

A special feature of this limiter is that the lower limit can also be set to positive values and the upper limit to negative values (see P300 and P301). This type of limit setting then acts as a lower limit (minimum value) for the ramp generator output signal in the other sign direction.

Example: P632.01-04 = 1 (= 100.00%)

P300 = 100.00 (%)

P301 = 10.00 (%)

P633.01-04 = 9 (= -100.00%)

results in a limitation of the value range for K0170 to between +10.00% and +100.00%

### 9.4.8 Velocity signal dv/dt (K0191)

This signal specifies the change in the ramp-function generator output K0190 in the time period set in P542.

## 9.5 Inching

See also Section 8, Sheet G129

The INCHING function can be preset via the binectors selected with indices .01 to .08 of parameter P435 or via bits 8 and 9 of control word 1 (logic operation, see function diagram in Section 8).

When the control word option is used, the following operating modes are possible (see also Section 8, Sheet 33):

P648 = 9: The control bits in control word 1 are input bit-serially. The binectors selected in P668 and P669 determine bits 8 and 9 of control word 1 and thus the input of the INCH command.

P648 ≠ 9: The connector selected in P648 is used as control word 1. Bits 8 and 9 of this word control the input of the INCH command.

The "Inching" function can be executed only if "Shutdown" and "Operating enable" are applied.

The "Inch" command is input when one or several of the named sources (binectors, bits in control word) change to the log. "1" state. In this case, a setpoint selected in parameter P436 is assigned to each source.

An inching setpoint of 0 is applied if the inch command is input by two or more sources simultaneously.

Parameter P437 can be set to define for each possible inch command source (binector, bit in control word - logic operation, see block diagram in Section 8) whether or not the ramp-function generator must be bypassed. When the ramp generator is bypassed, it operates with ramp-up/down times of 0.

#### Sequence of operations for entering Inching command:

If the "Inch" command is entered, the line contactor is energized via the "Line contactor closed" relay and the inching setpoint applied via the ramp-function generator (for exact sequence, see the description of "Switch-on / Shutdown" in Section 9.3.3).

#### Sequence of operations for cancellation of Inching:

After the "Inch" command has been cancelled, the sequence of operations commences in the same way as for "Shutdown" (see Section 9.3.3). After  $n < n_{\min}$  has been reached, the controllers are disabled and the line contactor opened after a parameterizable delay (P085) of between 0 and 60 s (operating state 07.0 or higher). The drive remains in operating state 01.3 while the parameterizable delay period (max. 60.0 s) runs down.



## 9.6 Crawling

See also Section 8, Sheet G130

The "Crawling" function can be activated in operating state o7 and, with "Operation enabled", in the Run state.

The "Crawl" command is entered when one or several of the binectors selected in P440 switches to the log. "1" state. A setpoint selected in parameter P441 is assigned to each binector. If the "Crawl" command is entered via several binectors, the setpoint values are added (limited to  $\pm 200\%$ ).

Parameter P442 can be set to define for each possible crawl command source (binector) whether or not the ramp-function generator must be bypassed. When the ramp generator is bypassed, it operates with ramp-up/down times of 0.

### Level / edge

P445 = 0: Level-triggered  
 Binector selected in P440 = 0: No crawl  
 Binector selected in P440 = 1: Crawl

P445 = 1: Edge-triggered  
 The input of "Crawl" is stored when the binector state changes from 0 → 1 (see Section 8, Sheet G130). The binector selected in P444 must be in the log. "1" state at the same time. The memory is reset when the latter binector changes state to log. "0" (see also example circuit in Section 9.3.3, Switch-on / Shutdown).

### Sequence of operations for entering Crawl command:

If the "Crawl" command is entered in operating state o7, the line contactor is energized via the "Line contactor closed" relay and the crawling setpoint applied via the ramp-function generator.

If the "Crawl" command is entered in the "Run" state, the drive decelerates from the operating speed to the crawling setpoint via the ramp-function generator.

### Sequence of operations for cancellation of Crawling:

With "Crawling" active, but no "Switch-on" command applied:

If all bits which activate the "Crawling" function switch to log. "0", the controllers are disabled after  $n < n_{\min}$  is reached and the line contactor de-energized (operating state o7.0 or higher).

With "Crawling" active from "Run" operating state:

If all bits which activate the "Crawling" function switch to log. "0" and if the conditions for the "Run" operating state are still fulfilled, then the drive accelerates from the set crawling speed to the operating speed via the ramp-function generator.

See also Section 9.3.3 (switch-on / shutdown) with regard to edge triggering, automatic restart and the effect of the current and torque limits during braking.

## 9.7 Fixed setpoint

See also Section 8, Sheet G127

The "Fixed setpoint" function can be activated in the "Run" state with the "Enable controllers" signal applied.

The "Fixed setpoint" function can be input via the binectors selected via indices .01 to .08 of parameter P430 and via bits 4 and 5 of control word 2 (= bits 20 and 21 of complete control word) (see function diagram in Section 8 for logic operation).

When the control word method is used, the following operating modes are possible (see also Section 8, Sheet G181):

- P649 = 9: The control bits in control word 2 are input bit-serially. The binectors selected via P680 and P681 determine bits 4 and 5 of control word 2 (= bits 20 and 21 of complete control word), and thus input of the "Fixed setpoint" function.
- P649 ≠ 9: The connector selected via P649 is used as control word 2. Bits 4 and 5 of this word control the input of "Fixed setpoint".

The "Fixed setpoint" function is input when one or several of the named sources (binectors, bits in control word) switch to the log. "1" state. In this case, a setpoint selected in parameter P431 is assigned to each source. If "Fixed setpoint" is input via several sources simultaneously, the associated setpoints are added (limited to  $\pm 200\%$ ).

Parameter P432 can be set to define for each possible fixed setpoint source (binector, bit in control word - logic operation, see block diagram in Section 8) whether or not the ramp-function generator must be bypassed. When the ramp generator is bypassed, it operates with ramp-up/down times of 0.

#### Sequence for entering Fixed Setpoint function:

The fixed setpoint is injected instead of the main setpoint.

#### Sequence for cancellation of Fixed Setpoint function:

When all the possible sources for injecting the fixed setpoint (binectors, bits in control word) have changed back to log. "0", the setpoint selected in parameter P433 (main setpoint) is switched through again.

## 9.8 Safety shutdown (E-Stop)

The task of the E-STOP function is to open the relay contacts (terminals 109/110) for energizing the main contactor within about 15 ms, independently of semiconductor components and the functional status of the microprocessor board (basic electronics). If the basic electronics are operating correctly, the closed-loop control outputs an I = 0 command to de-energize the main contactor. When an E-STOP command is given, the drive coasts to a standstill.

The E-STOP function can be triggered by one of the following methods:

- **Switch operation:**  
(switch between terminals XS-105 and XS-106; XS-107 open; XS-108 open)  
E-STOP is activated when the switch between terminals XS-105 and XS-106 opens.
- **Pushbutton operation:**  
(Stop pushbutton with NC contact between terminals XS-107 and XS-106; Reset pushbutton with NO contact between terminals XS-108 and XS-106; XS-105 open)  
Opening an NC contact between terminals XS-106 and XS-107 triggers the E-STOP function and stores the shutdown operation. Closing an NO contact between terminals XS-106 and XS-108 resets the function.

When the E-STOP function is reset, the drive switches to the "Starting lockout" state. This status needs to be acknowledged through activation of the "Shutdown" function, e.g. by opening terminal 37.

### Note

The E-STOP function is not an EMERGENCY STOP function according to EN 60204-1

**Sequence of operations for entering E-STOP command:**

1. Enter "E-STOP" command
2. Disable ramp-function generator, n and I controllers
3.  $I_{set} = 0$  is applied
4. a)  $U_{616} = 0$ : E-Stop has same effect as OFF2 (as soon as  $I = 0$ , the firing pulses are disabled)  
b)  $U_{616} = 1$ : E-Stop disables the output of firing pulses immediately (without waiting for  $I = 0$ )
5. Output signal "Close operating brake" (binector B0250 = 0, when  $P080 = 2$ )
6. Converter reaches operating state  $\leq 10.0$  or higher
7. An "older" actual field current value ( $K0265$ ) is input as the field current setpoint upper limit (function is "released" in operating states of  $\leq 05$ )
8. Relay "Power contactor on" (terminal 109/110) drops out
9. Drive coasts to a standstill (or is braked by the operating brake)
10. Parameterizable delay time ( $P258$ ) runs down
11. The field is reduced to a parameterizable value ( $P257$ )
12. When  $n < n_{min}$  ( $P370$ ,  $P371$ ) has been reached, the "Close holding brake" signal is output (binector B0250 = 0, when  $P080 = 1$ )

Note:

15ms after entry of "E Stop" the hardware causes relay "Power contactor on" (terminal 109/110) to drop out (even if item 8 of this sequence has not yet been reached).

## 9.9 Activation command for holding or operating brake (low active)

The signal for controlling the brake is available at binector B0250:

- log. "0" state = Close brake
- log. "1" state = Release brake

In order to drive a brake, this binector must be "wired up" to a binary output, e.g. by setting  $P771$  to 250 for connection to output terminals 46 /47 (see Section 8, Sheet G112, for other possible settings).

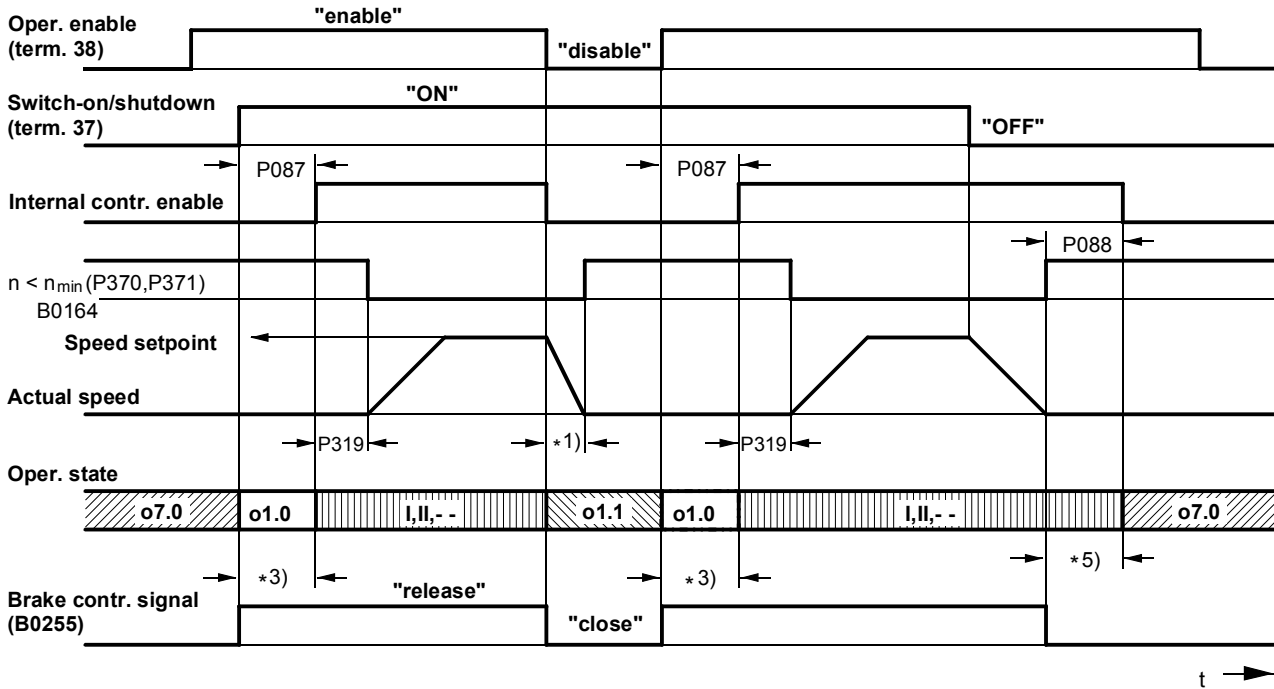
The following parameters influence the action of the brake control signal:

- $P080 = 1$  The brake is a holding brake:  
"Close brake" command is entered only when  $n < n_{min}$  ( $P370$ ,  $P371$ )
- $P080 = 2$  The brake is an operating brake:  
The "Close brake" command is entered even when the motor is running
- $P087$  Brake release time:  
A positive value prevents the motor from acting against the brake as it is released  
A negative value causes the motor to act against the brake while it is still closed in order to prevent the occurrence of a brief, torque-free interval
- $P088$  Brake closing time:  
Causes the motor to produce a torque while the brake is closing
- $P319$  Delay time for enabling ramp-function generator  
After the controllers have been enabled, a setpoint of 0 is input for the time set here. This time should be set such that the brake has actually been released when the timer runs down. This is of particular importance when  $P087$  is set to a negative value.

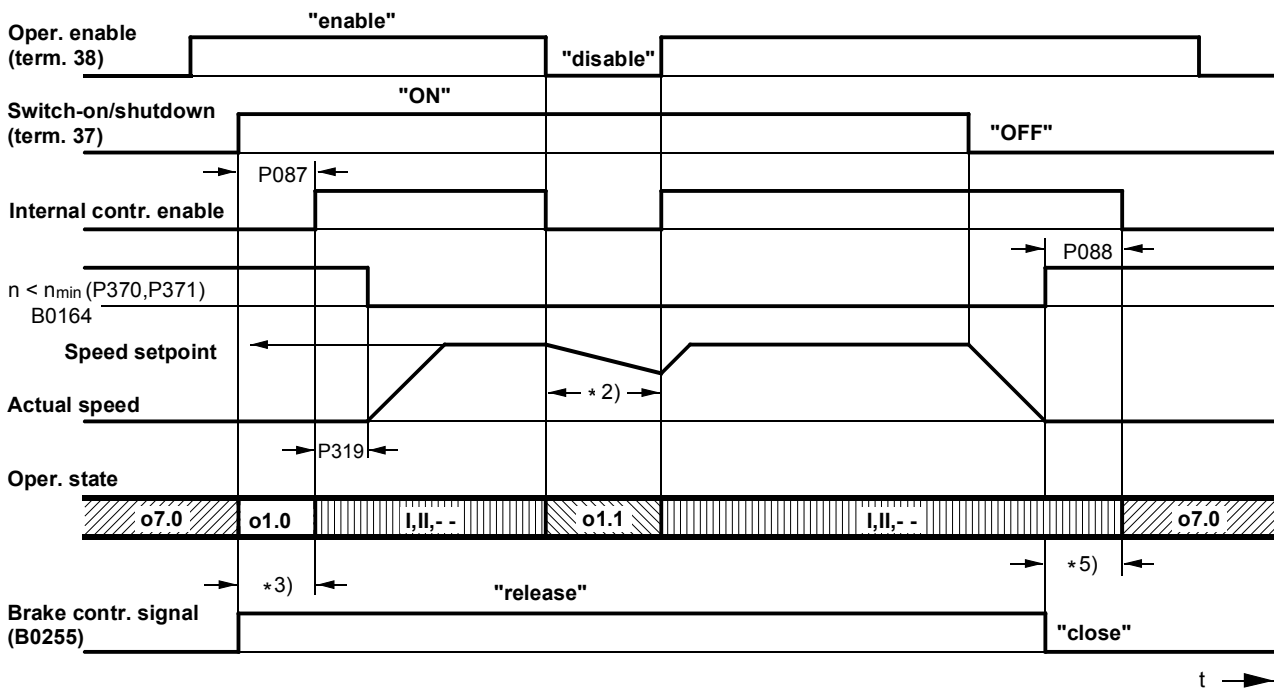
The following diagrams illustrate the chronological sequence of the brake control function with a signal level change at inputs "Switch-on / Shutdown" (e.g. terminal 37) and "Operating enable" (terminal 38). With respect to the brake control, input commands "Inching", "Crawling" or "Fast stop" have the same affect as "Switch-on / Shutdown", and input commands "Voltage disconnection" or "E-Stop" the same affect as cancelling the "Operating enable" command.

The command "Close brake" is output during the optimization run for precontrol and current controller ( $P051 = 25$ ).

### Operating brake (P080 = 2), positive brake release time (P087)

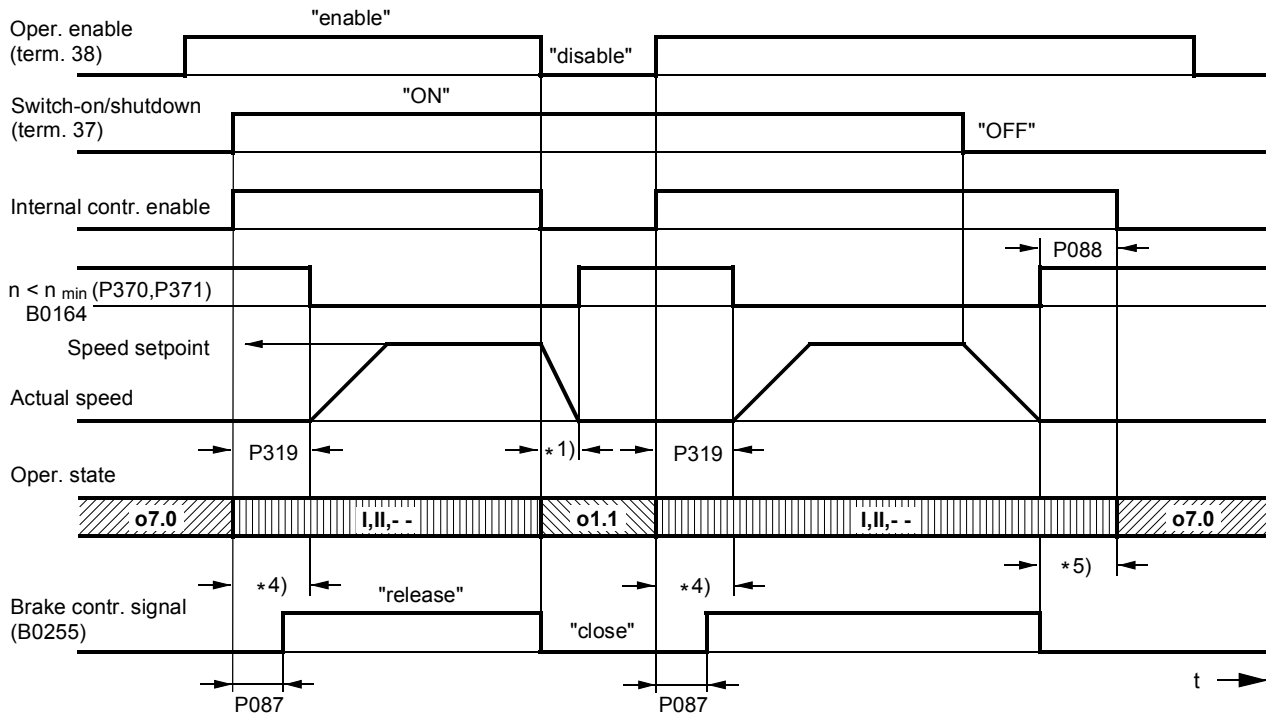


### Holding brake (P080 = 1), positive brake release time (P087)

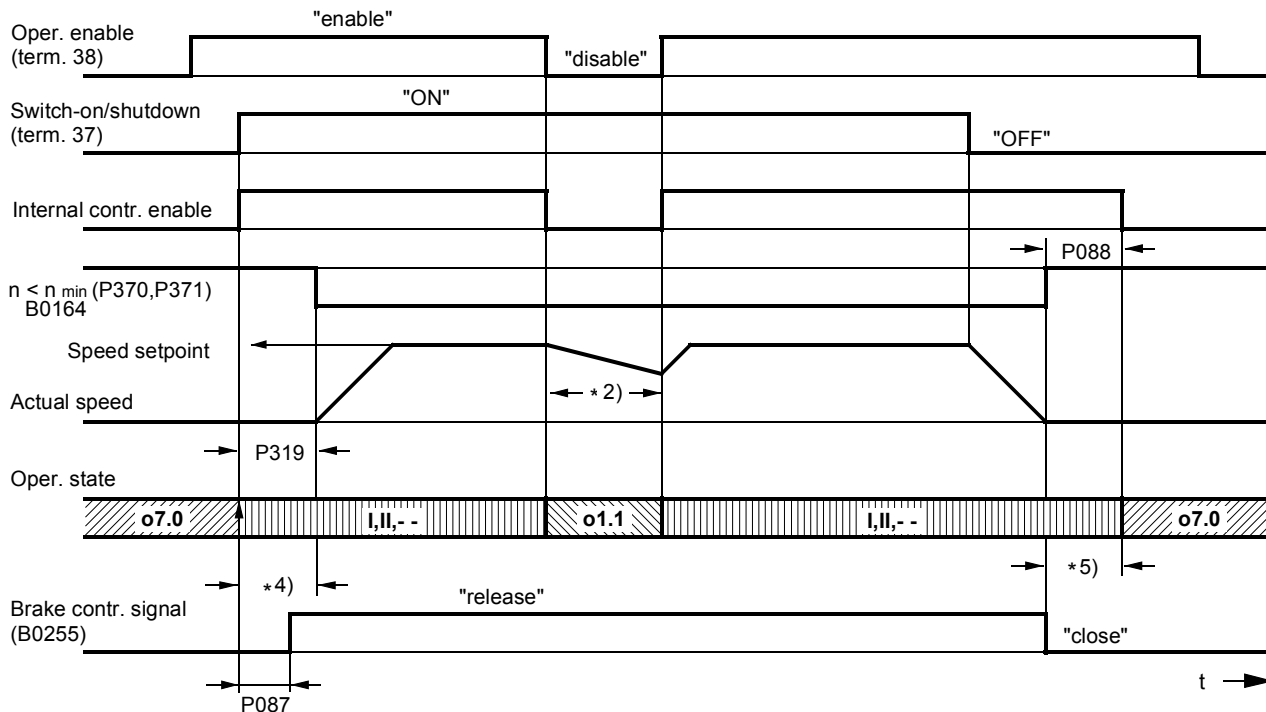


- \*1) Drive is braked mechanically by means of operating brake
- \*2) Drive coasts to standstill, "Close holding brake" not output until  $n < n_{min}$
- \*3) Time for the brake to open before the motor produces a torque (P087 positive)
- \*5) Time for the brake to close while the motor is still producing a torque (P088)

### Operating brake (P080 = 2), negative brake release time (P087)



### Holding brake (P080 = 1), negative brake release time (P087)



- \*1) Drive is braked mechanically by means of operating brake
- \*2) Drive coasts to standstill, "Close holding brake" not output until  $n < n_{\min}$
- \*4) In this case, the motor is still rotating against the closed brake (P087 negative)
- \*5) Time for the brake to close while the motor is still producing torque (P088)

## 9.10 Switch on auxiliaries

The function acts as a switch-on command for auxiliaries (e.g. motor fan).

The "Switch on auxiliaries" signal is available at binector B0251:

log. "0" state = Auxiliaries OFF  
log. "1" state = Auxiliaries ON

To act as the auxiliaries drive signal, this binector must be "wired up" to a binary output, e.g. by setting P771 to 251 for connection to output terminals 46 / 47 (see Section 8, Sheet G112, for other possible settings).

The "Switch on auxiliaries" signal switches to "high" at the same time as the "Switch on" command. The converter then waits in operating state o6.0 for a parameterizable delay period (P093). The line contactor is closed on expiry of the delay.

When the "Shutdown" command is entered, the firing pulses are disabled when  $n < n_{\min}$  is reached and the line contactor drops out. The "Switch on auxiliaries" signal switches to "low" after a parameterizable delay period (P094). However, if the "Switch on" command is entered again before this delay has expired, then the converter does not stay in operating state o6.0, but the line contactor is closed immediately instead.

## 9.11 Switch over parameter sets

See also in Section 9.1 under heading "Data sets"



### WARNING



Parameter sets can be switched over while the converter is in operation (online). As a result, depending on the setting of the control bits when the motor is running, the configuration or functions may be altered in such a way as to produce dangerous operating conditions.

For this reason, we strongly recommend that a "basic" parameter set containing all basic parameter settings is created first and then copied into the other parameter sets. The intentional changes vis-à-vis the "basic" version should then be entered in each parameter set.

The "Switch over parameter sets" function affects function parameters (identified by an ".F" next to parameter number in block diagrams in Section 8) and Bico parameters (identified by a ".B" next to parameter number in block diagrams in Section 8).

The following operating modes are possible (see also Section 8, Sheet G181):

- P649 = 9: The control bits in control word 2 are input bit-serially.  
The binectors selected in P676 and P677 determine bits 0 and 1 of control word 2 (= bits 16 and 17 of complete control word), and thus the input of the function data set.  
The binector selected in P690 determines bit 14 of control word 2 (= bit 30 of complete control word), and thus the input of the Bico data set.
- P649 ≠ 9: The connector selected in P649 is used as control word 2.  
Bits 0 and 1 of control word 2 (bits 16 and 17 of complete control word) control the input of the function data set. Bit 14 (= bit 30 of complete control word) controls the input of the Bico data set.

| Control word |       | Active function data set<br>(active index) |
|--------------|-------|--------------------------------------------|
| Bit 16       | Bit17 |                                            |
| 0            | 0     | 1                                          |
| 1            | 0     | 2                                          |
| 0            | 1     | 3                                          |
| 1            | 1     | 4                                          |

| Control word<br>Bit30 | Active Bico data set<br>(active index) |
|-----------------------|----------------------------------------|
| 0                     | 1                                      |
| 1                     | 2                                      |

**Caution:**

The parameter set selection must not be changed while the optimization run is in progress. Error message F041 will otherwise be output after 0.5 s.

When the "Switch over parameter sets" function is activated, a time delay of up to 25ms may occur before the newly selected parameter set actually becomes operative.

For information about copying parameter sets, please see Section 11 (Parameter List), parameters P055 and P057.

## 9.12 Speed controller

See also Section 8, Sheets G151 and G152

### Control signals for speed controller

The control signals for "Enable speed controller droop", "Enable speed controller" and "Switch over master/slave drive" are supplied by control word 2. The following operating modes are possible (see also Section 8, Sheet G181):

- P649 = 9: The control bits in control word 2 are input bit-serially.  
The binectors selected in P684, P685 and P687 determine bits 8, 9 and 11 of control word 2 (= bits 24, 25 and 27 of complete control word), and thus the functions "Enable speed controller droop", "Enable speed controller" and "Switch over master/slave drive".
- P649 ≠ 9: The connector selected in P649 is used as control word 2.  
Bits 8, 9 and 11 control the functions "Enable speed controller droop", "Enable speed controller" and "Switch over master/slave drive".

#### Enable speed controller:

- 0 = Disable controller, controller output (K0160) = 0, P component (K0161) = 0, I component (K0162) = value of connector selected in P631  
1 = Enable controller

#### Enable droop:

- 0 = Droop is not active  
1 = Droop is active

Switch over master/slave drive:

- 0 = Master drive
- 1 = Slave drive

When "Slave drive" is selected, the I component of the speed controller is made to "track" such that  $M(\text{set}, n \text{ contr.}) = M(\text{set}, \text{limit.})$ , the speed setpoint is set to equal the actual speed (K0179) (enable tracking with P229).

Set I component (selection of control signal via parameter P695):

When  $0 \Rightarrow 1$  signal transition of selected binector, the I component is set to the setting value (selected in parameter P631)

Stop I component (selection of control signal via parameter P696):

- 0 = I component enabled
- 1 = Stop I component

Limitation active:

This signal is in the log. "1" state when the upper or lower torque limitation is violated, the speed limiting controller is active, the current limitation is active or when the firing angle for the armature circuit reaches the  $\alpha_G$ -limit.

In this case, the I component of the speed controller is stopped.

Switch over to P controller:

The P controller function is activated (I component = 0) when the speed drops to below the changeover value.

**D component in actual value channel or setpoint/actual value deviation channel**

As a basis for selecting the correct derivative action time, it is necessary to calculate the maximum possible rate of rise at the derivative action element input, i.e. the period of time required by the input signal to change from 0 to 100% at this maximum rate of rise. The derivative action time should preferably be set to a shorter value than this period.

## 9.13 Serial interfaces

The SIMOREG CM is equipped with the following serial interfaces:

- **G-SST1** (serial interface 1)  
Connector X300 on board A7005 (operator panel)  
USS® protocol  
provided for the purpose of connection the OP1S operator panel
- **G-SST2** (serial interface 2)  
Terminal strip X172 (terminals 56 to 60) on board A7001  
USS® and peer-to-peer protocol, parameterizable

Additionally if board A7006 (terminal expansion) is installed:

- **G-SST3** (serial interface 3)  
Terminal strip X162 (terminals 61 to 65)  
USS® and peer-to-peer protocol, parameterizable

**Interface hardware**

The hardware of G-SST1 is designed to operate in RS232 and RS485 standard / two-wire mode, and G-SST2 and G-SST3 in RS485 standard / two and four-wire mode. For connectors and terminal assignments, see Section 8, Sheets G170 to G174.

The maximum cable length for a peer-to-peer connection from the transmitter to the last receiver connected to the same transmission output is 1000 m. The same maximum cable length applies to the bus cable of a USS connection. The maximum cable length is only 500 m for both types of connection if a baud rate of 187500 bd is selected.



**USS:**

A maximum of 32 nodes can be connected in the bus configuration (i.e. 1 master and max. 31 slaves). The bus connector must be activated on the two bus nodes which form each end of the bus circuit.

**Peer-to-peer:**

Up to 31 other drives can be connected in parallel to the transmit cable of one drive. With a "parallel connection", the bus connector must be activated on the last connected drive.

### 9.13.1 Serial interfaces with USS® protocol

Specification for the USS® protocol: Order No. E20125-D0001-S302-A1

The SIEMENS USS® protocol is implemented in all digital converter devices supplied by SIEMENS. It can be used to provide a point-to-point or bus-type link to a master station. Any mixture of converter types can be connected up to the same bus line. The USS protocol makes it possible to access all relevant process data, diagnostic information and parameters of the SIMOREG CM.

The USS protocol is a pure master-slave protocol. In this case, a converter device can only ever function as slave. Converter devices will transmit a telegram to the master only if they have received one from it first. In other words, converters linked via the USS protocol cannot exchange data directly with one another (they can do this only via a peer-to-peer link).

#### Useful data which can be transferred via the USS protocol

Sheets G170 to G172 in Section 8 show how useful data can be interconnected and list the parameters relevant for configuring USS interfaces.

If parameters need to be read and/or written via the USS interface, then "Parameter data length" (P782, P792, P802) must be set to 3, 4 or 127 (select setting 4 only if double word parameters need to be transferred). If parameters do not need to be transferred, the "Parameter data length" must be set to 0.

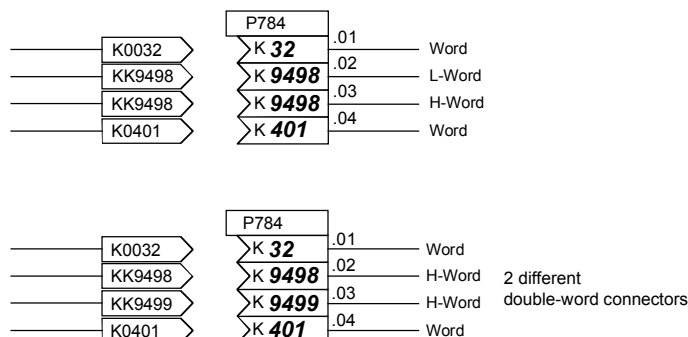
The number of process data words to be transferred is basically identical for the transmit and receive directions and can be set in "Process data length" (P781, P791, P801). Numeric representation "100% equals 4000h = 16384d" applies to all connectors.

#### Transfer of double-word connectors:

In the receive direction, the values of any two adjacent connectors (K) are combined to form a double-word connector (KK) (e.g. K2002 and K2003 to KK2032). These double-word connectors can be connected in the usual way to other function blocks. For details of how to connect with double-word connectors, see Section 9.1, subsection "The following rules apply to the selection of double-word connectors".

In the transmission direction, a double-word connector is applied by entering the same double-word connector at two contiguous indices of the selection parameter.

#### Examples:



**Numeric representation of parameter numbers and values on serial interfaces**

The mode of numeric representation of a parameter value is determined by the parameter "type" assigned to each parameter in the Parameter List. The different types of parameter are explained at the beginning of the list. Parameters are always transmitted in the form specified in the "Value range" column of the Parameter List; any decimal point, however, is omitted (example: display value 123.45 → the number 12345d = 3039h is transferred via the serial interface).

**Diagnostics and monitoring functions for USS interfaces**

All transmitted and received useful data words can be checked (directly at the internal software transfer point from/to USS driver) by means of display parameters r810 / r811, r812 / r813 or r814 / r815.

Diagnostic parameters r789, r799 or r809 provide information about the chronological distribution of errored and error-free telegrams, as well as the nature of any communication errors that have occurred.

A watchdog can be set in P787, P797 or P807 which can initiate a shutdown on faults (F011, F012 or F013) in the case of timeout. By connecting binectors B2031, B6031 or B9031 to the fault message triggers (using P788=2031 / P798=6031 / P808=9031), it is possible to acknowledge these fault messages even if the fault is active continuously, thereby ensuring that the drive can still be operated manually after the USS interface has failed.

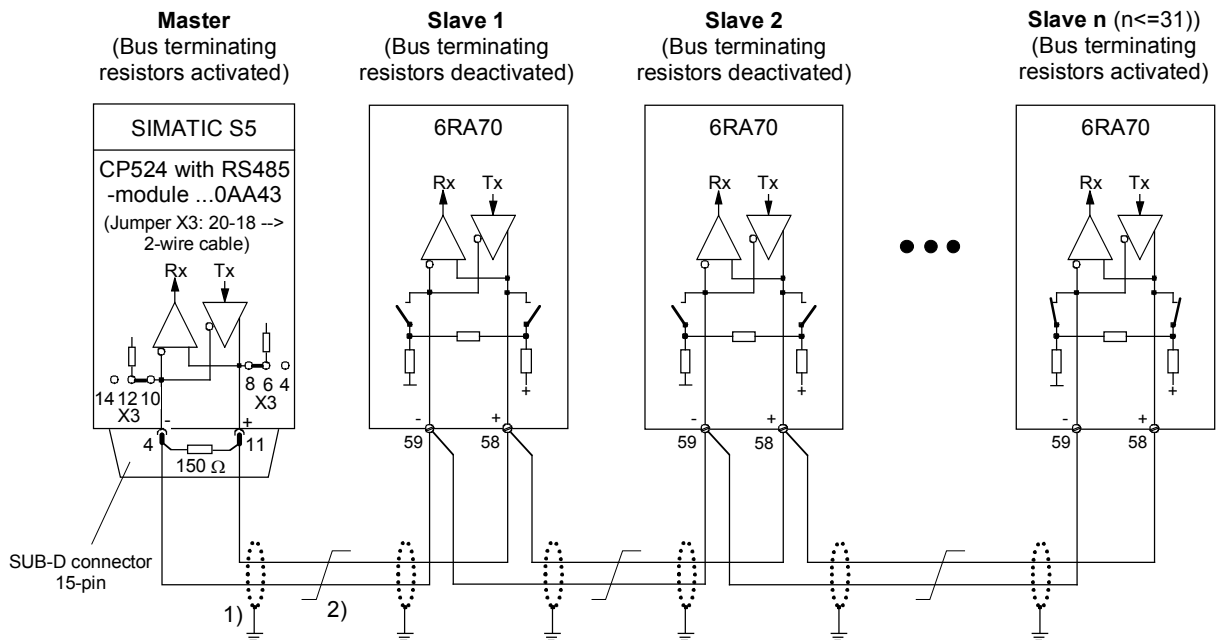
**Important !**

The serial interfaces for the USS protocol are parameterized with the same parameters used to configure the peer-to-peer protocol, although the setting ranges are different in some cases (see Notes for relevant parameters in Parameter List, Section 11).

**USS protocol: Brief start-up guide for 6RA70 converters**

|                                                                          | <b>G-SST1<br/>RS232 / RS485</b>                                                                         | <b>G-SST1<br/>RS485<br/>for connection of an OP1S</b>                                                                                                                          | <b>G-SST2 / G-SST3<br/>RS485</b>                                                                               |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Select USS protocol                                                      | P780 = 2                                                                                                | P780 = 2                                                                                                                                                                       | P790 / P800 = 2                                                                                                |
| Baud rate                                                                | P783 = 1 to 13, corresponding to 300 to 187500 baud                                                     | P783 = 6 (9600 Bd) or 7 (19200 Bd)<br>The baud rate setting must be identical for every node in bus operation                                                                  | P793 / P803 = 1 to 13, corresponding to 300 to 187500 baud                                                     |
| No. of process data (PZD No.)<br>(applies to Receive and Send)           | P781 = 0 to 16                                                                                          | P781 = 2                                                                                                                                                                       | P791 / P801 = 0 to 16                                                                                          |
| PZD assignment for control word and setpoints<br>(received process data) | All received process data are taken to connectors and must be wired up as required                      | If the control bits from the OP1S are to be used:<br>Word 1 (connector K2001):<br>Wiring up of control bits from OP1S, see Sec. 7.2.2<br>Word 2 (connector K2002):<br>Not used | All received process data are taken to connectors and must be wired up as required                             |
| No. of PKW                                                               | P782 =<br>0: No PKW data<br>3 / 4: 3 / 4 PKW data words<br>127: Variable data length for slave → master | P782 = 127 variable data length                                                                                                                                                | P792 / P802 =<br>0: No PKW data<br>3 / 4: 3 / 4 PKW data words<br>127: Variable data length for slave → master |
| PZD assignment for actual values<br>(transmitted process data)           | Selection of transmitted values via P784                                                                | Word 1: P784.i01=32 (stat. word 1 K0032)<br>Word 2: P784.i02=0                                                                                                                 | Selection of transmitted values via P794 / P804                                                                |
| Node address                                                             | P786 = 0 to 30                                                                                          | P786 = 0 to 30<br>Every node must have its own, unique address for bus operation                                                                                               | P796 / P806 = 0 to 30                                                                                          |
| Telegram failure time                                                    | P787 = 0.000 to 65.000s                                                                                 | P787 = 0.000s                                                                                                                                                                  | P797 / P807 = 0.000 to 65.000s                                                                                 |
| Bus termination                                                          | P785 = 0: Bus term. OFF<br>1: Bus term. ON                                                              | P785 = 0: Bus term. OFF<br>1: Bus term. ON                                                                                                                                     | P795 / P805 =<br>0: Bus term. OFF<br>1: Bus term. ON                                                           |
| Bus / point-to-point communication                                       | RS232: Only point-to-point operation possible<br>RS485: Bus operation possible                          | Bus operation possible                                                                                                                                                         | Bus operation possible                                                                                         |
| 2-wire / 4-wire transmission via RS485 interface                         | 2-wire operation is selected automatically                                                              | 2-wire operation is selected automatically                                                                                                                                     | 2-wire operation is selected automatically                                                                     |
| Cable                                                                    | Connector assignments, see Sect. 6.8 or Sheet G170 in Sect. 8                                           | See operating instructions for OP1S operator panel                                                                                                                             | Connector assignments, see Sect. 6.8 or Sheets G171, G172 in Sect. 8                                           |

### Connection example for a USS bus



- 1) The interface cable shields must be connected directly on the converter with the lowest possible impedance to converter or cubicle earth (e.g. via clamp).
- 2) Twisted cable, e.g. LIYCY 2x0.5 sqmm; with longer cables, an equipotential bonding conductor must be used to ensure that the difference in frame potentials between nodes stays below 7 V.

### 9.13.2 Serial interfaces with peer-to-peer protocol

The term "Peer-to-peer link" refers to a "Link between partners of equal status". In contrast to the classic master/slave bus system (e.g. USS and PROFIBUS), the same converter can function as both the master (setpoint source) and the slave (setpoint receiver) in a peer-to-peer link.

Signals can be transferred in fully digital form from one converter to another via the peer-to-peer link, for example:

- **Velocity setpoints** for producing a setpoint cascade, e.g. on paper, foil and wire-drawing machines and on fiber-drawing machinery.
- **Torque setpoints** for closed-loop load distribution controls on drives that are coupled mechanically or via the material, e.g. longitudinal-shaft drives on printing presses or S-roll drives
- **Acceleration setpoints (dv/dt)** for acceleration precontrol on multi-motor drives.
- **Control commands**

#### Useful data which can be transferred via the peer-to-peer link

Sheets G173 and G174 in Section 8 show how useful data can be interconnected and list the parameters relevant for configuring peer-to-peer links. Any connectors can be parameterized as transmit data (numeric representation: 100% equals 4000h = 16384d).

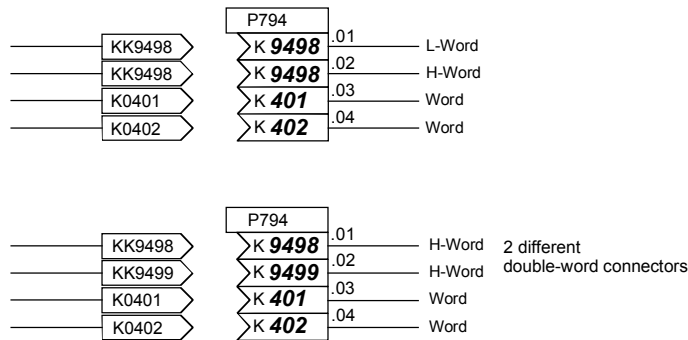
Parameters cannot be transferred via the peer-to-peer link.

Transfer of double-word connectors:

In the receive direction, the values of any two adjacent connectors (K) are combined to form a double-word connector (KK) (e.g. K6001 and K6002 to KK6081). These double-word connectors can be connected in the usual way to other function blocks. For details of how to connect with double-word connectors, see Section 9.1, subsection "The following rules apply to the selection of double-word connectors".

In the transmission direction, a double-word connector is applied by entering the same double-word connector at two contiguous indices of the selection parameter.

Examples:



### Diagnostics and monitoring functions for peer-to-peer link

All transmitted and received useful data words can be checked (directly at the internal software transfer point from/to peer driver) by means of display parameters r812 / r813 or r814 / r815. Diagnostic parameters r799 or r809 provide information about the chronological distribution of errored and error-free telegrams, as well as the nature of any communication errors that have occurred. A watchdog can be set in P797 or P807 which can initiate a shutdown on faults (F012 or F013) in the case of timeout. By connecting binectors B6031 or B9031 to the fault message triggers (using P798=6031 / P808=9031), it is possible to acknowledge these fault messages even if the fault is active continuously, thereby ensuring that the drive can still be operated manually after the peer-to-peer interface has failed.

#### Important !

The serial interfaces for the peer-to-peer protocol are parameterized with the same parameters used to configure the USS protocol, although the setting ranges are different in some cases (see Notes for relevant parameters in Parameter List, Section 11).

### Peer-to-peer communication, 4-wire operation

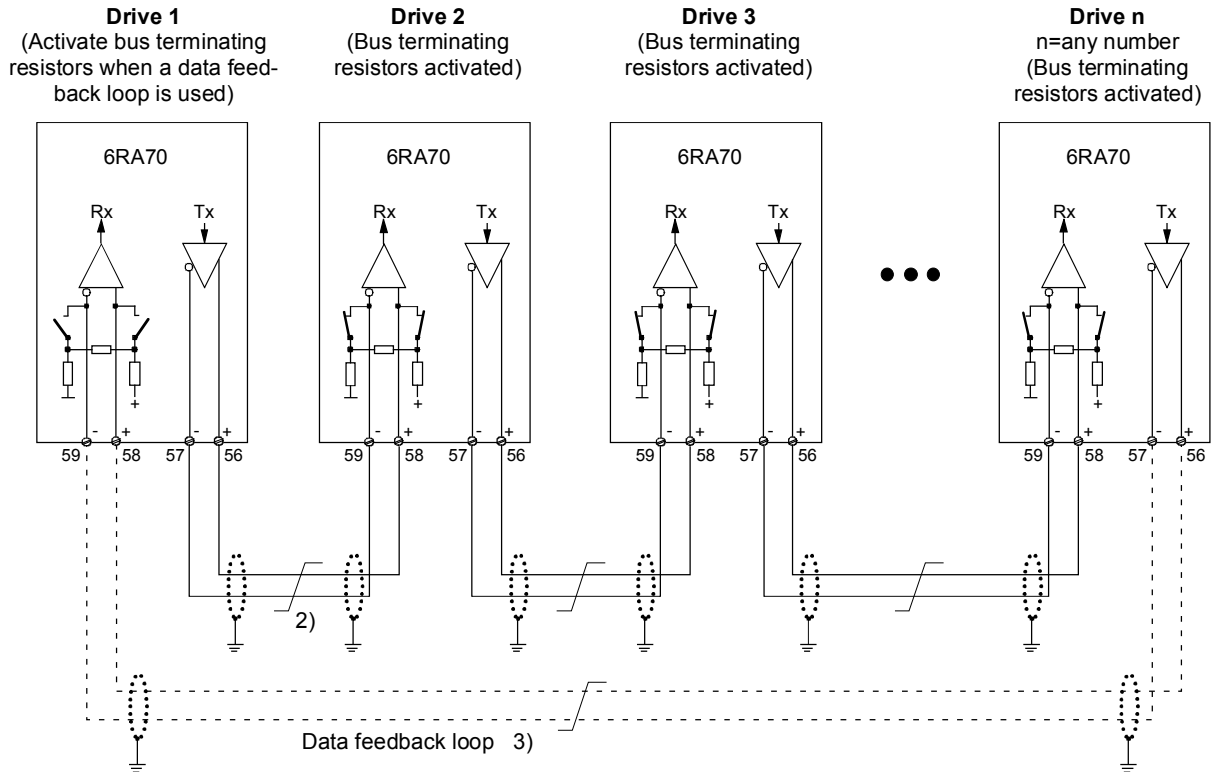
Serial linking of converter to converter (partners of equal status).

The signal flow can pass through the drives, for example, in a series connection. In this case, each drive forwards the data after processing only to the next drive (classic setpoint cascade).

### Brief start-up guide for 6RA70 converters

|                                                                          | G-SST2<br>RS485                                                                    | G-SST3<br>RS485                                                                    |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Select peer-to-peer protocol                                             | P790 = 5                                                                           | P800 = 5                                                                           |
| Baud rate                                                                | P793 = 1 to 13 corresponding to 300 to 187500 baud                                 | P803 = 1 to 13 corresponding to 300 to 187500 baud                                 |
| No. of process data (PZD No.)<br>(applies to Receive and Send)           | P791 = 1 to 5                                                                      | P801 = 1 to 5                                                                      |
| PZD assignment for control word and setpoints<br>(received process data) | All received process data are taken to connectors and must be wired up as required | All received process data are taken to connectors and must be wired up as required |
| No. of PKW                                                               | No parameters can be transferred                                                   | No parameters can be transferred                                                   |
| PZD assignment for actual values<br>(transmitted process data)           | Selection of transmitted values via P794 (indices .01 to .05)                      | Selection of transmitted values via P804 (indices .01 to .05)                      |
| Telegram failure time                                                    | P797 = 0.000 to 65.000s                                                            | P807 = 0.000 to 65.000s                                                            |
| Bus termination                                                          | P795 = 0: Bus term. OFF<br>1: Bus term. ON<br>(depending on type of link)          | P805 = 0: Bus term. OFF<br>1: Bus term. ON<br>(depending on type of link)          |
| 2-wire / 4-wire transmission<br>via RS485 interface                      | "4-wire" operation is automatically selected                                       | "4-wire" operation is automatically selected                                       |
| Cable                                                                    | Terminal assignments, see Section 6.8 or Sheet G173 in Section 8                   | Terminal assignments, see Section 6.8 or Sheet G174 in Section 8                   |

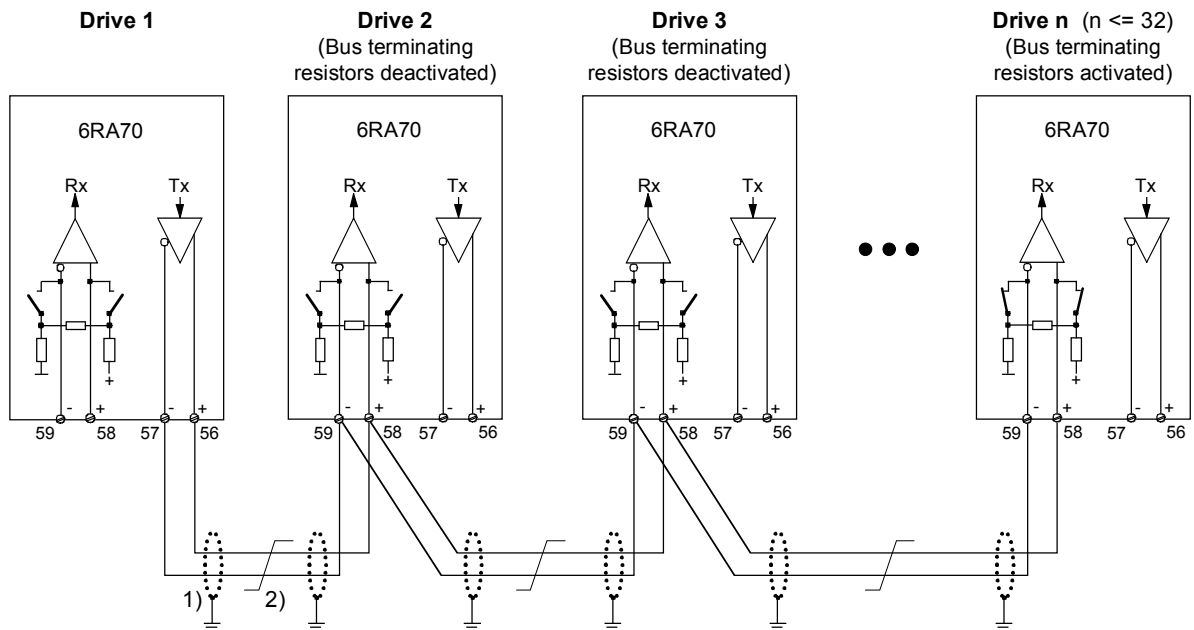
### Examples of peer-to-peer links



#### Peer link type "Series connection"

Each drive receives its own individual setpoint from the drive connected upstream (classic setpoint cascade)

- 1) The interface cable shields must be connected directly on the converter with the lowest possible impedance to converter or cubicle earth (e.g. via a clamp).
- 2) Twisted cable, e.g. LIYCY 2x0.5 sqmm; with longer cables, an equipotential bonding conductor must be used to ensure that the difference in frame potentials between nodes stays below 7 V.
- 3) Optional data feedback loop via which drive 1 can monitor operation of the entire peer chain.



#### Peer link type "Parallel connection"

Up to 31 drives receive identical setpoints from drive 1

- 1) The interface cable shields must be connected directly on the converter with the lowest possible impedance to converter or cubicle earth (e.g. via a clamp).
- 2) Twisted cable, e.g. LIYCY 2x0.5 sqmm; with longer cables, an equipotential bonding conductor must be used to ensure that the difference in frame potentials between nodes stays below 7V.



- 1) The interface cable shields must be connected directly on the converter with the lowest possible impedance to converter or or cubicle earth (e.g. via a clamp).
- 2) Twisted cable, e.g. LIYCY 2x0.5 sqmm; with longer cables, an equipotential bonding conductor must be used to ensure that the difference in frame potentials between nodes stays below 7V.

## 9.14 Thermal overload protection of DC motor (I<sup>2</sup>t monitoring of motor)

The I<sup>2</sup>t monitoring function is parameterized in parameters P100, P113 and P114. If these parameters are adapted correctly, the motor is protected against overloading (not all-round motor protection). This monitoring function is disabled in the factory setting of the parameters (P820 i006 = 37).

### Adaptation

P114: A time constant  $T_{\text{motor}}$  in minutes for the I<sup>2</sup>t monitoring function must be entered in parameter P114.

P113, P100: The permissible continuous current of the motor must be defined by parameters P100 and P113.

The permissible continuous current is the product of the calculation  $P113 * P100$ .

### Warning characteristic / switch-off characteristic

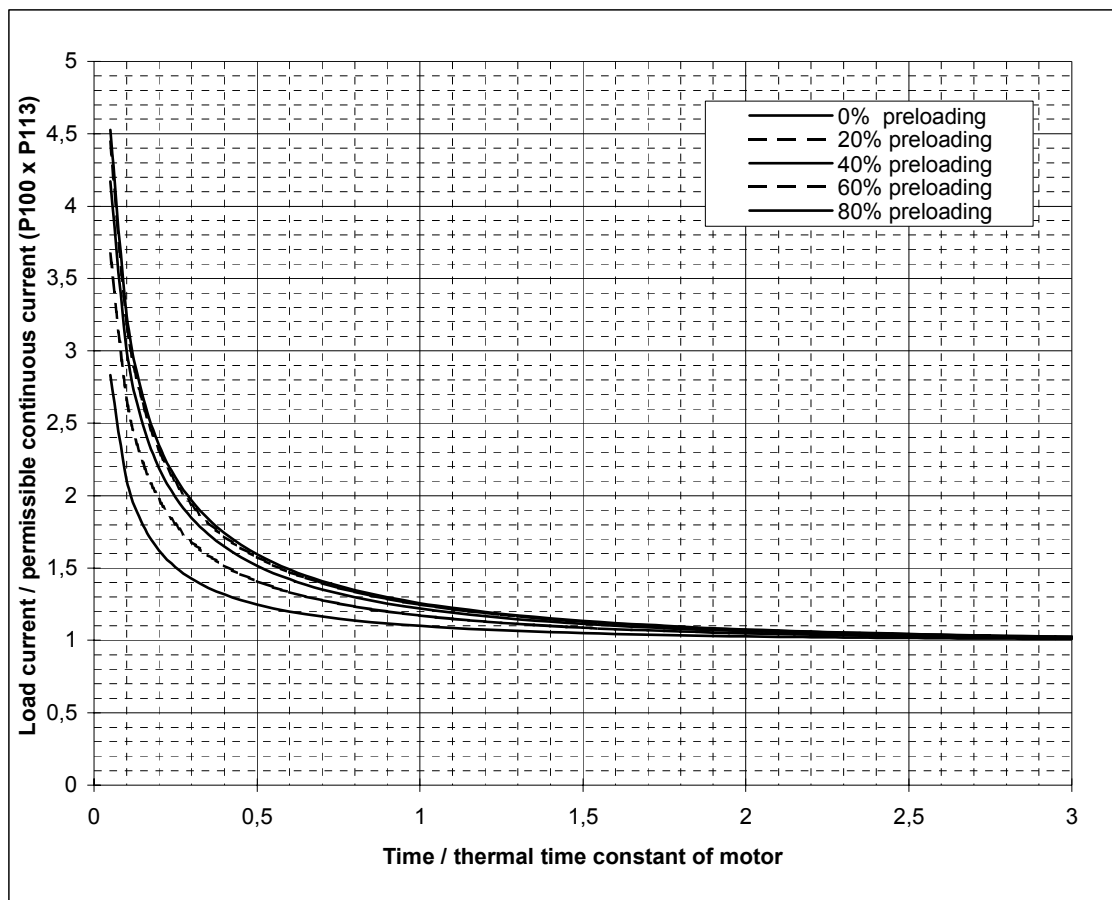
If the motor is loaded constantly, for example, with about 125% of the permissible continuous motor current, then alarm A037 is triggered after a time constant (P114) has elapsed. If the load is not reduced, then the drive is shut down when the switch-off characteristic is reached and fault message F037 displayed.

Warning/switch-off times for other loads can be calculated from the diagram.

### Alarm message triggering by motor I<sup>2</sup>t monitoring function

This diagram shows how long it takes for an alarm message to be triggered if, after a long preloading period ( $> 5 * T_{\text{th}}$ ), a new constant load value is injected abruptly.

$T_{\text{th}} = P114$  .. thermal time constant of motor

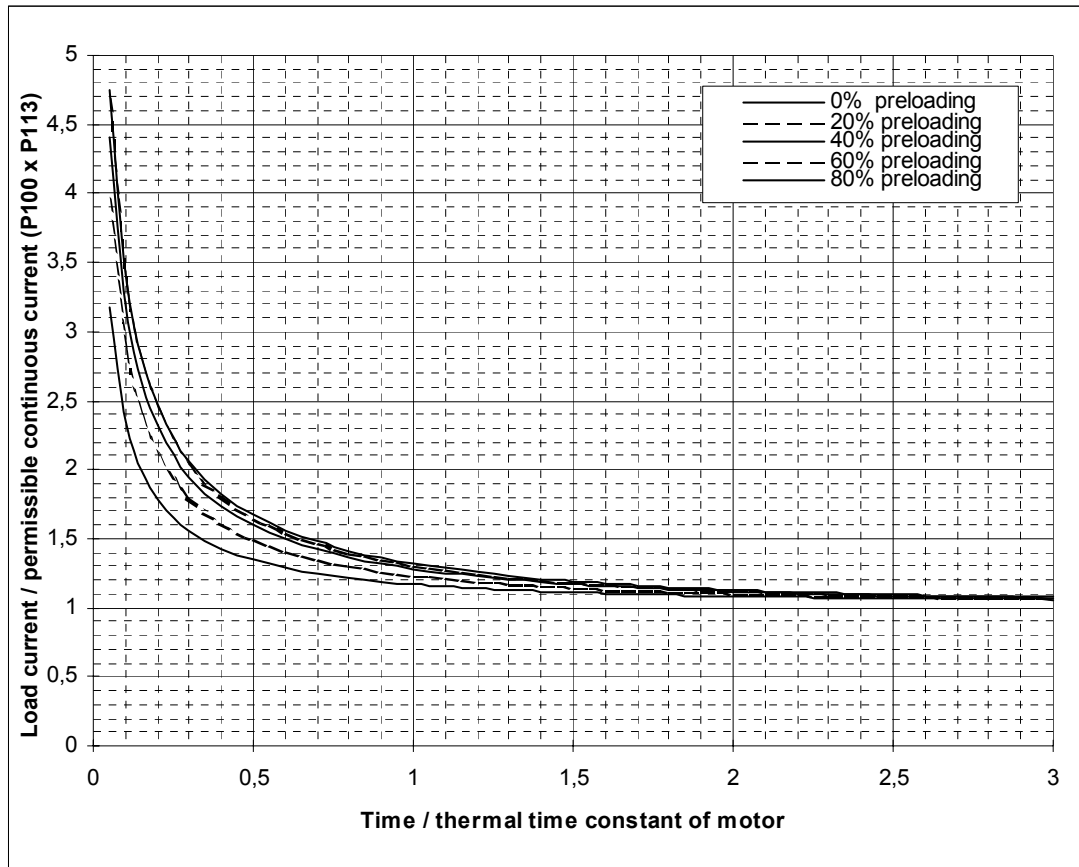




### Fault message triggering by motor I<sup>2</sup>t monitoring function

This diagram shows how long it takes for a fault message to be triggered if, after a long preloading period ( $> 5 \cdot T_{th}$ ), a new constant load value is injected abruptly.

$T_{th}$  = P114 .. thermal time constant of motor



### CAUTION

When the electronics power supply fails for longer than 2 s, the calculated motor preloading value is lost. When the supply is reconnected, the system assumes that the connected motor has not been loaded at all!

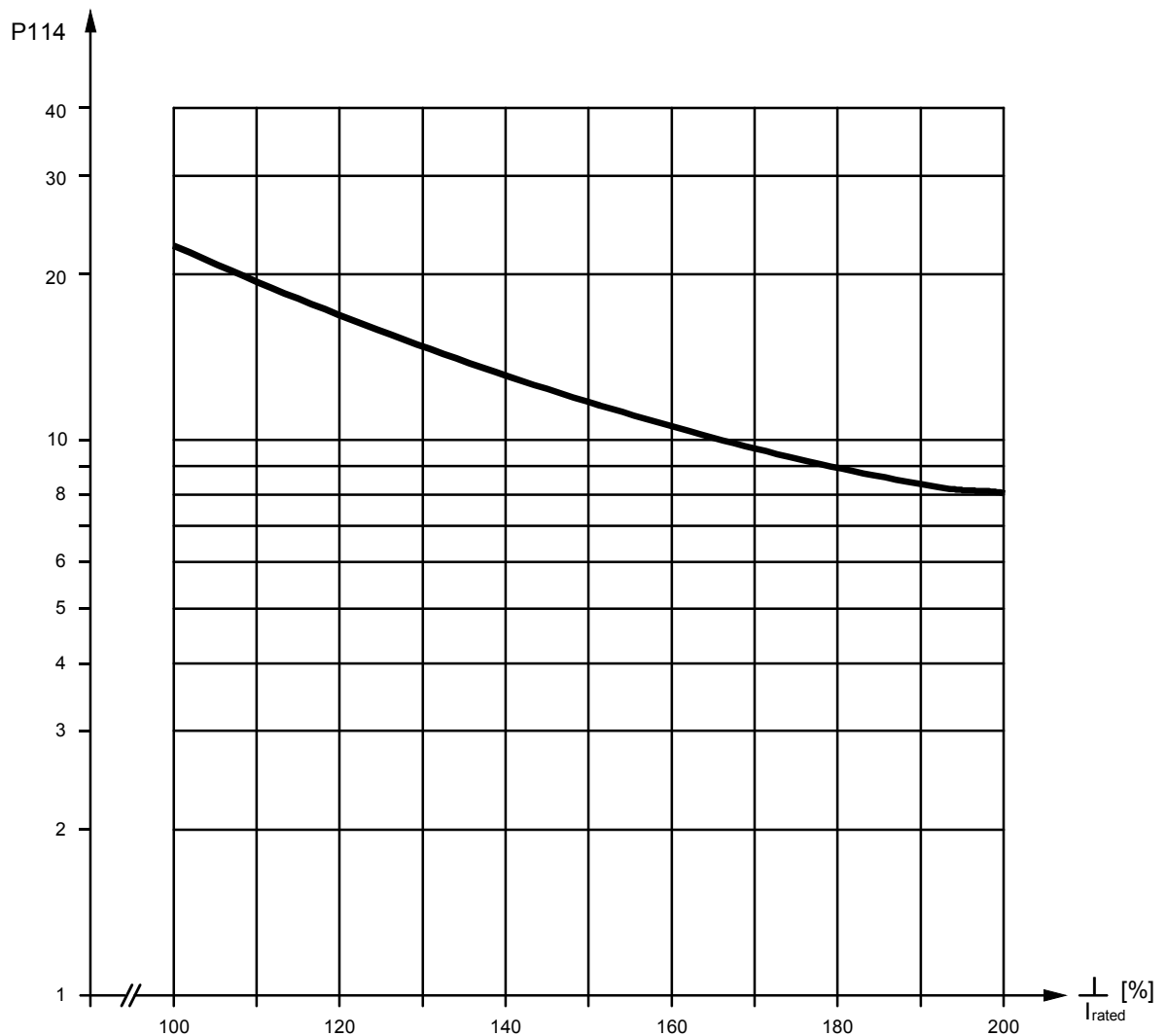
If the electronics power supply fails and the converter is switched on again within 2 s (e.g. via the "Automatic restart" function), then the temperature calculation is based on the last calculated I<sup>2</sup>t value of the motor..

The I<sup>2</sup>t monitoring function reproduces only a rough thermal image of the motor, i.e. it does not provide all-round motor protection.

If P114 ( $T_{motor}$ ) is set to zero, then the I<sup>2</sup>t monitoring function is deactivated.

**Calculation of thermal equivalent time constant (P114)**

It must be noted that the thermal equivalent time constant is dependent on the maximum overcurrent. Thermal equivalent time constant of 1G . 5/1H . 5 DC motors according to Catalog DA12.



$I_{rated}$  ... Rated motor armature current (=P100)

$I$  ... Maximum overcurrent at which motor is operated

**NOTES**

- When other motor types are connected, the manufacturer's specifications apply.
- If you are using DC motors 1G.5 / 1H.5 as specified in catalog DA12, parameter P113 must be set to 1.00

## 9.15 Speed-dependent current limitation

The speed-dependent current limitation protects the commutator and brushes of the DC motor at high speeds.

The necessary parameter settings (P104 to P107) can be taken from the motor rating plate.

The maximum operating speed of the motor (P108) must also be entered. This must be the same as the actual maximum operating speed.

The actual maximum operating speed is determined by:

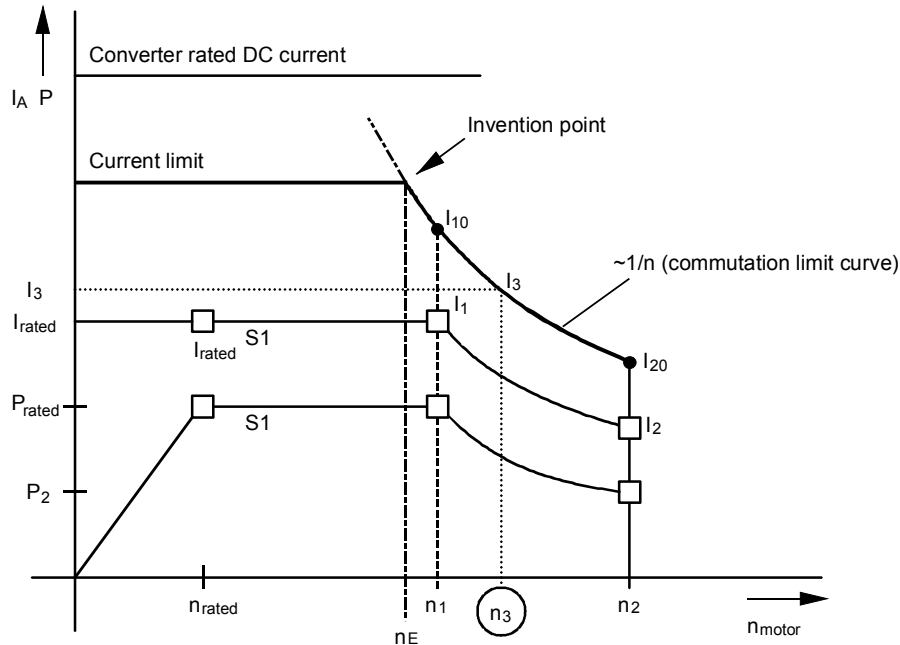
- P143 with actual speed supplied by a pulse encoder,
- P741 with actual speed supplied by an analog tacho,
- P115 in operation without a tachometer.

Furthermore, the speed-dependent current limitation must be activated by setting P109 = 1!

### CAUTION

Setting the speed-dependent current limitation function to the wrong value may cause excessive loading of the commutator and brushes, resulting in a drastic reduction in brush life!

### 9.15.1 Setting the speed-dependent current limitation for motors with commutation transition



□ Motor rating plate data

$n_E$  = Point at which speed-dependent current limitation intervenes

• Permissible limit values

⊙  $n_3$  = Maximum operating speed

$$I_{10} = 1.4 \cdot I_1$$

$$I_{20} = 1.2 \cdot I_2$$

The current limitation curve is determined by  $n_1$ ,  $I_{10}$ ,  $n_2$  and  $I_{20}$ .

Parameters:

P104 =  $n_1$

P105 =  $I_1$  (used by unit to calculate  $I_{10}$ )

P106 =  $n_2$

P107 =  $I_2$  (used by unit to calculate  $I_{20}$ )

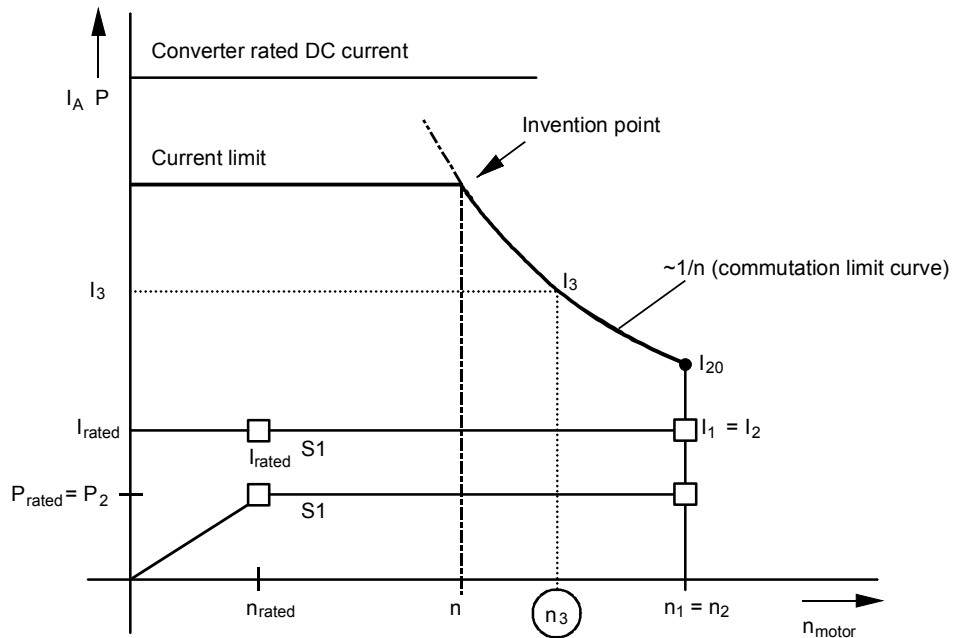
P108 =  $n_3$  (defines speed normalization)

P109 = 0 ... speed-dependent current limitation deactivated  
1 ... speed-dependent current limitation activated

Example of a motor rating plate:

|                    |                 |                        |       |                 |                 |
|--------------------|-----------------|------------------------|-------|-----------------|-----------------|
| * S H U N T -MOT.  |                 | 1GG5162-0GG4 . -6HU7-Z |       | EN 60034        |                 |
| NRE                |                 |                        |       | KW              |                 |
| V                  | $n_1$           | 1/MIN                  | $n_2$ | $I_1$           | A               |
| 46-380             | 50-1490         |                        |       | 78.0-78.5       |                 |
| 380                | <div>3400</div> | <div>4500</div>        |       | <div>80.0</div> | <div>58.0</div> |
| ERR.               | V               | A                      | REG.  | THYR.: B6C      | LV=             |
| SEP.               | 310             | 2.85                   | IP 23 | 0MH 380V/ 50HZ  |                 |
|                    | 77/51           | 0.87/0.60              |       | IM B3           |                 |
|                    |                 |                        |       | I.CL.F          |                 |
| Z: A11 G18 K01 K20 |                 |                        |       |                 |                 |
| SEP. VENTIL.       |                 |                        |       |                 |                 |

### 9.15.2 Setting of speed-dependent current limitation for motors without commutation transition



□ Motor rating plate data

$n_E$  = Point at which speed-dependent current limitation intervenes

• Permissible limit values

⊙  $n_3$  = Maximum operating speed

$$I_{20} = 1.2 \cdot I_2$$

Example of a motor rating plate:

|                    |                        |                                 |            |          |  |
|--------------------|------------------------|---------------------------------|------------|----------|--|
| * S H U N T -MOT.  |                        | 1GG5116-0FH40-6HU7-Z            |            | EN 60034 |  |
| NRE                |                        |                                 |            | KW       |  |
| V                  | $n_2 = n_1$ 1/MIN      | A                               |            |          |  |
| 46-380             | 50-2300                | 36.0-37.5                       | 0.265-12.0 |          |  |
| 380                | <span>6000</span> REG. | <span>38.5</span> — $I_2 = I_1$ | 12.0       |          |  |
| ERR.               | V A                    | THYR.: B6C LV= 0MH 380V/ 50HZ   |            |          |  |
| SEP.               | 310 1.45               | IP 23 IM B3                     |            |          |  |
|                    | 54 0.32                | I.CL.F                          |            |          |  |
| Z: A11 G18 K01 K20 |                        |                                 |            |          |  |
| SEP. VENTIL.       |                        |                                 |            |          |  |

## 9.16 Automatic restart

The "Automatic restart" function is controlled by the setting in parameter P086:

P086 = 0                      No automatic restart  
 P086 = 0.1s to 2.0s        "Automatic restart" in seconds

The purpose of the "Automatic restart" function is to prevent the SIMOREG CM from switching immediately to the "FAULT" state, but allow it to return to the "Run" state after the elimination of certain fault conditions such as brief failures in supply voltages, brief undervoltage or overvoltage, very high or very low line frequencies or in the case of an excessive deviation between the field current actual value and setpoint.

The appropriate fault message is output only if one of the following fault conditions prevails continuously for longer than the "Automatic restart time" set in P086 (maximum time delay within which fault condition must be eliminated for "Automatic restart"):

- F001    Failure of electronics supply in operation (5U1, 5W1)
- F004    Armature supply phase failure (1U1, 1V1, 1W1)
- F005    Fault in field circuit (field supply phase failure (3U1, 3W1) or  
            $I_{\text{field act}} < 50\% I_{\text{field set}}$ )
- F006    Undervoltage (armature or field supply)
- F007    Overvoltage (armature or field supply)
- F008    Line frequency (armature or field supply) less than 45Hz
- F009    Line frequency (armature or field supply) greater than 65 Hz

When one of the fault conditions associated with faults F003 to F006, F008, F009 is active and the automatic restart time delay is still running, the converter dwells in operating state 04.0 (with armature line voltage faults) or 05.0 (with field line voltage or field current faults).

Failures in the electronics supply lasting up to several 100 ms are bridged by the back-up power supply. With longer failures, the failure time is measured by measuring the voltage across one "discharge capacitor" and, if the failure has not lasted as long as the "Restart time" set in P086, the converter restarted again immediately provided that the corresponding control signals (e.g. "Switch-on", "Operating enable") are still applied.

When the "Switch-on", "Shutdown" and "Crawl" functions are edge-triggered (see P445 = 1), the converter cannot be restarted automatically after the power supply backup has been used.

## 9.17 Field reversal (also refer to Section 8 "Function diagrams" Sheet G200)

By reversing the current polarity in the field winding of the DC motor (i.e. through field reversal), a drive which incorporates a 6RA70 single-quadrant converter (with only a single armature conduction direction) will be able to operate in other quadrants of the speed/torque characteristic (reversal of rotational direction and braking). Two contactors in the field circuit (1, 2) are required to reverse the polarity of the field voltage.

The signal level of binectors B0260 ("Close field contactor 1") and B0261 ("Close field contactor 2") are defined in an internal operating sequence involving functions "Direction of rotation reversal using field reversal" and "Braking with field reversal". These binectors are used to control the two reversing contactors for changing the field polarity. A snubber circuit must be installed in the field circuit.

- Level of **B0260**:    0    No contactor control  
                           1    Control for one contactor for switching through positive field direction.
- Level of **B0261**:    0    No contactor control  
                           1    Control for one contactor for switching through negative field direction.

### 9.17.1 Direction of rotation reversal using field reversal

This function is controlled by the binector selected in P580.

The "Direction of rotation reversal using field reversal" has a switch function and defines the field direction and, if a positive speed setpoint is applied, also the direction of rotation.

|        |   |                                                                                                                        |
|--------|---|------------------------------------------------------------------------------------------------------------------------|
| Level: | 0 | Positive field direction is selected<br>("Close field contactor 1" (B0260) = 1, "Close field contactor 2" (B0261) = 0) |
|        | 1 | Negative field direction is selected<br>("Close field contactor 1" (B0260) = 0, "Close field contactor 2" (B0261) = 1) |

Changing the logic level of the binector controlling the "Direction of rotation reversal using field reversal" function initiates an internal sequence which brakes the motor and accelerates it in the opposite direction.

While the field reversal process is in progress, the logic level of the controlling binector is irrelevant, i.e. once the function has commenced, it is completed without interruption. Only on completion is another check made to establish whether the logic level of the controlling binector actually coincides with the currently selected field direction.

Note:

Only positive speed setpoints are meaningful.

#### Sequence of control operations when "Direction of rotation reversal using field reversal" is applied:

1. Drive is rotating in rotational direction 1 (or is at standstill)
2. Logic level of binector controlling the "Direction of rotation reversal using field reversal" changes
3. Internal field reversal process takes place (only if a braking operation has not already been activated by pushbutton function "Braking with field reversal"):
  - 3.1 Wait for armature current  $I_A = 0$  and then armature pulse disable (drive then dwells in operating state  $\geq o1.4$ )
  - 3.2 Disable field firing pulses (also causes K0268=0)
  - 3.3 Wait for  $I_{field} (K0265) < I_{field\ min} (P394)$
  - 3.4 Waiting time according to P092.i001 (0.0 to 10.0 s, factory setting 3.0 s)
  - 3.5 Open current field contactor (B0260 = 0 or B0261 = 0)
  - 3.6 Waiting time according to P092.i002 (0.0 to 10.0 s, factory setting 0.2 s)
  - 3.7 Close new field contactor (B0261 = 1 or B0260 = 1)
  - 3.8 Reverse polarity of actual speed value (except when P083 = 3 ... EMF as actual speed value)
  - 3.9 Waiting time according to P092.i003 (0.0 to 10.0 s, factory setting 0.1 s)
  - 3.10 Enable field firing pulses
  - 3.11 Wait for  $I_{field} (K0265) > I_{field\ set} (K0268) \cdot P398 / 100\%$
  - 3.12 Waiting time according to P092.i004 (0.0 to 10.0 s, factory setting 3.0 s)
  - 3.13 Enable armature firing pulses  
(It is possible to exit operating mode o1.4)
4. Drive brakes and then accelerates in rotational direction 2 (or remains at standstill)

Note:

If the actual speed value polarity is reversed internally as a result of field reversal, P083 (but not P083=3) is supplied with inverted signal values (see Section 8, Sheet G152). When the ramp-function generator is in use, it is advisable to set P228=0 (no speed controller setpoint filtering). Otherwise, initial braking along the current limit may occur in connection with the actual speed value polarity reversal and setting of the ramp-function generator output (to (reversed) actual speed value (or to value set in P639) in operating state o1.4).

### 9.17.2 Braking with field reversal

This function is controlled by the binector selected in P581.

"Braking with field reversal" has a pushbutton function.

If the logic level of the binector controlling the "Braking with field reversal" function = 1 (for at least 30 ms) and the converter is in an operating state  $\leq o5$  (line contactor closed), an internal process is activated for braking the drive down to  $n < n_{min}$ . The original field direction is then selected.

The motor cannot accelerate again in the original rotational direction until the braking command has been cancelled (binector level = 0) and an acknowledgement given with "Shutdown" and "Switch-on".

#### Sequence of control operations when "Braking with field reversal" is applied:

1. Drive rotates in direction 1
2. The binector controlling the "Braking with field reversal" function = 1 for more than 30 ms
3. Internal field reversal process takes place (only if the line contactor is closed (in operating state of  $\leq o5$ ) and the drive is not already in braking mode. Braking is detected by a negative internal actual speed (resulting from reversal of the real actual speed polarity in the negative field direction):
  - 3.1 Wait for armature current  $I_A = 0$  and then armature pulse disable (drive then dwells in operating state  $\geq o1.4$ )
  - 3.2 Disable field firing pulses (also causes K0268=0)
  - 3.3 Wait for  $I_{field} (K0265) < I_{field min} (P394)$
  - 3.4 Waiting time according to P092.i001 (0,0 to 10,0 s, factory setting 3,0 s)
  - 3.5 Open current field contactor (B0260 = 0 or B0261 = 0)
  - 3.6 Waiting time according to P092.i002 (0,0 to 10,0 s, factory setting 0,2 s)
  - 3.7 Close new field contactor (B0261 = 1 or B0260 = 1)
  - 3.8 Reverse polarity of actual speed value (except when P083 = 3 ... EMF as actual speed value)
  - 3.9 Waiting time according to P092.i003 (0,0 to 10,0 s, factory setting 0,1 s)
  - 3.10 Enable field firing pulses
  - 3.11 Wait for  $I_{field} (K0265) > I_{field set} (K0268) * P398 / 100\%$
  - 3.12 Waiting time according to P092.i004 (0,0 to 10,0 s, factory setting 3,0 s)
  - 3.13 Enable armature firing pulses (It is possible to exit operating mode o1.4)
4. Internal sequence for braking the drive:
  - 4.1 Internal setting of  $n_{set} = 0$  at the ramp function generator input, the drive brakes
  - 4.2 Wait for  $n < n_{min}$  (P370)
  - 4.3 Wait for armature current  $I_A = 0$  and thus armature pulse disable (drive then switches to operating state o7.2)
  - 4.4 Wait for cancellation of braking command through binector level = 0 (as long as level = 1, drive is held in operating state o7.2)
5. Internal sequence for switching over to original field direction (only if the current field direction is not the same as the direction requested by the "Direction of rotation reversal using field reversal" function):
  - 5.1 Wait for armature current  $I_A = 0$  and then armature pulse disable (drive then dwells in operating state  $\geq o1.4$ )
  - 5.2 Disable field firing pulses (also causes K0268=0)
  - 5.3 Wait for  $I_{field} (K0265) < I_{field min} (P394)$
  - 5.4 Waiting time according to P092.i001 (0,0 to 10,0 s, factory setting 3,0 s)
  - 5.5 Open current field contactor (B0260 = 0 or B0261 = 0)
  - 5.6 Waiting time according to P092.i002 (0,0 to 10,0 s, factory setting 0,2 s)
  - 5.7 Close new field contactor (B0261 = 1 or B0260 = 1)
  - 5.8 Reverse polarity of actual speed value (except when P083 = 3 ... EMF as actual speed value)
  - 5.9 Waiting time according to P092.i003 (0,0 to 10,0 s, factory setting 0,1 s)
  - 5.10 Enable field firing pulses
  - 5.11 Wait for  $I_{field} (K0265) > I_{field set} (K0268) * P398 / 100\%$
  - 5.12 Waiting time according to P092.i004 (0,0 to 10,0 s, factory setting 3,0 s)
  - 5.13 Armature firing pulses are possible again



6. Drive is in operating state o7.2  
 Drive can be accelerated in original rotational direction after acknowledgement by an external "Shutdown" and "Switch-on" command.

Please also read the Note at the end of the section 9.17.1.

Delay times for field reversal (parameter P092)

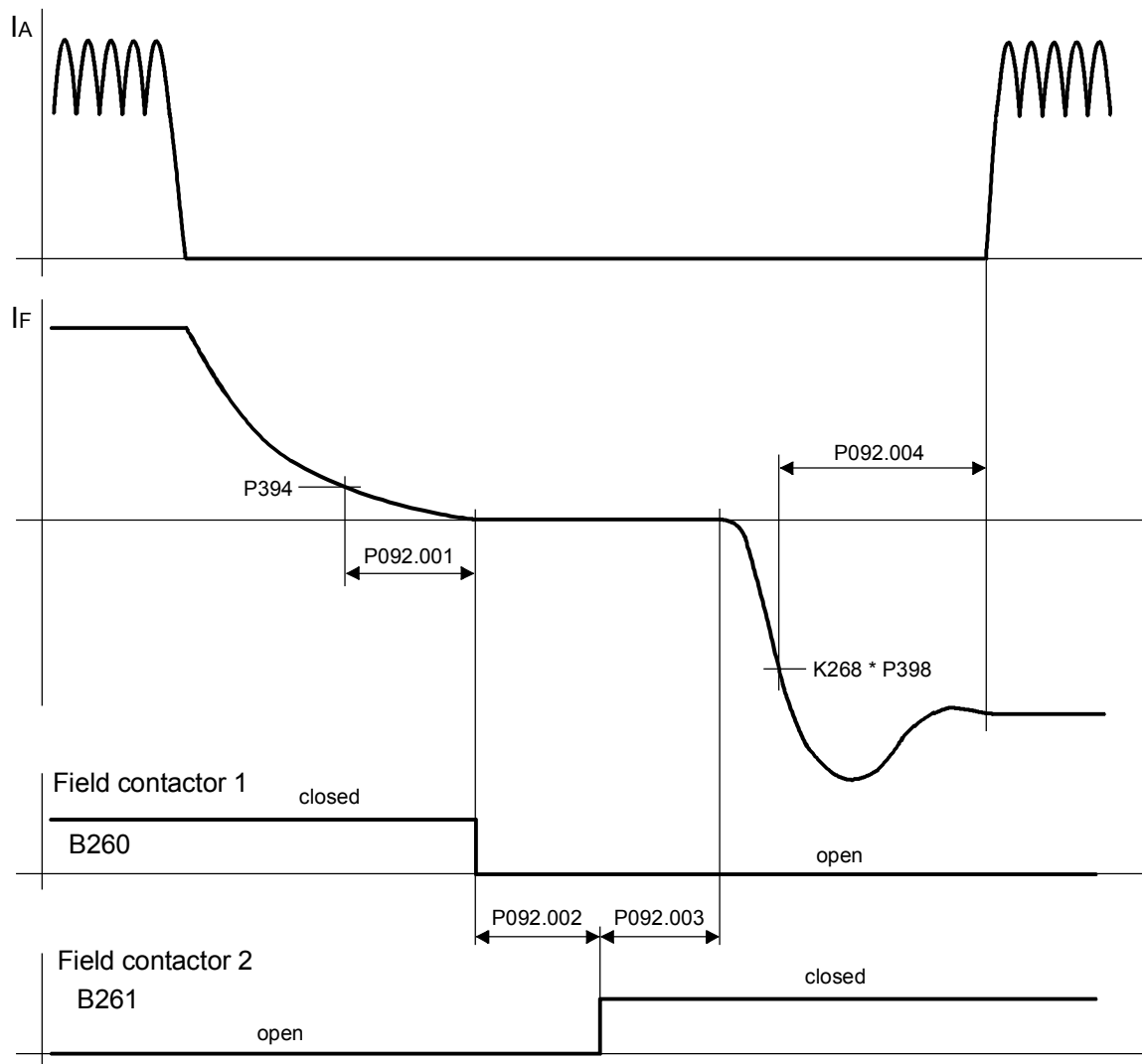
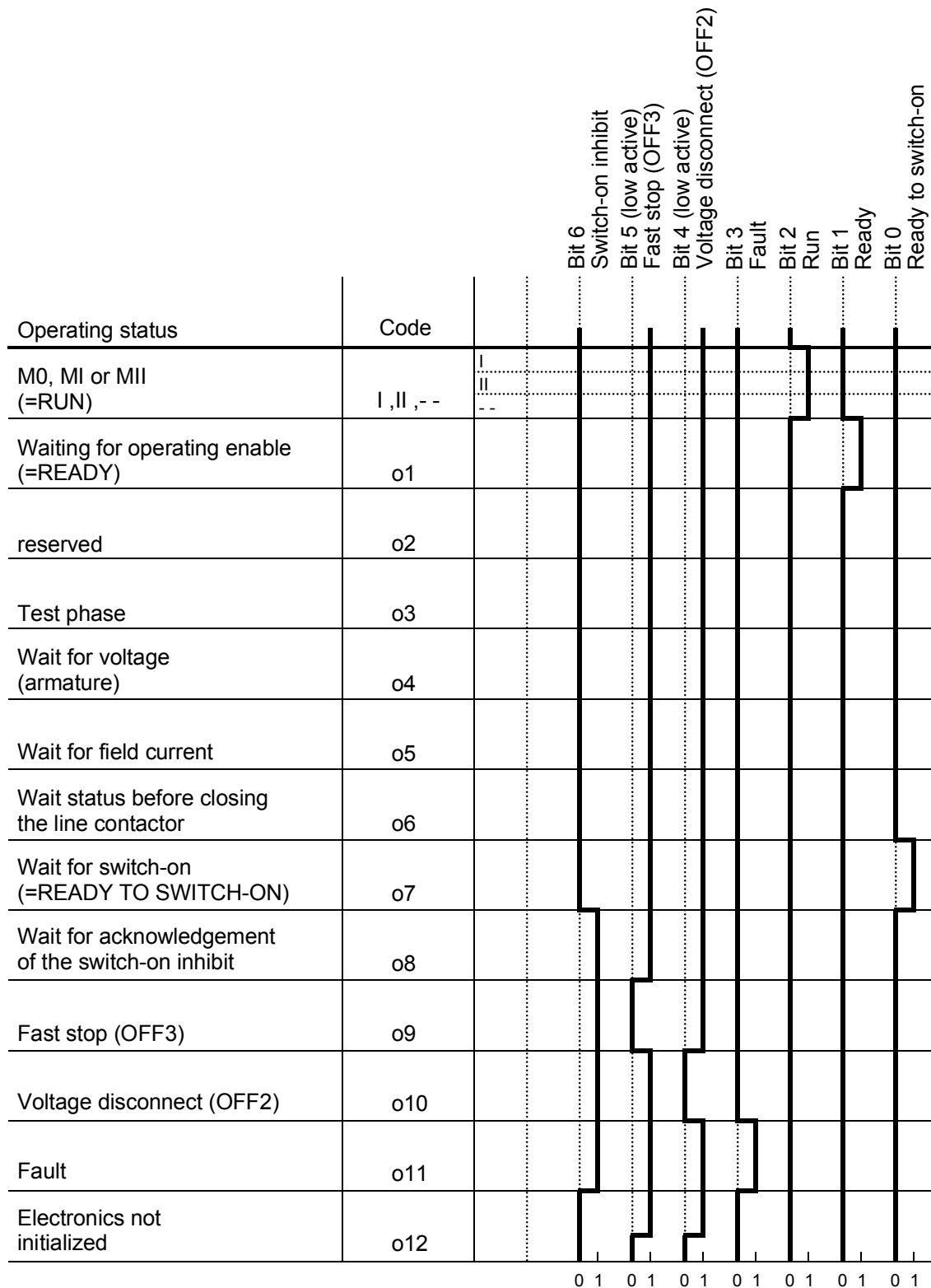


Bild 9.17.1

## 9.18 Status description of some bits of status word ZSW1





## 10 Faults and alarms

When a fault or alarm message is activated, it is displayed both on the simple operator control panel (PMU) and on the OP1S user-friendly operator control panel (see also Section 7.2, Operator control panels).

An alarm stops being displayed immediately the cause of the alarm signal has been eliminated.

A fault message must be cancelled by pressing the P key on the PMU or Reset key on the OP1S (panel must be in "Operational display" status) as soon as the cause has been eliminated.

### NOTE

#### Setting parameters when fault or alarm message is active

##### On the PMU:

You can shift an active fault message or alarm "to the background" by pressing the P key and Higher key simultaneously on the PMU.

If you do not press any key on the PMU within a 30 s period, the fault message or active alarm in the background is automatically displayed again.

You can fetch a message back to the foreground earlier by pressing the P key and Lower key simultaneously on the PMU when the parameter number level is selected.

##### On the OP1S:

You can set parameters normally even if a fault message or alarm is active.

## 10.1 Fault messages

### 10.1.1 General information about faults

Fault message display:

On the PMU: F (fault) and a three-digit number. The red LED (Fault) lights up.

On the OP1S: On bottom line of operational display: The red LED (Fault) lights up.

Only one current fault message can be displayed at a time, i.e. other simultaneously active faults are ignored.

Many fault messages (see List of Fault Messages) can only be active in certain operating states.

The system responses to a fault are as follows:

- The armature current is reduced, the firing pulses are disabled and the SIMOREG unit switches to operating state o11.0 (fault)
- Fault message is displayed on the operator panel (PMU, OP1S)
- B0106 ( = status word 1, bit 3) is set and B0107 cancelled (see also alarm bits for special faults such as undervoltage, overtemperature, external faults, etc.)
- The following parameters are refreshed:
  - r047 fault diagnostic memory  
(The displayed values are decimal. For bit-serial evaluation, the values must be converted from decimal to binary notation, e.g. to be able to determine the relevant terminal in the case of F018)
  - r049 Fault time
  - r947 fault memory, see also r947 in Section 11, Parameter List
  - r949 fault value  
(The displayed values are decimal. For bit-serial evaluation, the values must be converted from decimal to binary notation, e.g. to be able to determine the relevant terminal in the case of F018)
  - P952 number of faults

A text is also displayed for each individual fault in parameter r951 (fault text list). These texts can, for example, be displayed on the OP1S.

If a fault is not acknowledged before the electronics supply voltage is switched off, then fault message F040 will be displayed when the supply is next switched on.

### 10.1.2 List of fault messages

#### NOTE

##### Further information about the causes of fault messages

When a fault message is activated, values providing more information about the fault cause are stored in parameter r047. Where the values can be interpreted by the user, they are included in the following list of fault messages.

The value in r047.001 is referred to as the "fault value". This is also stored in r949 which also contains the fault values belonging to older fault messages. The values in r047 are overwritten when the next fault message occurs.

Values for r047 which are not included in the list below can help a SIEMENS specialist to locate a fault cause. For this reason, all indices of parameter r047 should be read out whenever a fault message occurs, even if the meaning of the individual indices of parameter r047 is not specified for every fault message listed below.

Please note: Before you contact SIEMENS with any query regarding a fault message, please make a note of the contents of all indices of parameter r047.

| Fault No. | Description<br>Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error) | Further information (r047.002 to r047.016) |
|-----------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|-----------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------|

### 10.1.2.1 Supply faults

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                        |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| F001 | <b>Failure of electronics power supply</b><br>(active in all operating states)<br><br>Failure of the electronics supply voltage (terminals 5U1, 5W1, 5N1) in "RUN" state for longer than the "restart" time set in parameter P086 or the electronics are operating on undervoltage.<br><br>Possible fault causes: <ul style="list-style-type: none"> <li>Line contactor has opened in "RUN" state</li> <li>Brief supply failure</li> <li>Supply voltage too low</li> </ul> |                                                        |
|      | Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                               | r047 Index 002 to 016:                                 |
|      | 1 Electronics supply voltage in "RUN" has been interrupted for longer than setting in P086                                                                                                                                                                                                                                                                                                                                                                                 | i002 Duration of actual supply failure in 1/10 seconds |
|      | 2 Supply failure prewarning responds periodically                                                                                                                                                                                                                                                                                                                                                                                                                          | -                                                      |
|      | 3 Supply failure prewarning is active for longer than 1.28 s                                                                                                                                                                                                                                                                                                                                                                                                               | -                                                      |

### 10.1.2.2 External fault

|      |                                                                                                                                                                                                                                                                              |  |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| F003 | <b>External fault</b><br>(active in operating states of ≤ o4)<br><br>This fault message is triggered by the signal at term. 124/125.<br><br>Fault value:                                                                                                                     |  |
|      | 1 When U833= 1: LOW signal at term. 124/125<br>When U833= 2: HIGH signal at term. 124/125<br><br>4 When U833= 1: LOW signal at term. 124/125 longer than set in P086 (if this is > 0)<br>When U833= 2: HIGH signal at term. 124/125 longer than set in P086 (if this is > 0) |  |

### 10.1.2.3 Supply faults

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| F004 | <b>Phase failure in armature supply</b><br>(active in operating states of ≤ o4)<br><br>The supply voltage RMS value, calculated from the area of each supply half-wave (rectified average value * peak factor), must be greater than the response value for phase failure monitoring<br><br>$P078.001 * \frac{P353}{100\%}$<br>The distance between two identical supply zero passages of a phase must not exceed 450 degrees.<br>If one of these two conditions remains unfulfilled for longer than the "restart time" set in P086, a fault message is activated.<br>After switch-on, the converter waits in operating states o4 and o5 together for a period not exceeding the setting in P089 for voltage to appear at the power terminals (and for field current) before activating the fault message.<br><br>Possible fault causes: <ul style="list-style-type: none"> <li>Parameter P353 is incorrectly set</li> <li>Armature phase has failed</li> <li>Line contactor opened in operation</li> <li>Fuse has blown on three-phase side in armature circuit</li> <li>Fuse has blown in power section</li> <li>Interruption in a thyristor firing pulse cable (auxiliary cathodes at connectors X12, X14, X16 are voltage carriers).</li> </ul> |  |
|      | Fault value: <ul style="list-style-type: none"> <li>1 Voltage failure has occurred in armature supply (1U1, 1V1, 1W1) (when P086=0)</li> <li>2 Delay time set in parameter P089 has expired in operating state o4</li> <li>3 Fuse has blown in power section</li> <li>4 Voltage failure has lasted longer than period set in P086 (if this is &gt;0)</li> <li>6 The "Main contactor checkback" (control word 2 bit 31) [see also P691] did not switch to "1" before the time set in P095 ran out, or switched back to "0" during operation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |

| Fault No.   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                            |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|             | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Further information (r047.002 to r047.016) |
| <b>F005</b> | <b>Fault in the field circuit</b><br>(active in operating states of $\leq o5$ )<br><br>The line voltage RMS value calculated from the area of each network half-wave (rectification average value * peak factor) must be greater than the response value for phase failure monitoring<br>$P078.002 * \frac{P353}{100\%}$ The distance between two identical network zero passages of the voltage for the field converter must not exceed 450 degrees.<br>The actual field current K0265 equals < 50% of the required field current setpoint K0268 for more than 500ms. This monitoring function is effective only if the field current setpoint corresponds to >2% of the converter rated field current.<br>[In SW 1.9 and later, the percentage (50%) and time (500ms) can be altered in P396 and P397 respectively]<br><br>If one of the fault conditions described persists in operation (or $\leq o4$ ) for longer than the "restart" time set in P086, the fault message is output.<br><br>After the converter is switched on, it waits in operating state o5 for a period not exceeding the setting in P089 for the field supply voltage or sufficiently high field current before this fault message is activated.<br><br>Monitoring for timeout for during field reduction or build-up is performed after field reversal has been initiated (fault value 6 and 7).<br><br>Possible fault causes <ul style="list-style-type: none"> <li>• Threshold for phase failure (P353) set incorrectly</li> <li>• Field phase failed</li> <li>• Line contactor opened during operation</li> <li>• Fuse blown in the field circuit</li> <li>• Field current controller and/or field current precontrol not optimized or badly optimized (check P112, P253 to P256; possibly execute current controller optimization)</li> <li>• Check P396 (field current monitoring threshold) and P397 (field current monitoring time)</li> <li>• If the fault value is 6: Offset fault in the actual field current value sensing, relevant parameter: P825.i01-i03 (Offset depends on P076.i02) or P394, P395 (Threshold and hysteresis for message <math>I_{\text{field}} &lt; I_{\text{field\_min}}</math>) must be checked</li> <li>• If the fault value is 7: Circuit for the "new" field direction is interrupted (e.g. because the contactor for "new" field direction does not pick up), P398, P399 (Threshold and hysteresis for message <math>I_{\text{field}} &lt; I_{\text{field\_x}}</math>) must be checked</li> </ul> Fault value: |                                            |
|             | 1 Voltage failure occurred in the field supply (terminals 3U1 and 3W1) (if P086 = 0)<br>2 Delay time according to P089 elapsed in state o5.1 (waiting for voltage at the field power section)<br>3 Delay time according to P089 elapsed in state o5.0 (waiting until $I_{\text{field act}}$ (K0265) is > 50% of the instantaneous field current setpoint K0268) [threshold settable in P396 as of SW 1.9]<br>4 After P086 > 0 has elapsed (time for automatic restart) in operating state $\leq o4$ :<br>Voltage failure in the field supply or<br>$I_{\text{field act}}$ (K0265) < 50% $I_{\text{field set}}$ (K0268) for longer than 500 ms<br>[settable via P396 and P397 as of SW 1.9]<br>5 When P086 = 0 (no automatic restart) in operating state $\leq o4$ :<br>$I_{\text{field act}}$ (K0265) < 50% $I_{\text{field set}}$ (K0268) for longer than 500 ms<br>[settable via P396 and P397 as of SW 1.9]<br>6 If field reduction before field reversal, $I_{\text{field}} \leq I_{\text{field\_min}}$ (P394) is not reached within 30 s<br>7 If field build-up after field reversal, $I_{\text{field}} > I_{\text{field\_x}}$ (P398) is not reached within 30 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                            |
| <b>F006</b> | <b>Undervoltage</b><br>(active in operating states of $\leq o4$ )<br><br>The voltage at terminals 1U1, 1V1 or 1W1 and 3U1, 3W1 is lower than the response threshold for longer than the "restart time" set in P086.<br><br>Response threshold for armature supply voltage:<br>$P078.001 * (1 + \frac{P351}{100\%})$ Response threshold for field supply voltage:<br>$P078.002 * (1 + \frac{P351}{100\%})$ Possible fault causes <ul style="list-style-type: none"> <li>• Line undervoltage</li> <li>• Monitoring values set too sensitively or incorrectly (P351, P078)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                            |

| Fault No.   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                        |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Further information (r047.002 to r047.016)                                                                                                                                             |
|             | Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | r047 Index 002 to 016:                                                                                                                                                                 |
|             | 1 Undervoltage has occurred                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | i002 Number of phase that has activated fault message<br>0 ... Phase UV<br>1 ... Phase VW<br>2 ... Phase WU<br>3 ... Phase field<br>i003 Incorrect voltage value (normalized to 16384) |
|             | 4 Undervoltage persists for longer than time set in parameter P086 (if this is set to >0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -                                                                                                                                                                                      |
| <b>F007</b> | <b>Overvoltage</b><br>(active in operating states of ≤ o4)<br><br>The voltage at terminals 1U1, 1V1 or 1W1 and 3U1, 3W1 is higher than the response threshold (for longer than the "restart time" set in P086).<br><br>Response threshold for armature supply voltage:<br>$P078.001 * (1 + \frac{P352}{100\%})$ Response threshold for field supply voltage:<br>$P078.002 * (1 + \frac{P352}{100\%})$ Possible fault causes <ul style="list-style-type: none"> <li>Line overvoltage</li> <li>Monitoring values set too sensitively or incorrectly (P352, P078)</li> </ul> |                                                                                                                                                                                        |
|             | <b>NOTICE</b><br>This monitoring function is deactivated in the delivery state. It can be activated via parameter P820.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                        |
|             | Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | r047 Index 002 to 016:                                                                                                                                                                 |
|             | 1 Overvoltage has occurred                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 002 Number of phase that has activated fault message<br>0 ... Phase UV<br>1 ... Phase VW<br>2 ... Phase WU<br>3 ... Phase field<br>i003 Incorrect voltage value (normalized to 16384)  |
|             | 4 Undervoltage persists for longer than time set in parameter P086 (if this is >0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -                                                                                                                                                                                      |
| <b>F008</b> | <b>Line frequency less than the minimum line frequency acc. to parameter P363</b><br>(active in operating states of ≤ o5)<br><br>This fault message is activated if the line frequency is less than the minimum line frequency (for longer than the "restart time" set in parameter P086).<br><br><u>Note:</u> Up to software version 1.7 the threshold for activation of the fault message (minimum line frequency) is 45Hz.                                                                                                                                             |                                                                                                                                                                                        |
|             | Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                        |
|             | 1 Frequency of the armature supply < minimum line frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                        |
|             | 2 Frequency of the field supply < minimum line frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                        |
|             | 4 Line frequency less than the minimum line frequency for longer than set in parameter P086 (if >0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                        |
| <b>F009</b> | <b>Line frequency greater than the maximum line frequency acc. to parameter P364</b><br>(active in operating states of ≤ o5)<br><br>This fault message is activated if the line frequency is greater than the maximum line frequency (for longer than the "restart time" set in parameter P086).<br><br><u>Note:</u> Up to software version 1.7 the threshold for activation of the fault message (maximum line frequency) is 65Hz                                                                                                                                        |                                                                                                                                                                                        |
|             | Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                        |
|             | 1 Frequency of the armature supply > maximum line frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                        |
|             | 2 Frequency of the field supply > maximum line frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                        |
|             | 4 Line frequency greater than the maximum line frequency for longer than set in parameter P086 (if >0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                        |



| Fault No. | Description | Further information (r047.002 to r047.016) |
|-----------|-------------|--------------------------------------------|
|-----------|-------------|--------------------------------------------|

#### 10.1.2.4 Interface error

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| F011 | <p><b>Telegram failure at GSST1</b></p> <p>when <u>P780 = 2</u>:</p> <p><b>USS telegram failure at G-SST1</b><br/>(active from the first receipt of a valid protocol in all operating states)</p> <p>After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P787.</p> <p>Possible fault causes</p> <ul style="list-style-type: none"> <li>• Cable break</li> <li>• Error in USS master</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| F012 | <p><b>Telegram failure at GSST2</b></p> <p>when <u>P790 = 2</u>:</p> <p><b>USS telegram failure at G-SST2</b><br/>(active from the first receipt of a valid protocol in all operating states)</p> <p>After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P797.</p> <p>Possible fault causes</p> <ul style="list-style-type: none"> <li>• Cable break</li> <li>• Error in USS master</li> </ul> <p>when <u>P790 = 4 or 5</u> and <u>P798 = 32 or 33</u>:</p> <p><b>Peer-to-peer telegram failure at G-SST2</b><br/>(active in operating states of <math>\leq 06</math>)</p> <p>After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P797.</p> <p>Possible fault causes</p> <ul style="list-style-type: none"> <li>• Interruption in connecting cable</li> <li>• EMC interference on connecting cable</li> <li>• P797 is set too low</li> </ul> |
| F013 | <p><b>Telegram failure at GSST3</b></p> <p>when <u>P800 = 2</u> and <u>P808 = 32 or 33</u>:</p> <p><b>USS telegram failure to G-SST3</b><br/>(active from the first receipt of a valid protocol in all operating states)</p> <p>After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P807.</p> <p>Possible fault causes</p> <ul style="list-style-type: none"> <li>• Cable break</li> <li>• Error in USS master</li> </ul> <p>when <u>P800 = 4 or 5</u>:</p> <p><b>Peer-to-peer telegram failure at G-SST3</b><br/>(active in operating states of <math>\leq 06</math>)</p> <p>After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P807.</p> <p>Possible fault causes</p> <ul style="list-style-type: none"> <li>• Interruption in connecting cable</li> <li>• EMC interference on connecting cable</li> <li>• P807 is set too low</li> </ul> |
| F014 | <p><b>Telegram failure at paralleling interface</b><br/>(active when <u>U800 = 1 or 2</u> from the first receipt of a valid protocol in all operating states)</p> <p>After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter U807.</p> <p>Possible fault causes</p> <ul style="list-style-type: none"> <li>• Interruption in connecting cable</li> <li>• EMC interference on connecting cable</li> <li>• U807 is set too low</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Fault No.                                                                                                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                         | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                              | Further information (r047.002 to r047.016)                                                                                                                                                                                                                                           |
| <b>F015</b>                                                                                                             | <b>Telegram failure on one SIMOLINK board</b><br>(active when $U741 > 0$ as soon as the first valid telegram is received)<br><br>After receipt of one valid telegram, no further valid telegrams have arrived within the period set in parameter U741.<br><br>Possible fault causes <ul style="list-style-type: none"> <li>• Break in connecting cable</li> <li>• Parameter setting change during telegram exchange (for parameters see Section 11 "Configuration of SIMOLINK board")</li> <li>• U741 is set to low</li> </ul> Fault value: |                                                                                                                                                                                                                                                                                      |
|                                                                                                                         | 1 Telegram failure on 1 <sup>st</sup> SLB<br>2 Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                      |
| <b>F016</b>                                                                                                             | <b>Hardware fault on expansion board EB1</b><br><br>Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                      |
|                                                                                                                         | 1 Fault on first EB1<br>2 Fault on second EB1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                      |
| <b>F017</b>                                                                                                             | <b>Hardware fault on expansion board EB2</b><br><br>Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                      |
|                                                                                                                         | 1 Fault on first EB2<br>2 Fault on second EB2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                      |
| <b>F018</b>                                                                                                             | <b>Short circuit or overloading of binary outputs</b><br>(active in all operating states)<br><br>Possible fault causes <ul style="list-style-type: none"> <li>• Short circuit or overload at terminals 46, 48, 50 or 52 and 26 or 34</li> </ul> Fault value:                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                      |
|                                                                                                                         | r047 Index 002 to 016:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                      |
|                                                                                                                         | 1 Short circuit or overload at binary outputs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | i002 Bit 8 = 1: Overload at terminal 46<br>Bit 9 = 1: Overload at terminal 48<br>Bit 10 = 1: Overload at terminal 50<br>Bit 11 = 1: Overload at terminal 52<br>Bit 12 = 1: Overload at terminal 26 (15 V output)<br>Bit 13 = 1: Overload at terminal 34, 44 and/or 210 (24 V output) |
| <b>NOTICE</b><br>This monitoring function is deactivated in the delivery state. It can be activated via parameter P820. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                      |

#### 10.1.2.5 External faults

|             |                                                                                                                                                                                                                                                                                                                  |  |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>F019</b> | <b>Fault message from free function block FB286</b><br>(active in all operating states)<br><br>Fault value:                                                                                                                                                                                                      |  |
|             | 1 the binector wired via parameter U100 Index.005 is in the state log."1"<br>2 the binector wired via parameter U100 Index.006 is in the state log."1"<br>3 the binector wired via parameter U100 Index.007 is in the state log."1"<br>4 the binector wired via parameter U100 Index.008 is in the state log."1" |  |
| <b>F020</b> | <b>Fault message from free function block FB287</b><br>(active in all operating states)<br><br>Fault value:                                                                                                                                                                                                      |  |
|             | 1 the binector wired via parameter U101 Index.005 is in the state log."1"<br>2 the binector wired via parameter U101 Index.006 is in the state log."1"<br>3 the binector wired via parameter U101 Index.007 is in the state log."1"<br>4 the binector wired via parameter U101 Index.008 is in the state log."1" |  |
| <b>F021</b> | <b>External fault 1</b><br>(active in all operating states)<br><br>Bit 15 in control word 1 was in the log. "0" state for longer than the time set in P360 index 001                                                                                                                                             |  |

| Fault No.   | Description                                                                                                                                                                                                                                                                                                      |                                            |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|             | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                   | Further information (r047.002 to r047.016) |
| <b>F022</b> | <b>External fault 2</b><br>(active in all operating states)<br><br>Bit 26 in control word 2 was in the log. "0" state for longer than the time set in P360 index 002                                                                                                                                             |                                            |
| <b>F023</b> | <b>Fault message from free function block FB2</b><br>(active in all operating states)<br><br>Fault value:                                                                                                                                                                                                        |                                            |
|             | 1 the binector wired via parameter U100 Index.001 is in the state log."1"<br>2 the binector wired via parameter U100 Index.002 is in the state log."1"<br>3 the binector wired via parameter U100 Index.003 is in the state log."1"<br>4 the binector wired via parameter U100 Index.004 is in the state log."1" |                                            |
| <b>F024</b> | <b>Fault message from free function block FB3</b><br>(active in all operating states)<br><br>Fault value:                                                                                                                                                                                                        |                                            |
|             | 1 the binector wired via parameter U101 Index.001 is in the state log."1"<br>2 the binector wired via parameter U101 Index.002 is in the state log."1"<br>3 the binector wired via parameter U101 Index.003 is in the state log."1"<br>4 the binector wired via parameter U101 Index.004 is in the state log."1" |                                            |

#### 10.1.2.6 Fault messages from motor sensors

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                                  |   |                                                                    |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------|---|--------------------------------------------------------------------|
| <b>F025</b> | <b>Brush length too short</b><br>(active in operating states of $\leq o3$ )<br><br>When parameter P495=2 (binary sensing of brush length), fault message at log."0" signal (longer than 10s) at terminal 211<br><br>Possible fault causes <ul style="list-style-type: none"> <li>Encoder for brush length has responded</li> <li>Open circuit in encoder cable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |   |                                                                  |   |                                                                    |
| <b>F026</b> | <b>Bearings in bad condition</b><br>(active in operating states of $\leq o6$ )<br><br>When parameter P496=2 (bearing condition sensing) fault message at log. "1" signal (longer than 2 s) at terminal 212<br><br>Possible fault causes <ul style="list-style-type: none"> <li>Encoder for bearing condition has responded</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |                                                                  |   |                                                                    |
| <b>F027</b> | <b>Air-flow monitoring of motor fan</b><br>(active in operating states of $< o6$ )<br><br>When parameter P497=2 (air-flow monitoring), fault message at log "0" signal (longer than 40s) at terminal 213<br><br>Possible fault causes <ul style="list-style-type: none"> <li>Encoder for fan monitoring has responded</li> <li>Open circuit in encoder cable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |   |                                                                  |   |                                                                    |
| <b>F028</b> | <b>Motor overtemperature</b><br>(active in operating states of $\leq o6$ )<br><br>When parameter P498=2 (thermostat connected), fault message at log. "0" signal (longer than 10s) at terminal 214<br><br>Possible fault causes <ul style="list-style-type: none"> <li>Thermostat for monitoring motor temperature has responded</li> <li>Open circuit in encoder cable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |                                                                  |   |                                                                    |
| <b>F029</b> | <b>Motor overtemperature</b><br>(active in all operating states)<br><br>Select via P493=2 or 3 (temperature sensor at terminals 22 / 23) or P494=2 or 3 (temperature sensor at terminals 204 / 205)<br><br><u>When parameter P490.01=1 (KTY84 at terminals 22 / 23) or P490.02=1 (KTY84 at terminals 204 / 205):</u><br>The fault message is activated if the motor temperature reaches or exceeds the value set in parameter P492.<br><br><u>When parameter P490.01=2, 3, 4 or 5 (PTC thermistor at terminals 22 / 23) or P490.02=2, 3, 4 or 5 (PTC thermistor at terminals 204 / 205):</u><br>The fault message is activated if the motor temperature reaches or exceeds the response value of the selected PTC thermistor.<br><br>Fault value: <table> <tr> <td>1</td><td>Fault activation through temperature sensor at terminals 22 / 23</td></tr> <tr> <td>2</td><td>Fault activation through temperature sensor at terminals 204 / 205</td></tr> </table> | 1 | Fault activation through temperature sensor at terminals 22 / 23 | 2 | Fault activation through temperature sensor at terminals 204 / 205 |
| 1           | Fault activation through temperature sensor at terminals 22 / 23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |                                                                  |   |                                                                    |
| 2           | Fault activation through temperature sensor at terminals 204 / 205                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |                                                                  |   |                                                                    |

| Fault No. | Description<br>Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error) | Further information (r047.002 to r047.016) |
|-----------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|-----------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------|

### 10.1.2.7 Drive faults

#### NOTICE

The monitoring functions F031, F035, F036 and F037 are deactivated in the delivery state. They can be activated via parameter P820.

|      |                                                                                                                                                                                                                                                           |                                                                                 |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| F030 | <b>Commutation failure or overcurrent has occurred</b><br>(active in operating states of – –, I, II)                                                                                                                                                      |                                                                                 |
|      | Possible error causes                                                                                                                                                                                                                                     |                                                                                 |
|      | <ul style="list-style-type: none"><li>• Mains voltage dip in regenerative feedback mode</li><li>• Current control loop not optimized</li></ul>                                                                                                            |                                                                                 |
|      | Fault value: r047 Index 002 to 016:                                                                                                                                                                                                                       |                                                                                 |
|      | 1                                                                                                                                                                                                                                                         | The blocking voltage time area for the commutating thyristor pair was too small |
|      | 2                                                                                                                                                                                                                                                         | The current crest curve breaks upwards                                          |
|      | 3                                                                                                                                                                                                                                                         | The maximum current value was higher than 250% of rated device current          |
|      | i002                                                                                                                                                                                                                                                      | Delay angle (K0100) in case of error                                            |
|      | i003                                                                                                                                                                                                                                                      | Actual EMF (K0287) in case of error                                             |
|      | i004                                                                                                                                                                                                                                                      | Trigger circuitry diagnostics (K0989) in case of error                          |
|      | i005                                                                                                                                                                                                                                                      | Actual field current (K0265) in case of error                                   |
|      | i006                                                                                                                                                                                                                                                      | Number of pulses (K0105) in case of error                                       |
|      | 4                                                                                                                                                                                                                                                         | A paralleled SIMOREG has detected a commutation failure or overcurrent          |
| F031 | <b>Speed controller monitoring</b><br>(active in operating states of – –, I, II)                                                                                                                                                                          |                                                                                 |
|      | The monitor responds when the difference between the connectors selected in P590 and P591 (factory setting: Setpoint/actual value difference of speed controller) exceeds the limit set in parameter P388 for longer than the time set in parameter P390. |                                                                                 |
|      | Possible fault causes                                                                                                                                                                                                                                     |                                                                                 |
|      | <ul style="list-style-type: none"><li>• Open control loop</li><li>• Controller not optimized</li><li>• P590 or P591 is not correctly parameterized</li></ul>                                                                                              |                                                                                 |

### 10.1.2.8 External faults

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |                                                                         |   |                                                                         |   |                                                                         |   |                                                                         |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------------------------------------------------------------|---|-------------------------------------------------------------------------|---|-------------------------------------------------------------------------|---|-------------------------------------------------------------------------|
| <b>F033</b> | <p><b>Fault message from free function block FB4</b><br/>(active in all operating states)</p> <p>Fault value:</p> <table border="1"> <tr><td>1</td><td>the binector wired via parameter U102 Index.001 is in the state log."1"</td></tr> <tr><td>2</td><td>the binector wired via parameter U102 Index.002 is in the state log."1"</td></tr> <tr><td>3</td><td>the binector wired via parameter U102 Index.003 is in the state log."1"</td></tr> <tr><td>4</td><td>the binector wired via parameter U102 Index.004 is in the state log."1"</td></tr> </table> | 1 | the binector wired via parameter U102 Index.001 is in the state log."1" | 2 | the binector wired via parameter U102 Index.002 is in the state log."1" | 3 | the binector wired via parameter U102 Index.003 is in the state log."1" | 4 | the binector wired via parameter U102 Index.004 is in the state log."1" |
| 1           | the binector wired via parameter U102 Index.001 is in the state log."1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |                                                                         |   |                                                                         |   |                                                                         |   |                                                                         |
| 2           | the binector wired via parameter U102 Index.002 is in the state log."1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |                                                                         |   |                                                                         |   |                                                                         |   |                                                                         |
| 3           | the binector wired via parameter U102 Index.003 is in the state log."1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |                                                                         |   |                                                                         |   |                                                                         |   |                                                                         |
| 4           | the binector wired via parameter U102 Index.004 is in the state log."1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |                                                                         |   |                                                                         |   |                                                                         |   |                                                                         |
| <b>F034</b> | <p><b>Fault message from free function block FB5</b><br/>(active in all operating states)</p> <p>Fault value:</p> <table border="1"> <tr><td>1</td><td>the binector wired via parameter U103 Index.001 is in the state log."1"</td></tr> <tr><td>2</td><td>the binector wired via parameter U103 Index.002 is in the state log."1"</td></tr> <tr><td>3</td><td>the binector wired via parameter U103 Index.003 is in the state log."1"</td></tr> <tr><td>4</td><td>the binector wired via parameter U103 Index.004 is in the state log."1"</td></tr> </table> | 1 | the binector wired via parameter U103 Index.001 is in the state log."1" | 2 | the binector wired via parameter U103 Index.002 is in the state log."1" | 3 | the binector wired via parameter U103 Index.003 is in the state log."1" | 4 | the binector wired via parameter U103 Index.004 is in the state log."1" |
| 1           | the binector wired via parameter U103 Index.001 is in the state log."1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |                                                                         |   |                                                                         |   |                                                                         |   |                                                                         |
| 2           | the binector wired via parameter U103 Index.002 is in the state log."1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |                                                                         |   |                                                                         |   |                                                                         |   |                                                                         |
| 3           | the binector wired via parameter U103 Index.003 is in the state log."1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |                                                                         |   |                                                                         |   |                                                                         |   |                                                                         |
| 4           | the binector wired via parameter U103 Index.004 is in the state log."1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |                                                                         |   |                                                                         |   |                                                                         |   |                                                                         |

### 10.1.2.9 Drive faults

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>F035</b> | <p><b>Drive is blocked</b><br/>(active in operating states of – –, I, II)</p> <p>This monitoring function responds if the following conditions are fulfilled for longer than the period set in parameter P355:</p> <ul style="list-style-type: none"> <li>• Positive or negative torque or armature current limit</li> <li>• The armature current is higher than 1% of the converter rated armature DC current</li> <li>• The actual speed is less than 0.4% of maximum speed</li> </ul> <p>Possible fault causes</p> <ul style="list-style-type: none"> <li>• Drive is blocked</li> </ul> |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Fault No. | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                            |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|           | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Further information (r047.002 to r047.016) |
| F036      | <b>No armature current is flowing</b><br>(active in operating states of – –, I, II)<br><br>This monitoring function responds if the armature firing angle is at the rectifier stability limit for more than 500 ms and the armature current is less than 1% of the converter rated armature DC current.<br><br>Possible fault causes <ul style="list-style-type: none"><li>• Armature circuit is open (e.g. DC fuses have blown, open circuit, etc.)</li><li>• Rectifier stability limit <math>\alpha_G</math> (P150) is incorrectly set</li><li>• Drive is operating at <math>\alpha_G</math> limit (e.g. due to supply undervoltage)</li><li>• EMF is too high because maximum speed setting is too high, refer to P083, P115, P143, P741)</li><li>• EMF is too high because field weakening is not selected (refer to P082)</li><li>• EMF is too high because field current is set too high (refer to P102)</li><li>• EMF is too high because transition speed for field weakening is set too high (refer to P101) ??</li></ul>                                                                                                                                                                                                                                                                         |                                            |
| F037      | <b>I<sup>2</sup>t motor monitor has responded</b><br>(active in operating states of – –, I, II)<br><br>This monitoring function responds when an I <sup>2</sup> t value is reached which corresponds to the final temperature at 110% of the rated motor armature current.<br><br>Possible fault causes <ul style="list-style-type: none"><li>• Parameter P114 is incorrectly set</li><li>• Drive has been operating for too long at &gt;110% of rated motor armature current</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                            |
| F038      | <b>Overspeed</b><br>(active in operating states of – –, I, II)<br><br>This fault message is activated if the actual speed value (selected in P595) exceeds the positive (P380) or negative (P381) threshold by 0.5%.<br><br>Possible fault causes <ul style="list-style-type: none"><li>• Lower current limit has been input</li><li>• Current-controlled operation</li><li>• P512, P513 are set too low</li><li>• Tachometer cable contact fault in operation close to maximum speed</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                            |
| F039      | <b>Reserved</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                            |
| F040      | <b>Electronics supply disconnected in active fault status</b><br>(active in all operating states)<br><br>This fault message is activated if the electronics power supply has been disconnected, even though a fault was displayed and not yet acknowledged.<br><br>Possible fault causes <ul style="list-style-type: none"><li>• Not all fault messages have been acknowledged</li></ul><br>Fault value:<br>Last active fault message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                            |
| F041      | <b>Ambiguous selection of parameter set or ramp-function generator</b><br>(active in all operating states)<br><br><ul style="list-style-type: none"><li>• While an optimization run is in progress, the function data set selection must not be changed. Fault F041 is displayed if another, different function data set is selected while an optimization run is being executed.</li><li>• Check whether ramp-function generator parameter set 1 or 2 or 3 (parameters P303 to P314) is clearly selected. If parameter sets 2 and 3 are selected simultaneously for more than 0.5s, then fault message F041 is displayed. While the parameter set selection is ambiguous, the system continues to apply the last clearly identified ramp-function generator parameters.</li></ul><br>Possible fault causes <ul style="list-style-type: none"><li>• P676 or P677 (selection of binectors which determine the active function data set in control word 2, bits 16 and 17) is incorrectly set</li><li>• P637 or P638 (selection of binectors which determine ramp-function generator setting) is incorrectly set</li></ul><br>Fault value:<br>2     The selection of the function data set has been changed during an optimization run<br>3     Ambiguous selection of ramp-function generator parameter set |                                            |

| Fault No.   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                  |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
|             | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Further information (r047.002 to r047.016)       |
| <b>F042</b> | <b>Tachometer fault</b><br>(active in operating states of – –, I, II)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                  |
|             | A check is performed every 20ms to ensure that $\frac{\text{Actual speed (K0179)}}{\text{Actual EMF (K0287)}} \text{ is } > +5\%$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                  |
|             | If the check result is incorrect for 4 times in succession, the fault message is activated.<br><br>The following rule applies:<br>100% actual speed = maximum speed<br>100% actual EMF = ideal average DC voltage at $\alpha \geq 0$ , i.e. when the thyristor bridge is fully gated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                  |
|             | The ideal DC voltage average value at $\alpha = 0$ is $P078.001 * \frac{3 * \sqrt{2}}{\pi}$<br><br>The monitoring function is effective only if the EMF $> a\%$ of $P078.001 * \frac{3 * \sqrt{2}}{\pi}$<br>"a" is a percentage that can be set in parameter P357 (default setting 10%).<br>The monitoring function is effective only if the armature current is $> 2\%$ of the converter rated DC current set in r072.002.                                                                                                                                                                                                                                                                                                                                                                |                                                  |
| <b>F043</b> | <b>EMF too high for braking operation</b><br>(active in operating states of – –, I, II)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |
|             | This fault message is activated if the following 5 conditions are fulfilled when a <u>torque direction reversal is requested</u> (selection of MI or MII): <ul style="list-style-type: none"> <li>• P272=0 (fault message is parameterized and not alarm + field weakening)</li> <li>• A parameterized, additional, torque-free interval (P160 <math>\neq 0</math>) has expired</li> <li>• Parallel drive is ready for engagement of the new torque direction</li> <li>• The absolute value of the <u>armature current (K0118)</u> requested in the new torque direction is <u><math>&gt;0.5\%</math> of P072</u></li> <li>• The <u>calculated firing angle (K0101)</u> for the armature current requested for the new torque direction is <u><math>&gt;165</math> degrees</u>.</li> </ul> |                                                  |
|             | Possible fault causes <ul style="list-style-type: none"> <li>• No "speed-dependent field weakening" (P081=0) is parameterized even though operation in the field weakening range is needed for the requested maximum speed</li> </ul> Note:<br>In motor operation, it is possible to reach EMF values corresponding to the peak of the phase-to-phase supply voltage at a firing angle of $\alpha_G=30^\circ$ (rectifier stability limit P150) and low armature currents. <ul style="list-style-type: none"> <li>• Setpoint EMF for field weakening operation too high (parameter P101 is set too high)</li> <li>• Supply voltage dip</li> <li>• EMF controller or field current controller is not optimized, possibly resulting in excessive EMF on power-up.</li> </ul>                  |                                                  |
|             | Fault value: r047 Index 002 to 016:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                  |
| <b>F044</b> | 1 Open circuit in tachometer or pulse encoder cable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | i002 Actual speed value (K0179) in case of fault |
|             | 2 Polarity of tachometer or pulse encoder is incorrect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | i003 Actual EMF value (K0287) in case of fault   |
|             | Calculated firing angle (armature) before limitation (K0101)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |
|             | i002 Instantaneously measured actual EMF (K0287)<br>i003 Armature current controller setpoint (K0118)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                  |
| <b>F044</b> | <b>A slave connected to the paralleling interface is not operating</b><br>(active when <u>U800 = 1 or 2 and U806 <math>&gt; 10</math> (master)</u> after receipt of the first valid protocol in operating states – –, I, II)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |
|             | Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |
|             | 1 A fault message is active on a slave                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                  |
|             | 2 A slave is not in operation (e.g. because its enable input is set to "0")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                  |

| Fault No. | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                            |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|           | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Further information (r047.002 to r047.016) |
| F046      | <b>Analog select input for main setpoint (terminals 4 and 5) faulty</b><br>(active in operating states of $\leq 06$ )<br><br>This fault message is activated when P700=2 (current input 4 to 20 mA) and an input current of less than 2mA is flowing.<br><br>Possible fault causes <ul style="list-style-type: none"><li>• Open circuit in supply cable</li><li>• P700 is incorrectly set</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                            |
| F047      | <b>Analog select input 1 (terminals 6 and 7) is faulty</b><br>(active in operating states of $\leq 06$ )<br><br>This fault message is activated when P710=2 (current input 4 to 20 mA) and an input current of less than 2mA is flowing.<br><br>Possible fault causes <ul style="list-style-type: none"><li>• Open circuit in supply cable</li><li>• P710 is incorrectly set</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                            |
| F048      | <b>Fault in measuring channel for digital speed sensing using pulse encoder</b><br>(active in all operating states)<br><br><u>1. Disturbances on encoder cables:</u><br>Faults on the encoder cables (transitions to 0 with a 1 signal or to 1 with a 0 signal) are signalled as a rotational direction change by the evaluation circuit. Frequent changes in rotational direction can occur only at speeds around 0.<br>The fault message is activated if 10 consecutive pulse encoder signal evaluations identify "direction of rotation change" at a speed of $\geq 48$ rev/min and an EMF > threshold (see below).<br><br><u>2. Pulse encoder defective:</u><br>The fault message is activated if, at an EMF > threshold (see below) 10 consecutive pulse encoder signal evaluations identify "implausible characteristics" of these signals (i.e. frequent rotational direction changes, edges too close together, failure of an encoder cable or short circuit between two encoder cables).<br><br>Possible fault causes <ul style="list-style-type: none"><li>• EMC-related interference on a pulse encoder signal (terminals 28 to 31)</li><li>• Pulse encoder defective</li><li>• Interruption in an encoder cable</li><li>• Short circuit between an encoder cable and the supply voltage or another encoder cable</li><li>• P110 or P111 is incorrectly set (resulting in incorrectly calculation of EMF)</li></ul><br>Note:<br>When the speed encoder is operating correctly, signal sequences, which are characteristic of a faulty pulse encoder or disturbances on the pulse encoder cables, may occur continuously at the input terminals (e.g. continuous changes in rotational direction or short pulse intervals) at about 0 speed, e.g. as the result of slight oscillation around a bright/dark transition on the speed encoder disk).<br><br>For this reason, fault F048 is not activated until the $EMF > 10\% \text{ of } P078.001 * \frac{3 * \sqrt{2}}{\pi}$ .<br><br>Fault value:<br><br>1     Disturbances on encoder cables<br>2     Defective pulse encoder |                                            |

### 10.1.2.10 Start-up faults

|                                                                                                                                                                                                                                                                                |                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>F050</b>                                                                                                                                                                                                                                                                    | <b>Optimization run not possible</b><br>(active in all operating states)<br><br>A fault has occurred during an optimization run. |
| <b>NOTE</b><br>The contents of r047, Index 002 to 016, can provide specialists with more detailed information about fault causes. For this reason, please read out and document all the indices associated with this fault and pass them on when you contact Siemens for help. |                                                                                                                                  |

| Fault No. | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                            |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|           | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Further information (r047.002 to r047.016) |
|           | Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                            |
| 1         | <p>Armature current is too low when <math>\alpha=30^\circ</math> and EMF=0.<br/>(average armature current &lt;75% of <math>I_{A, \text{ motor}}</math> or &lt;75% of <math>I_{A, \text{ rated}}</math>)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Armature circuit interrupted</li> <li>• High-resistance load</li> <li>• P150 (Alpha G limit) has been set to excessively high value</li> </ul>                                                                                                                                                                                                                                                            |                                            |
| 2         | <p>It was not possible to determine the armature circuit resistance (P110) because the armature current was <math>\geq 37.5\%</math> of P100 in fewer than 20 of the 150 firing cycles of the measuring phase.</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Armature current of 37.5% of P100 (<math>I_{A, \text{ motor}}</math>) is no longer possible (although a current of 75% of P100 was already flowing, maybe a fuse has blown).</li> </ul>                                                                                                                                                                                                            |                                            |
| 3         | <p>Armature current peaks are too small at <math>\alpha=30^\circ</math> and EMF=0<br/>(armature current peak value &lt;50% of <math>I_{A, \text{ motor}}</math> or &lt;50% of <math>I_{A, \text{ rated}}</math>)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Armature circuit inductance is too high (field supply from armature terminals)</li> <li>• P150 (Alpha G limit) has been set to excessively high value</li> </ul> <p>Possible remedy:</p> <ul style="list-style-type: none"> <li>• Reduce P100 (<math>I_{A, \text{ motor}}</math>) while this optimization run is in progress</li> </ul>                                                          |                                            |
| 4         | <p>The armature circuit inductance (P111) cannot be determined from the sampled values of the armature current and line voltage of the armature current crest last generated</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• P100 (<math>I_{A, \text{ motor}}</math>) or r072.i002 (<math>I_{A, \text{ rated}}</math>) very much smaller than actual motor rated current of the armature</li> <li>• <math>L_A &gt; 327.67\text{mH}</math> (armature circuit inductance too large)</li> <li>• P100 (<math>I_{A, \text{ motor}}</math>) very much smaller than r072.i002 (<math>I_{A, \text{ rated}}</math>)</li> <li>• Armature circuit short-circuited</li> </ul> |                                            |
| 5         | <p>Offset adjustment of actual field current sensing is not possible<br/>(value detected for P825 is outside permissible value range)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Fault in actual field current sensing circuit<br/>(defective A7004 gating board or A7001 electronics board)</li> </ul>                                                                                                                                                                                                                                                                                                                                                      |                                            |
| 7         | <p>The field circuit resistance (P112) is indeterminable<br/>(the actual field current does not reach the internally specified setpoint of 95% of P102 as a result of P112 variation)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• <math>R_A &gt; 3276.7\Omega</math></li> <li>• Fault in actual field current sensing circuit (defective gating board or A7001 electronics board)</li> <li>• The command "Inject standstill field" is applied</li> <li>• P102 is set too high</li> <li>• A thyristor in the field bridge is not firing</li> </ul>                                                                                                             |                                            |
| 8         | <p>80% of rated EMF (<math>K287=P101 - P100 * P110</math>) cannot be reached within 15s (or maximum of the three set acceleration times)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Acceleration time (P303, P307, P311) is set too low</li> <li>• P101 does not match the set maximum speed (<math>U_A</math> at <math>n_{\text{max}} &lt; P101</math>) or setting for P102 is too low</li> <li>• The command "Ramp-function generator enable"=0 or "Ramp-function generator stop"=1</li> </ul>                                                                                                                                                             |                                            |
| 9         | <p>Field current control loop is not stable enough to record field characteristics<br/>(30s after injection of internal field current setpoint, actual field current is deviating by more than (0.39% of P102 + 0.15 % of r073.002) from the setpoint)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Field current controller or field current precontrol is not optimized or optimized badly (check P112, P253 to P256 or execute a current controller optimization run (P051=25))</li> </ul>                                                                                                                                                                  |                                            |
| 10        | <p>Field characteristic is not uniform<br/>(i.e. in spite of field current setpoint reduction, the flux values of this measuring point calculated from EMF and actual speed are rising)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• High armature reaction and sharp load variations during recording of field characteristics</li> <li>• Field current controller or field current precontrol is not optimized or optimized badly (check P112, P253 to P256 or execute a current controller optimization run (P051=25))</li> </ul>                                                                                                                           |                                            |



| Fault No. | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                            |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|           | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Further information (r047.002 to r047.016) |
| 11        | <p>A lower field current limit of <math>\geq 50\%</math> of P102 (<math>I_{F,motor}</math>) is applied (for this reason, it is not possible to plot a minimum of 9 field weakening measuring points)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• P103 <math>\geq 50\%</math> of P102</li> </ul> <p>Check P614 !</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                            |
| 12        | <p>The drive has reached the positive torque limit even though the applied field current setpoint is still <math>\geq 50\%</math> of P102 (<math>I_{F,motor}</math>)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Armature current is very "unsteady", e.g. due to high speed controller P gain setting in P225 (on drive with high integral-action time). In this case, setting a lower actual speed filtering value in P200 and execution of another speed controller optimization run (P051=26) may help.</li> <li>• Check torque limits</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                            |
| 13        | <p>The drive has reached the positive armature current limit even through the applied field current setpoint is still <math>\geq 50\%</math> of P102 (<math>I_{F,motor}</math>)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Armature current is very "unsteady", e.g. due to high speed controller P gain setting in P225 (on drive with high integral-action time). In this case, setting a lower actual speed filtering value in P200 and execution of another speed controller optimization run (P051=26) may help</li> <li>• Check armature current limits</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                            |
| 14        | <p>The speed has changed by more than 12.5% at a constant speed setpoint even through the applied field current setpoint is still <math>\geq 50\%</math> of P102 (<math>I_{F,motor}</math>)</p> <p>Possible cause: as for fault value 12</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                            |
| 15        | <p>The EMF setpoint is too small to plot a field characteristic</p> $EMF_{set} = U_A - I_{A,motor} \cdot R_A = P101 - P100 \cdot P110 < 10\% \text{ of } 1.35 \cdot P078.i001$ <p>(e.g. P078.i001 = 400 V . . . minimum <math>EMF_{set} = 54 \text{ V}</math>)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                            |
| 16        | Field weakening operation is not allowed in operation without a tachometer (P083=3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                            |
| 17        | <p>The field current controller cannot be optimized because the field circuit time constant cannot be determined (actual field current does not decay after switch-off to below 0.95*initial value within approximately 1s or to below 0.8 * 0.95*initial values within approximately 2 s)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Setting in P103 is too high</li> <li>• Field circuit inductance is too high</li> <li>• Fault in actual field current sensing circuit (gating board or A7001 electronics board defective)</li> <li>• Ratio r073.02 / P102 is too high (change P076.02 if necessary)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                            |
| 18        | <p>Field weakening range is too wide, i.e. during power-up (at full field) to a speed setpoint of <math>+10\% n_{max}</math>, the <math> EMK </math> is <math>&gt; 77\%</math> of setpoint EMF (<math>P101 - P100 \cdot P110</math>)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Maximum speed setting is incorrect</li> <li>• Pulse encoder parameters are incorrect (P140 to P143)</li> <li>• Parameters for tachometer adaptation are incorrect (P741)</li> <li>• Setpoint EMF is not correct (P101, P100, P110)</li> <li>• An excessively high load torque (in positive or negative direction, e.g. a suspended load) causes the drive to rotate, one of the armature current or torque limits may be parameterized too low</li> </ul>                                                                                                                                                                                                                                                                                                                                                       |                                            |
| 19        | <p>A steady-state actual speed of <math>+10\%</math>, <math>+20\%</math>, <math>+30\%</math> . . . or <math>+100\%</math> of the maximum speed cannot be reached within 3 minutes (or maximum value of the three set acceleration times) in speed-controlled operation (the speed setpoint/actual value difference averaged over 90 firing cycles must equal <math>&lt; 0.1\% n_{max}</math> for a specific time period)</p> <p>Possible cause:</p> <ul style="list-style-type: none"> <li>• Acceleration time is set too low (P303, P307, P311)</li> <li>• Drive is blocked</li> <li>• An excessively high load torque (in positive or negative direction, e.g. a suspended load) causes the drive to rotate, one of the armature current or torque limits may be parameterized too low</li> <li>• Poor speed controller setting (P225, P226, P228) or speed controller is parameterized as pure P controller or with droop</li> <li>• A band elimination filter (P201, P202 or P203, P204) is active</li> <li>• Command "Ramp-function generator enable" =0 or "Ramp-function generator STOP" =1 is applied</li> </ul> |                                            |
| 20        | <p>Current limit is too low</p> <p>(With speed controller optimization run: Less than 30% or 45% of P100 (<math>I_{A,motor}</math>) + the armature current required for zero speed,</p> <p>With optimization run for friction moment and moment of inertia compensation: Less than 20% of P100 (<math>I_{A,motor}</math>) + the armature current required for a steady-state speed corresponding to 10% of maximum speed)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                            |

| Fault No. | Description                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error) | Further information (r047.002 to r047.016)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|           | 21                                                                                             | Field weakening range is too wide ( $n_{act} < +7\% n_{max}$ produces $ EMF  > 54\%$ setpoint EMF)<br>(setpoint EMF = $K289 = P101 - P100 * P110$ )<br>Possible cause:<br><ul style="list-style-type: none"> <li>Maximum speed setting is incorrect</li> <li>Pulse encoder parameters are incorrect (P140 to P143)</li> <li>Parameters for tachometer adaptation are incorrect (P741)</li> <li>Setpoint EMF is not correct (P101, P100, P110)</li> <li>Caution:<br/>Even a high absolute negative actual speed value can produce an <math> EMF </math> of <math>&gt; 54\%</math> setpoint EMF</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|           | 22                                                                                             | With speed controller optimization run:<br>With an acceleration current equaling 20% or 30% of P100 ( $I_{A, motor}$ ) + armature current required for zero speed or<br>With optimization run for friction moment and moment of inertia compensation:<br>With an acceleration current equaling the current required to achieve a steady-state speed of 10% of maximum speed + 20% of P100 ( $I_{A, motor}$ ), the maximum speed cannot be reached within 45s +7%<br>Possible cause:<br><ul style="list-style-type: none"> <li>Centrifugal mass is too large</li> <li>Drive is blocked, heavily speed-dependent or excessively high load torque</li> <li>"Active" load is attempting to maintain a certain speed</li> </ul> Possible remedy:<br><ul style="list-style-type: none"> <li>Increase P100 while the optimization run is in progress in order to raise the applied acceleration current during optimization (during the speed controller optimization run, a maximum of 45% of <math>I_{A, motor}</math> (+ armature current for zero speed) is applied as the armature current setpoint, <math>I_{A, motor}</math> (P100) can thus be increased to 2.2 times the value at maximum without exceeding 100% <math>I_{A, motor}</math> during optimization)</li> </ul>                       |
|           | 23                                                                                             | With speed controller optimization run:<br>With an acceleration current equaling 20% or 30% of P100 ( $I_{A, motor}$ ) + armature current required for zero speed or<br>With optimization run for friction moment and moment of inertia compensation:<br>With an acceleration current equaling the current required to achieve a steady-state speed of 10% of maximum speed + 20% of P100 ( $I_{A, motor}$ ), the maximum speed or 100% of setpoint EMF cannot be reached within 90s +13%<br>Possible cause:<br><ul style="list-style-type: none"> <li>Flywheel mass is too large</li> <li>Drive is blocked, heavily speed-dependent or excessively high load torque</li> <li>"Active" load is attempting to maintain a certain speed</li> </ul> Possible remedy:<br><ul style="list-style-type: none"> <li>Increase P100 while the optimization run is in progress in order to raise the applied acceleration current during optimization (during the speed controller optimization run, a maximum of 45% of <math>I_{A, motor}</math> (+ armature current for zero speed) is applied as the armature current setpoint, <math>I_{A, motor}</math> (P100) can thus be increased to 2.2 times the value at maximum without exceeding 100% <math>I_{A, motor}</math> during optimization)</li> </ul> |
|           | 24                                                                                             | With speed controller optimization run:<br>The actual speed does not drop to below +2% of maximum speed or to below the speed threshold $n_{min}$ set in P370 within 2 minutes<br>With optimization run for field weakening:<br>The actual speed does not drop to below +2% of maximum speed or to below the speed threshold $n_{min}$ set in P370 within 10 minutes<br>With optimization run for friction moment and moment of inertia compensation:<br>The actual speed does not drop to below +2% of maximum speed or to below the speed threshold $n_{min}$ set in P370 within 11 or 2 minutes<br>Possible cause:<br><ul style="list-style-type: none"> <li>Single-quadrant drive coasts to a standstill too slowly</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|           | 25                                                                                             | The average armature current required for the speed range from +7% to approximately +13% of maximum speed to cover the friction and/or steady-state load torque cannot be calculated<br>Possible cause:<br><ul style="list-style-type: none"> <li>Drive with very little friction or very small integral-action time and, as a result of the very short measuring time, computational inaccuracies during evaluation</li> <li>Distorted or disturbed actual speed value</li> <li>Large flywheel mass that is coupled to the drive via long shaft with high torsion, possibly via a coupling with large amount of play</li> </ul> Possible remedy:<br><ul style="list-style-type: none"> <li>Reduce P100 for duration of the optimization run to decrease the acceleration current applied during optimization and thus to lengthen the measuring time</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Fault No.       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                            |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|                 | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Further information (r047.002 to r047.016) |
| 26              | Load torque too high ( $n_{\text{set}}=0\%$ $n_{\text{max}}$ results in $n_{\text{ict}} \geq 40\%$ $n_{\text{max}}$ ) (actual speed value is averaged over 90 firing cycles, speed monitoring at $\geq 40\%$ $n_{\text{max}}$ does not start for 1s after application of speed setpoint of $n_{\text{set}}=0$ )<br>Possible cause:<br><ul style="list-style-type: none"> <li>An excessively high load torque (in a positive or negative direction, e.g. suspended load) causes the drive to rotate (the speed controller parameters are parameterized according to the factory setting during this run)</li> <li>One of the armature current or torque limits is parameterized too low (the motor field may not be reaching full field strength fast enough with the result that the initial motor torque is too low)</li> <li>Maximum speed setting is incorrect</li> <li>Pulse encoder parameters are incorrect (P140 to P143)</li> <li>Parameters for tachometer adjustment are not correct (P741)</li> </ul>         |                                            |
|                 | 27 Load torque is too high ( $n_{\text{set}}=0\%$ $n_{\text{max}}$ results in $ \text{EMF}  \geq 100\%$ setpoint EMF) (EMF monitoring at $\geq (P101 - P100 * P110)$ does not start for 1 s after application of speed setpoint of $n_{\text{set}}=0$ )<br>Possible cause:<br><ul style="list-style-type: none"> <li>An excessively high load torque (in a positive or negative direction, e.g. suspended load) causes the drive to rotate (the speed controller parameters are parameterized according to the factory setting during this run)</li> <li>One of the armature current or torque limits is parameterized too low (the motor field may not be reaching full field strength fast enough with the result that the initial motor torque is too low)</li> <li>Maximum speed setting is incorrect</li> <li>Pulse encoder parameters are incorrect (P140 to P143)</li> <li>Parameters for tachometer adjustment are not correct (P741)</li> <li>Setpoint EMF settings are incorrect (P101, P100, P110)</li> </ul> |                                            |
|                 | 28 A steady-state actual speed corresponding to 0% of maximum speed cannot be reached within 0 s in speed-controlled operation (the speed setpoint/actual value difference averaged over 90 firing cycles must be $<1.0\%$ $n_{\text{max}}$ for a total of 4s)<br>Possible cause: As for fault value 26                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                            |
|                 | 29 The calculated <u>armature circuit inductance is greater than 327.67 mH</u> , therefore <u>P111 = 327.67 mH has been set</u> . All other parameters (the current controller parameters P155 and P156 too) have been set correctly despite that. (For the real armature circuit inductance in mH, see r047.i010).<br>Possible cause:<br><ul style="list-style-type: none"> <li>e.g. field supply from the armature terminals</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                            |
|                 | 30 The calculated <u>armature circuit inductance is greater than 327.67 mH</u> and the calculated <u>armature circuit resistance is greater than 32.767 <math>\Omega</math></u> , therefore <u>P111 = 327.67 mH and P110 = 32.767 <math>\Omega</math> has been set</u> . All other parameters have also been set. However, the values of the current controller parameters P155 and P156 might differ from the optimum setting.<br>Possible cause:<br><ul style="list-style-type: none"> <li>e.g. field supply from the armature terminals</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                            |
|                 | 31 The calculated <u>armature circuit resistance is greater than 32.767 <math>\Omega</math></u> , therefore <u>P110 = 32.767 <math>\Omega</math> has been set</u> . All other parameters have also been set. Possibly the calculated P111 and therefore also the current controller parameters P155 and P156 have been distorted by the limitation in P110 .<br>Possible cause:<br><ul style="list-style-type: none"> <li>e.g. field supply from the armature terminals</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                            |
| r047 Index 002: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                            |
| F051            | 1 Fault has occurred during optimization run for current controller and precontrol for armature and field (selected by means of P051=25)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                            |
|                 | 2 Fault has occurred during optimization run for speed controller (selected through setting P051=26)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                            |
|                 | 3 Fault has occurred during optimization run for field weakening (selected through setting P051=27)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                            |
|                 | 4 Fault has occurred during internal offset adjustments (selected through P051=22)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                            |
|                 | 5 Fault has occurred in optimization run for friction and moment of inertia compensation (selected through setting P051=28)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                            |
| F051            | <b>No optimization run when permanent memory is disabled</b> [V2.1 and later]<br>(active in all operating states)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                            |
|                 | If P051.001 is set to 0 (write access to permanent memory disabled), it is not possible to execute an optimization run.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                            |

| Fault No.   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Further information (r047.002 to r047.016)                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>F052</b> | <b>Optimization run aborted as a result of external cause</b><br>(active in operating states of --, I, II)<br><br>This fault message is activated when the converter ceases operating in the RUN state (state I, II or --) during an optimization run (and thus in response to every FAULT) or if the EMERGENCY STOP or SHUTDOWN command is applied. The optimization run is aborted. Only those parameters which had been fully optimized prior to activation of the fault message are altered. When the STANDSTILL command is applied, this fault message is <u>not</u> activated if the optimization run for field weakening is interrupted <u>after</u> the 1st field weakening measuring point has been recorded or, in the case of the optimization run for friction and moment of inertia compensation, <u>after</u> the measuring point at 10% maximum speed has been determined. In these cases, the run may be interrupted by STANDSTILL so as to be able to complete the run in several stages (by repeated restarts) for a limited travel path. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|             | Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | r047 Index 002 to 016:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|             | 1 Run was aborted because converter is <u>no longer</u> operating in RUN mode<br>2 Run was aborted because EMERGENCY STOP command was applied (speed controller setpoint =0)<br>3 Run was aborted because STANDSTILL command was applied (ramp-function generator setpoint=0)<br>4 Operation has been aborted because P051 was changed during the optimization run<br>5 Run was aborted because SWITCH-ON command was not applied within 30 s of selection of optimization run<br>6 Operation has been aborted because the OPERATING ENABLE command was not entered within 1 minute of selection of the optimization run.<br>7 Operation has been aborted because converter was not in operating state < 07.2 15 s after selection of the optimization run with P051 = 25, 26, 27 or 28 (input of OFF1 command may have been forgotten)                                                                                                                                                                                                                     | i002=1 Fault has occurred during optimization run for current controller and precontrol for armature and field (selected by means of P051=25)<br>i002=2 Fault has occurred during optimization run for speed controller (selected through setting P051=26)<br>i002=3 Fault has occurred during optimization run for field weakening (selected through setting P051=27)<br>i002=5 Fault has occurred in optimization run for friction and moment of inertia compensation (selected through setting P051=28) |

### 10.1.2.11 External faults

|             |                                                                                                                                                                                                                                                                                                                  |  |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>F053</b> | <b>Fault message from free function block FB288</b><br>(active in all operating states)<br><br>Fault value:                                                                                                                                                                                                      |  |
|             | 1 the binector wired via parameter U102 Index.005 is in the state log."1"<br>2 the binector wired via parameter U102 Index.006 is in the state log."1"<br>3 the binector wired via parameter U102 Index.007 is in the state log."1"<br>4 the binector wired via parameter U102 Index.008 is in the state log."1" |  |
| <b>F054</b> | <b>Fault message from free function block FB289</b><br>(active in all operating states)<br><br>Fault value:                                                                                                                                                                                                      |  |
|             | 1 the binector wired via parameter U103 Index.005 is in the state log."1"<br>2 the binector wired via parameter U103 Index.006 is in the state log."1"<br>3 the binector wired via parameter U103 Index.007 is in the state log."1"<br>4 the binector wired via parameter U103 Index.008 is in the state log."1" |  |

### 10.1.2.12 Start-up faults

|             |                                                                                                                                                                                                                                                                |                                                                                                                           |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>F055</b> | <b>No field characteristic recorded</b><br>(active in operating states of --, I, II)<br><br>Possible fault causes <ul style="list-style-type: none"> <li>The optimization run for field weakening (P051=27) has not yet been executed.</li> </ul> Fault value: |                                                                                                                           |
|             | 1                                                                                                                                                                                                                                                              | P170 = 1 ("torque control") selected, but "no valid field characteristic has been recorded" (P117=0) yet                  |
|             | 2                                                                                                                                                                                                                                                              | P081 = 1 ("speed-dependent field weakening") selected, but "no valid field characteristic has been recorded" (P117=0) yet |

| Fault No.   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                            |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|             | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Further information (r047.002 to r047.016) |
| <b>F056</b> | <b>Important parameter is not set</b><br>(active in operating states of $\leq o6$ )<br><br>This fault message is activated if certain parameters are still set to 0.<br><br>Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                            |
|             | 1 Speed controller actual value selection in P083 is still set to 0<br>2 Rated motor armature current in P100 is still set to 0.0<br>3 Rated motor field current in P102 is still set to 0.00 (fault message only when P082 $\neq$ 0)<br>4 Rated direct current of external field device in U838 still at 0.00 (fault message only when P082 $\geq$ 21)<br>10 Connection of measuring leads for line voltage not yet set (U821.001 still set to 0)<br>14 Rated armature direct current not yet set (U822 still set to 0.0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                            |
| <b>F058</b> | <b>Parameter settings are not consistent</b><br>(active in operating states of $\leq o6$ )<br><br>Inconsistent values have been set in mutually dependent parameters.<br><br>Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                            |
|             | 2 The parameters for speed-dependent current limitation are not set correctly (the following applies: P105 > P107 (I1 > I2) and P104 < P106 (n1 < n2))<br>3 The field characteristic is not uniform<br>4 The first threshold for P gain adaptation of the speed controller set in parameter P556 is higher than the second threshold setting in parameter P559<br>5 P557 is set to greater than P560<br>6 P558 is set to greater than P561<br>7 If P083=1 (analog tachometer), then P746 may not equal 0 (main actual value is not connected)<br>8 If P083=2 (pulse encoder), then P140 may not equal x0 (no pulse encoder installed)<br>9 If P083=3 (EMF control) then P082 may not equal x1x (field weakening operation)<br>10 P090 (stabilization time for supply voltage) $\geq$ P086 (time for automatic restart)<br>11 P090 (stabilization time for supply voltage) $\geq$ P089 (waiting time in state o4 or o5)<br>12 P445=1 is set (switch-on, shutdown and crawl act as a pushbutton) although no binector is parameterized as a shutdown button (P444=0)<br>14 Parameter U673 > U674 (this setting is not permitted; see function diagram B152)<br>15 Parameter P169 = 1 and P170 = 1 (impermissible setting)                                                                                                                                                                                                                                                                            |                                            |
| <b>F059</b> | <b>Technology option S00 is disabled/will be disabled soon</b><br>(active in all operating statuses)<br><br>Fault value:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                            |
|             | 1 Time credit for S00 = 0 hrs<br>The technology option S00 for 500 operating hours no longer applies. The functions are now no longer available, but the parameter settings have been retained.<br>If you wish to continue using technology option S00, please contact your nearest Siemens Sales Office to obtain the PIN number you will require to permanently enable this option.<br>You will need to know the serial number of your SIMOREG CM. For further details, please refer to the description of parameters U977 and n978 in Chapter 11 of the Parameter List.<br>2 Time credit S00 < 100 Std.<br>The remaining time period of temporary enabling of technology option S00 is now less than 100 operating hours. The technology functions will not be available for much longer.<br>If you wish to continue using technology option S00, please contact your nearest Siemens Sales Office to obtain the PIN number you will require to permanently enable this option.<br>You will need to know the serial number of your SIMOREG CM. For further details, please refer to the description of parameters U977 and n978 in Chapter 11 of the Parameter List.<br>3 S00 operation will not be possible if an SLB cycle time of < 1 ms is set<br>Owing to the available capacity of the electronics board, it is <u>not</u> possible to operate the S00 technology option at the same time as a SIMOLINK bus with an extremely short cycle time (U746 < 1 ms).<br>See also parameter U746. |                                            |

| Fault No. | Description                                                                                 | Further information (r047.002 to r047.016) |
|-----------|---------------------------------------------------------------------------------------------|--------------------------------------------|
|           | Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error) |                                            |

### 10.1.2.13 Hardware faults

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------------------------------------------|---|--------------------------------------------------|---|--------------------------------------------------|---|--------------------------------------------------|---|--------------------------------------------------|---|--------------------------------------------------|---|-------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|--------------------------------------------|----|----------------------------------------|----|----------------------------------------|----|----------------------------------------|----|----------------------------------------|----|----------------------------------------|----|----------------------------------------|
| <b>F061</b> | <p><b>Fault message from thyristor check function</b><br/>(active in operating state o3)</p> <p>This fault message can be activated only if the thyristor check is activated via parameter P830.</p> <p>If "Thyristor defective" or "Thyristor unable to block" is signaled, then the relevant thyristor module must be replaced.</p> <p>Possible causes for irreparable damage to thyristors:</p> <ul style="list-style-type: none"> <li>• Interruption in snubber circuit</li> <li>• Current controller and precontrol are not optimized (excessive current peaks)</li> <li>• Inadequate cooling (e.g. fan is not operating, ambient temperature is too high, fan is rotating in wrong direction (incorrect phase sequence), inadequate air supply, heatsink is very dirty)</li> <li>• Excessive voltage peaks in incoming supply system</li> <li>• External short circuit or fault to ground (check armature circuit)</li> </ul> <p>If "Thyristor unable to block" is signaled, the cause can generally be attributed to a firing circuit fault, rather than to a defective thyristor.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>• Firing pulse cable to relevant thyristor is interrupted</li> <li>• Ribbon cable X101, X21A or X22A is incorrectly inserted or interrupted</li> <li>• Defective electronics or gating board</li> <li>• Internal interruption in gating cable in thyristor module</li> </ul> <p>The designation of the firing leads and the associated thyristors is to be found in Chapter 6.3 (Connection of the external power section).</p> <p>Fault value:</p> <table border="1"> <tr> <td>1</td><td>Defective thyristor (short circuit in module V1)</td></tr> <tr> <td>2</td><td>Defective thyristor (short circuit in module V2)</td></tr> <tr> <td>3</td><td>Defective thyristor (short circuit in module V3)</td></tr> <tr> <td>4</td><td>Defective thyristor (short circuit in module V4)</td></tr> <tr> <td>5</td><td>Defective thyristor (short circuit in module V5)</td></tr> <tr> <td>6</td><td>Defective thyristor (short circuit in module V6)</td></tr> <tr> <td>8</td><td>Fault to ground in armature circuit</td></tr> <tr> <td>9</td><td>I=0 message defective<br/>Possible fault cause<br/> <ul style="list-style-type: none"> <li>• Defective A7001 electronics board</li> </ul> </td></tr> <tr> <td>11</td><td>Thyristor cannot be fired (V11)</td></tr> <tr> <td>12</td><td>Thyristor cannot be fired (V12)</td></tr> <tr> <td>13</td><td>Thyristor cannot be fired (V13)</td></tr> <tr> <td>14</td><td>Thyristor cannot be fired (V14)</td></tr> <tr> <td>15</td><td>Thyristor cannot be fired (V15)</td></tr> <tr> <td>16</td><td>Thyristor cannot be fired (V16)</td></tr> <tr> <td>17</td><td>2 or more thyristors (MI) cannot be fired<br/>Possible fault cause<br/> <ul style="list-style-type: none"> <li>• Armature circuit interrupted</li> </ul> </td></tr> <tr> <td>21</td><td>Thyristor cannot be fired (V21)</td></tr> <tr> <td>22</td><td>Thyristor cannot be fired (V22)</td></tr> <tr> <td>23</td><td>Thyristor cannot be fired (V23)</td></tr> <tr> <td>24</td><td>Thyristor cannot be fired (V24)</td></tr> <tr> <td>25</td><td>Thyristor cannot be fired (V25)</td></tr> <tr> <td>26</td><td>Thyristor cannot be fired (V26)</td></tr> <tr> <td>27</td><td>2 or more thyristors (MII) cannot be fired</td></tr> <tr> <td>31</td><td>Thyristor unable to block (V11 or V21)</td></tr> <tr> <td>32</td><td>Thyristor unable to block (V12 or V22)</td></tr> <tr> <td>33</td><td>Thyristor unable to block (V13 or V23)</td></tr> <tr> <td>34</td><td>Thyristor unable to block (V14 or V24)</td></tr> <tr> <td>35</td><td>Thyristor unable to block (V15 or V25)</td></tr> <tr> <td>36</td><td>Thyristor unable to block (V16 or V26)</td></tr> </table> | 1 | Defective thyristor (short circuit in module V1) | 2 | Defective thyristor (short circuit in module V2) | 3 | Defective thyristor (short circuit in module V3) | 4 | Defective thyristor (short circuit in module V4) | 5 | Defective thyristor (short circuit in module V5) | 6 | Defective thyristor (short circuit in module V6) | 8 | Fault to ground in armature circuit | 9 | I=0 message defective<br>Possible fault cause<br><ul style="list-style-type: none"> <li>• Defective A7001 electronics board</li> </ul> | 11 | Thyristor cannot be fired (V11) | 12 | Thyristor cannot be fired (V12) | 13 | Thyristor cannot be fired (V13) | 14 | Thyristor cannot be fired (V14) | 15 | Thyristor cannot be fired (V15) | 16 | Thyristor cannot be fired (V16) | 17 | 2 or more thyristors (MI) cannot be fired<br>Possible fault cause<br><ul style="list-style-type: none"> <li>• Armature circuit interrupted</li> </ul> | 21 | Thyristor cannot be fired (V21) | 22 | Thyristor cannot be fired (V22) | 23 | Thyristor cannot be fired (V23) | 24 | Thyristor cannot be fired (V24) | 25 | Thyristor cannot be fired (V25) | 26 | Thyristor cannot be fired (V26) | 27 | 2 or more thyristors (MII) cannot be fired | 31 | Thyristor unable to block (V11 or V21) | 32 | Thyristor unable to block (V12 or V22) | 33 | Thyristor unable to block (V13 or V23) | 34 | Thyristor unable to block (V14 or V24) | 35 | Thyristor unable to block (V15 or V25) | 36 | Thyristor unable to block (V16 or V26) |
| 1           | Defective thyristor (short circuit in module V1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 2           | Defective thyristor (short circuit in module V2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 3           | Defective thyristor (short circuit in module V3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 4           | Defective thyristor (short circuit in module V4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 5           | Defective thyristor (short circuit in module V5)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 6           | Defective thyristor (short circuit in module V6)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 8           | Fault to ground in armature circuit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 9           | I=0 message defective<br>Possible fault cause<br><ul style="list-style-type: none"> <li>• Defective A7001 electronics board</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 11          | Thyristor cannot be fired (V11)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 12          | Thyristor cannot be fired (V12)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 13          | Thyristor cannot be fired (V13)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 14          | Thyristor cannot be fired (V14)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 15          | Thyristor cannot be fired (V15)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 16          | Thyristor cannot be fired (V16)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 17          | 2 or more thyristors (MI) cannot be fired<br>Possible fault cause<br><ul style="list-style-type: none"> <li>• Armature circuit interrupted</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 21          | Thyristor cannot be fired (V21)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 22          | Thyristor cannot be fired (V22)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 23          | Thyristor cannot be fired (V23)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 24          | Thyristor cannot be fired (V24)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 25          | Thyristor cannot be fired (V25)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 26          | Thyristor cannot be fired (V26)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 27          | 2 or more thyristors (MII) cannot be fired                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 31          | Thyristor unable to block (V11 or V21)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 32          | Thyristor unable to block (V12 or V22)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 33          | Thyristor unable to block (V13 or V23)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 34          | Thyristor unable to block (V14 or V24)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 35          | Thyristor unable to block (V15 or V25)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |
| 36          | Thyristor unable to block (V16 or V26)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                                  |   |                                     |   |                                                                                                                                        |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                                                                                                                                       |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                 |    |                                            |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |    |                                        |

| Fault No. | Description                                                                                    |                                            |
|-----------|------------------------------------------------------------------------------------------------|--------------------------------------------|
|           | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error) | Further information (r047.002 to r047.016) |

#### 10.1.2.14 Internal faults

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                      |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <b>F062</b> | <b>Fault in parameter memory</b><br>(active in all operating states)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                      |
|             | Software monitoring of correct functioning of the EEPROM module (non-volatile memory) on the A7009 board.<br>The EEPROM values contains all data which must be protected in the case of a power failure (i.e. parameter values and process data which must remain stored during power failures).                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                      |
|             | The following are monitored: <ul style="list-style-type: none"> <li>• Connection between the A7001 electronics board and the EEPROM on the A7009 backplane wiring assembly</li> <li>• Whether the parameter values stored on the EEPROM are within the permissible value range</li> <li>• Whether data are being correctly stored on the EEPROM. For this purpose, values are read and checked for correctness after they are transferred to the module</li> <li>• Whether the checksum of the non-volatile process data in the EEPROM is correct</li> </ul>                                                                                                                                        |                                                                                                      |
|             | Possible causes for all fault types:<br>Excessive EMC-related interference is present (e.g. due to unprotected contactors, unscreened cables, loose shield connections)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                      |
|             | Fault value: r047 Index 002 to 016:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                      |
|             | 1 Connection to EEPROM is faulty<br>Possible fault causes <ul style="list-style-type: none"> <li>• A7001 electronics board is defective</li> <li>• A7009 backplane wiring assembly is defective</li> <li>• Plug-in connection X109 is defective</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                      |
|             | 2 Parameter value is outside permissible value range<br>Possible fault causes <ul style="list-style-type: none"> <li>• "Restore to default value" has never been executed with this software (e.g. after software replacement)</li> <li>• A7009 backplane wiring assembly is defective</li> </ul> Possible remedy: <ul style="list-style-type: none"> <li>• Acknowledge fault, execute "Restore to default value" and start up the drive again</li> </ul>                                                                                                                                                                                                                                           | i002 Number of faulty parameter<br>i003 Index of faulty parameter<br>i004 Faulty parameter value     |
|             | 3 Parameter value cannot be stored on EEPROM<br>Possible fault causes <ul style="list-style-type: none"> <li>• A7001 electronics board is defective</li> <li>• A7009 backplane wiring assembly is defective</li> <li>• Plug-in connection X109 is defective</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                              | i002 Address of fault memory location<br>i003 Faulty value in EEPROM<br>i004 Correct parameter value |
|             | 11 Checksum of non-volatile data (part 1) is not correct<br>12 Checksum of non-volatile data (part 2) is not correct<br>13 Checksum of non-volatile data (part 3) is not correct<br>20 Checksum of configuring table of parameter values is not correct<br>Possible fault causes <ul style="list-style-type: none"> <li>• Defective EEPROM</li> <li>• "Restore to default value" has never been executed with this software (e.g. after software replacement)</li> </ul> Possible remedy: <ul style="list-style-type: none"> <li>• Acknowledge fault, execute "Restore to default value" and start up the drive again! Check interference suppression measures and improve if necessary.</li> </ul> | i002 Calculate checksum<br>i003 Checksum found in EEPROM                                             |



| Fault No.   | Description                                                                                                                                                                                                                                                                     |                                                     |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
|             | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                  | Further information (r047.002 to r047.016)          |
| <b>F063</b> | <b>Errors in compensation data of analog inputs and outputs</b><br>(active in all operating states)                                                                                                                                                                             |                                                     |
|             | This function monitors whether the factory-set compensation data for the analog inputs and outputs are plausible                                                                                                                                                                |                                                     |
|             | Possible fault cause:                                                                                                                                                                                                                                                           |                                                     |
|             | <ul style="list-style-type: none"> <li>Defective A7001 or A7006 electronics board</li> </ul>                                                                                                                                                                                    |                                                     |
|             | Fault value: r047 Index 002 to 016:                                                                                                                                                                                                                                             |                                                     |
|             | 11 Incorrect number of words in compensation values for analog inputs and outputs of A7001                                                                                                                                                                                      | i002 Incorrect number of words                      |
|             | 12 Checksum error in compensation values for analog inputs and outputs of A7001                                                                                                                                                                                                 | i002 Calculated checksum<br>i003 Errored checksum   |
|             | 13 Incorrect value among compensation values for analog inputs and outputs of A7001                                                                                                                                                                                             | i002 Incorrect value                                |
|             | 23 Incorrect value among compensation values for analog inputs and outputs of A7006                                                                                                                                                                                             | i002 Incorrect value                                |
|             | 41 A7042 not present or defective                                                                                                                                                                                                                                               |                                                     |
|             | 42 A7042 not present or defective                                                                                                                                                                                                                                               |                                                     |
|             |                                                                                                                                                                                                                                                                                 |                                                     |
| <b>F064</b> | <b>Watchdog timer has initiated a reset</b><br>(active in all operating states)                                                                                                                                                                                                 |                                                     |
|             | An internal microprocessor hardware counter monitors whether the program for calculating the firing pulses runs at least once every 14 ms (program is executed on average every 2.7 to 3.3 ms). If this is not the case, the counter initiates a reset, F064 is then displayed. |                                                     |
|             | Possible fault causes                                                                                                                                                                                                                                                           |                                                     |
|             | <ul style="list-style-type: none"> <li>A7001 electronics board is defective</li> <li>Excessive EMC-related interference is present (e.g. due to unprotected contactors, unscreened cables, loose shield connections)</li> </ul>                                                 |                                                     |
| <b>F065</b> | <b>Illegal microprocessor status</b><br>(active in all operating states)                                                                                                                                                                                                        |                                                     |
|             | An internal microprocessor hardware function monitors the microprocessor for illegal operating states.                                                                                                                                                                          |                                                     |
|             | Possible fault causes                                                                                                                                                                                                                                                           |                                                     |
|             | <ul style="list-style-type: none"> <li>A7001 electronics board is defective</li> <li>Excessive EMC-related interference is present (e.g. due to unprotected contactors, unscreened cables, loose shield connections)</li> </ul>                                                 |                                                     |
| <b>F067</b> | <b>Converter cooling faulty</b><br>(active in operating states of $\leq 013$ )                                                                                                                                                                                                  |                                                     |
|             | The heatsink temperature monitoring function is activated 6s after connection of the electronics supply.<br>(The current heat sink temperature is indicated at parameter r013 and on connector K050)                                                                            |                                                     |
|             | Fault value: r047 Index 002 to 016:                                                                                                                                                                                                                                             |                                                     |
|             | 1 Heatsink temperature > permissible heatsink temperature                                                                                                                                                                                                                       | i002 Measured heatsink temperature (16384 .. 100°C) |
|             | 2 Heatsink temperature sensor is defective                                                                                                                                                                                                                                      | i003 Measured ADC value                             |
|             | 3 Device fan faulty<br>When U832= 1: LOW signal at term. 120/121<br>When U832= 2: HIGH signal at term. 120/121                                                                                                                                                                  |                                                     |
| <b>F068</b> | <b>Analog measuring channel faulty (main setpoint, main actual value or analog select input)</b><br>(active in all operating states)                                                                                                                                            |                                                     |
|             | Hardware monitoring of measuring circuits                                                                                                                                                                                                                                       |                                                     |
|             | Possible fault causes                                                                                                                                                                                                                                                           |                                                     |
|             | <ul style="list-style-type: none"> <li>A7001 module defective</li> <li>Measuring circuit saturated (input voltage at terminals 4 and 5 or 6 and 7 higher than approx. 11.3V)</li> </ul>                                                                                         |                                                     |
|             | Fault value:                                                                                                                                                                                                                                                                    |                                                     |
|             | 1 Measuring channel for main setpoint / analog select input 1 faulty (terminals 4 and 5)                                                                                                                                                                                        |                                                     |
|             | 2 Measuring channel for main actual value faulty (terminals 103 and 104)                                                                                                                                                                                                        |                                                     |
|             | 3 Measuring channel for analog select input 1 faulty (terminals 6 and 7)                                                                                                                                                                                                        |                                                     |



| Fault No.   | Description                                                                                                                                                                                                                             |                                            |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|             | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                          | Further information (r047.002 to r047.016) |
| <b>F069</b> | <b>MLFB data are faulty</b><br>(active in all operating states)                                                                                                                                                                         |                                            |
|             | Possible fault causes                                                                                                                                                                                                                   |                                            |
|             | <ul style="list-style-type: none"> <li>Excessive EMC-related interference is present (e.g. due to unprotected contactors, unscreened cables, loose shield connections)</li> <li>A7009 backplane wiring assembly is defective</li> </ul> |                                            |
|             | Fault value: r047 Index 002 to 016:                                                                                                                                                                                                     |                                            |
|             | 1 MLFB code number (r070) = MLFB code number (r070) is illegal                                                                                                                                                                          | i002 Incorrect MLFB code number            |
|             | 2 MLFB data checksum error                                                                                                                                                                                                              | -                                          |
|             | 3 Works number checksum error                                                                                                                                                                                                           | -                                          |
|             | 4 Number of words of MLFB data is incorrect                                                                                                                                                                                             | -                                          |

#### 10.1.2.15 Communication errors with supplementary boards

|             |                                                                                                                                                                                                                          |                                                                                                                                                |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>F070</b> | <b>SCB1: Serious initialization error</b><br>(active in all operating states)<br>SCB1 and SCI cannot power up correctly (see diagnostic parameter n697 for details)                                                      |                                                                                                                                                |
|             | Fault value:                                                                                                                                                                                                             |                                                                                                                                                |
|             | 12 No connection to slave 1                                                                                                                                                                                              |                                                                                                                                                |
|             | 22 No connection to slave 2                                                                                                                                                                                              |                                                                                                                                                |
| <b>F073</b> | <b>SCB1: Current below 4mA minimum value at analog input1 of slave 1</b><br>(active in all operating states)<br>The cause of the fault may be a cable break                                                              |                                                                                                                                                |
| <b>F074</b> | <b>SCB1: Current below 4mA minimum value at analog input2 of slave 1</b><br>(active in all operating states)<br>The cause of the fault may be a cable break                                                              |                                                                                                                                                |
| <b>F075</b> | <b>SCB1: Current below 4mA minimum value at analog input3 of slave 1</b><br>(active in all operating states)<br>The cause of the fault may be a cable break                                                              |                                                                                                                                                |
| <b>F076</b> | <b>SCB1: Current below 4mA minimum value at analog input1 of slave 2</b><br>(active in all operating states)<br>The cause of the fault may be a cable break                                                              |                                                                                                                                                |
| <b>F077</b> | <b>SCB1: Current below 4mA minimum value at analog input2 of slave 2</b><br>(active in all operating states)<br>The cause of the fault may be a cable break                                                              |                                                                                                                                                |
| <b>F078</b> | <b>SCB1: Current below 4mA minimum value at analog input3 of slave 2</b><br>(active in all operating states)<br>The cause of the fault may be a cable break                                                              |                                                                                                                                                |
| <b>F079</b> | <b>SCB1: Telegram failure</b><br>(active in all operating states)<br>Check function of SCB1 (activity LEDs) and connection to SCI slaves (fiber optics)                                                                  |                                                                                                                                                |
| <b>F080</b> | <b>Error in initialization of a CB/TB board</b>                                                                                                                                                                          |                                                                                                                                                |
|             | Possible causes for fault values 1 and 6:                                                                                                                                                                                |                                                                                                                                                |
|             | <ul style="list-style-type: none"> <li>CB/TB board is defective</li> <li>CB/TB board is not installed correctly</li> <li>CB/TB board is taking too long to run up (e.g. due to very complex TB configuration)</li> </ul> |                                                                                                                                                |
|             | Fault value (r949 index 001): r047 index 002 to 016:                                                                                                                                                                     |                                                                                                                                                |
|             | 1 The "Heartbeat counter" of the CB/TB has not started to count within 20 s                                                                                                                                              | i015 Code number of board:<br>1 TB or 1 <sup>st</sup> CB<br>2 2 <sup>nd</sup> CB                                                               |
|             | 2 The product version of the installed CT/TB board is not compatible with the SIMOREG 6RA70 converter                                                                                                                    | i002 Code number of slot containing incompatible board:<br>2 Slot D<br>3 Slot E<br>4 Slot F<br>5 Slot G<br>6 CB when configuration includes TB |

| Fault No.   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                  |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|             | Cause as a function of fault value<br>(r047.001, r949.001 or r949.009 with acknowledged error)                                                                                                                                                                                                                                                                                                                                                                       | Further information (r047.002 to r047.016)                                                       |
|             | 5 Parameters P918, U711 to U721 are not correctly set or not accepted after a change by means of U710 = 0 setting. (The meanings of these parameters are defined in the manual for the relevant CB board, see also function diagrams, Section 8, Sheets Z110 and Z111)                                                                                                                                                                                               | i015 Code number of board:<br>1 TB or 1 <sup>st</sup> CB<br>2 2 <sup>nd</sup> CB                 |
|             | 6 The initialization run for a CB/TB board has not been completed within 40 s                                                                                                                                                                                                                                                                                                                                                                                        | i015 Code number of board:<br>1 TB or 1 <sup>st</sup> CB<br>2 2 <sup>nd</sup> CB                 |
| <b>F081</b> | <b>CB/TB heartbeat error</b><br>CB/TB has not incremented the monitoring counter for a period of 800 ms<br>Possible causes of fault <ul style="list-style-type: none"> <li>• CB/TB board is defective</li> <li>• CB/TB board is not correctly installed</li> </ul>                                                                                                                                                                                                   | i015 Code number of board:<br>1 TB or 1 <sup>st</sup> CB<br>2 2 <sup>nd</sup> CB                 |
| <b>F082</b> | <b>CB/TB message timeout or error in data exchange</b><br><br>Possible causes of fault <ul style="list-style-type: none"> <li>• CB/TB PZD message timeout (with fault value 10)</li> <li>• Excessive EMC-related interference (e.g. due to unprotected contactors, unscreened cables, loose screen connections)</li> <li>• CB/TB board is defective</li> <li>• CB/TB board is not correctly inserted</li> </ul> Fault value (r949 index 001): r047 Index 002 to 016: |                                                                                                  |
|             | 1 Fault in alarm channel from CB to basic unit                                                                                                                                                                                                                                                                                                                                                                                                                       | i015 Code number of board:<br>1 TB or 1 <sup>st</sup> CB<br>2 2 <sup>nd</sup> CB                 |
|             | 2 Fault in alarm channel from TB to basic unit                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                  |
|             | 3 Fault in fault channel from TB to basic unit                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                  |
|             | 5 Fault in parameter job channel from CB to basic unit                                                                                                                                                                                                                                                                                                                                                                                                               | i015 Code number of board:<br>1 TB or 1 <sup>st</sup> CB<br>2 2 <sup>nd</sup> CB                 |
|             | 6 Fault in parameter response channel from basic unit to CB                                                                                                                                                                                                                                                                                                                                                                                                          | i015 Code number of board:<br>1 1 <sup>st</sup> TB or 1 <sup>st</sup> CB<br>2 2 <sup>nd</sup> CB |
|             | 7 Fault in parameter job channel from TB to basic unit                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                  |
|             | 8 Fault in parameter response channel from basic unit to TB                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                  |
|             | 10 CB/TB process data failure (message timeout period set in U722)                                                                                                                                                                                                                                                                                                                                                                                                   | i015 Code number of board:<br>1 TB or 1 <sup>st</sup> CB<br>2 2 <sup>nd</sup> CB                 |
|             | 11 Fault in parameter job channel from PMU to TB                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                  |
|             | 12 Fault in parameter response channel from TB to PMU                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                  |
|             | 15 Fault in setpoint channel from CB/TB to basic unit                                                                                                                                                                                                                                                                                                                                                                                                                | i015 Code number of board:<br>1 TB or 1 <sup>st</sup> CB<br>2 2 <sup>nd</sup> CB                 |
|             | 16 Fault in actual value channel from basic unit to CB/TB                                                                                                                                                                                                                                                                                                                                                                                                            | i015 Code number of board:<br>1 TB or 1 <sup>st</sup> CB<br>2 2 <sup>nd</sup> CB                 |

#### 10.1.2.16 Fault messages from supplementary boards

|                     |                                                                                                                                                                                                      |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>F101 to F147</b> | This group of fault messages is activated by supplementary boards<br>Please refer to the operating manual of the relevant supplementary board for explanation of the fault messages and fault values |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 10.2 Alarm messages

Alarm message display:

On the PMU: A (Alarm) and a three-digit number. The red LED (Fault) flashes.

On the OP1S: On the bottom line of the operational display. The red LED (Fault) flashes.

An alarm message cannot be acknowledged, but disappears automatically when the cause has been eliminated.

Several alarm messages can be active at the same time, these are then displayed in succession.

Many alarms (see List of Alarm Messages) can only be active in certain operating states.

The system responses to an alarm are as follows:

- Alarm message is displayed on the operator panel (PMU, OP1S)
- B0114 (= status word 1, bit 7) is set and B0115 is cancelled  
(see also special alarm bits in status word 2, e.g. for an external alarm, overload, etc.)
- The corresponding bit in one of the alarm words r953 (K9801) to r960 (K9808) is set

| Alarm       | Description                                                                                                                                                                                                                                                                                                                                                           |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A015</b> | <b>Simolink start</b><br>(active in all operating states)<br><br>Although the board has been initialized, it cannot yet exchange telegrams (parameters have not yet been correctly configured on all nodes or the boards have not yet been linked via fiber optics to form a closed ring).                                                                            |
| <b>A018</b> | <b>Short circuit at binary outputs</b><br>(active in all operating states)<br><br>Hardware monitoring function to check for short circuit at one of the binary select outputs (see also F018 and r011).                                                                                                                                                               |
| <b>A019</b> | <b>Alarm message from free function block FB256</b><br>(active in all operating states)<br><br>The binector wired via parameter U104 Index.002 is in the state log."1"                                                                                                                                                                                                |
| <b>A020</b> | <b>Alarm message from free function block FB257</b><br>(active in all operating states)<br><br>The binector wired via parameter U105 Index.002 is in the state log."1"                                                                                                                                                                                                |
| <b>A021</b> | <b>External alarm 1</b><br>(active in all operating states)<br><br>Bit 28 in control word 2 was in the log. "0" state for longer than the time set in P360 index 003.                                                                                                                                                                                                 |
| <b>A022</b> | <b>External alarm 2</b><br>(active in all operating states)<br><br>Bit 29 in control word 2 was in the log. "0" state for longer than the time set in P360 index 004.                                                                                                                                                                                                 |
| <b>A023</b> | <b>Alarm message from free function block FB6</b><br>(active in all operating states)<br><br>The binector wired via parameter U104 Index.001 is in the state log."1"                                                                                                                                                                                                  |
| <b>A024</b> | <b>Alarm message from free function block FB7</b><br>(active in all operating states)<br><br>The binector wired via parameter U105 Index.001 is in the state log."1"                                                                                                                                                                                                  |
| <b>A025</b> | <b>Brush length too short</b><br>(active in all operating states)<br><br>When parameter P495=1 (binary sensing of brush length):<br>Alarm in response to log. "0" signal (longer than 10s) at terminal 211<br><br>Possible causes <ul style="list-style-type: none"> <li>• Encoder for brush length has responded</li> <li>• Interruption in encoder cable</li> </ul> |

| Alarm       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A026</b> | <p><b>Poor bearing condition</b><br/>(active in all operating states)</p> <p>When parameter P496=1 (bearing condition sensing):<br/>Alarm in response to log. "0" signal (longer than 2s) at terminal 212</p> <p>Possible causes</p> <ul style="list-style-type: none"> <li>Encoder for bearing condition has responded</li> </ul>                                                                                                                                                                                                                                                                                                                                                               |
| <b>A027</b> | <p><b>Air flow monitoring</b><br/>(active in operating states of &lt; o6)</p> <p>When parameter P497=1 (air flow monitoring):<br/>Alarm in response to log. "0" signal (longer than 40s) at terminal 213</p> <p>Possible causes</p> <ul style="list-style-type: none"> <li>Encoder for fan monitoring has responded</li> <li>Interruption in encoder cable</li> </ul>                                                                                                                                                                                                                                                                                                                            |
| <b>A028</b> | <p><b>Motor overtemperature</b><br/>(active in all operating states)</p> <p>When parameter P498=1 (thermostat connected):<br/>Alarm in response to log. "0" signal (longer than 10s) at terminal 214</p> <p>Possible causes</p> <ul style="list-style-type: none"> <li>Thermostat for monitoring motor temperature has responded</li> <li>Interruption in encoder cable</li> </ul>                                                                                                                                                                                                                                                                                                               |
| <b>A029</b> | <p><b>Motor overtemperature</b><br/>(active in all operating states)</p> <p>Selection via P493=1 or 3 (thermostat at terminals 22 / 23) or<br/>P494=1 or 3 (thermostat at terminals 204 / 205)</p> <p><u>When parameter P490.01=1 (KTY84 at terminals 22 / 23) or P490.02=1 (KTY84 at terminals 204 / 205):</u><br/>The alarm is activated if the motor temperature reaches or exceeds the values set in parameter P492.</p> <p><u>When parameter P490.01=2, 3, 4 or 5 (PTC thermistor at terminals 22 / 23) or P490.02=2, 3, 4 or 5 (PTC thermistor at terminals 204 / 205):</u><br/>The alarm is activated if the motor temperature reaches or exceeds the trip value of the selected PTC.</p> |
| <b>A030</b> | <p><b>Commutation failure or overcurrent has occurred</b><br/>(active in operating states of – –, I, II)</p> <p>Possible error causes</p> <ul style="list-style-type: none"> <li>Mains voltage dip in regenerative feedback mode</li> <li>Current control loop not optimized</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>A031</b> | <p><b>Speed controller monitoring</b><br/>(active in operating states of – –, I, II)</p> <p>The monitor responds when the difference between the connectors selected in P590 and P591 (factory setting: Setpoint/actual value difference of speed controller) exceeds the limit set in parameter P388 for longer than the time set in parameter P390.</p> <p>Possible causes</p> <ul style="list-style-type: none"> <li>Control loop interrupted</li> <li>Controller is not optimized</li> <li>P590 or P591 is not correctly parameterized</li> </ul>                                                                                                                                            |
| <b>A033</b> | <p><b>Alarm message from free function block FB8</b><br/>(active in all operating states)</p> <p>The binector connected via parameter U106 Index.001 is in the log. "1" state</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>A034</b> | <p><b>Alarm message from free function block FB9</b><br/>(active in all operating states)</p> <p>The binector connected via parameter U107 Index.001 is in the log. "1" state</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>A035</b> | <p><b>Drive blocked</b><br/>(active in operating states of – –, I, II)</p> <p>The monitoring function responds if the following conditions are fulfilled for longer than the time set in parameter P355:</p> <ul style="list-style-type: none"> <li>Positive or negative torque or armature current limit reached</li> <li>Armature current is greater than 1% of converter rated armature DC current</li> <li>The actual speed value is less than 0.4% of maximum speed</li> </ul>                                                                                                                                                                                                              |

| Alarm       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A036</b> | <b>No armature current can flow</b><br>(active in operating states of – –, I, II)<br><br>This monitoring function responds if the armature firing angle is at the rectifier stability limit for more than 500 ms and the armature current is less than 1% of the converter rated armature DC current.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>A037</b> | <b>I<sup>2</sup>t motor monitor has responded</b><br>(active in operating states of – –, I, II)<br><br>The alarm is activated when the calculated I <sup>2</sup> t value of the motor reaches the value which corresponds to the final temperature at 100% of permissible continuous motor current (= P113*P100).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>A038</b> | <b>Overspeed</b><br>(active in operating states of – –, I, II)<br><br>The monitoring function responds if the actual speed value (selected in P595) exceeds the positive (P512) or negative (P513) threshold by 0.5%.<br><br>Possible causes <ul style="list-style-type: none"> <li>• Lower current limit has been input</li> <li>• Current-controlled operation</li> <li>• P512, P513 are set too low</li> <li>• Tachometer cable contact fault in operation close to maximum speed</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>A039</b> | <b>Reserved</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>A043</b> | <b>Automatic field current reduction if EMF is too high in operation</b><br>(active in operating states of – –, I, II)<br><br>This alarm is active only when parameter P272=1 and activated if the following equation applies to firing angle $\alpha$ (armature) before limitation (K101):<br>$\alpha > (\alpha_{\text{W}} \text{ (inverter stability limit acc. to P151)} - 5 \text{ degrees})$ or , at a low (pulsating) current<br>$\alpha > (165 \text{ degrees} - 5 \text{ degrees})$<br>The field is reduced simultaneously with A043, implemented through control of the armature firing angle to $(\alpha_{\text{W}}$ (or 165 degrees) - 5 degrees) using a P controller whose output reduces the EMF controller setpoint. For this reason, "Field current setpoint input through internal EMF control" (PO81=1) must be parameterized.<br>When a change in torque direction is requested, both torque directions are inhibited until the calculated control angle (K101) is <165 degrees for the armature current requested in the new torque direction, i.e. until the field, and thus the EMF, have been reduced accordingly.<br>See also parameter P082. |
| <b>A044</b> | <b>An alarm is active on one slave connected to the paralleling interface</b><br>(active in all operating states)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>A046</b> | <b>Analog select input for main setpoint (terminals 4 and 5) faulty</b><br>(active in operating states of $\leq 06$ )<br><br>This alarm is activated when P700=2 (current input 4 to 20 mA) and the input current is less than 3mA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>A047</b> | <b>Analog select input 1 (terminals 6 and 7) faulty</b><br>(active in operating states of $\leq 06$ )<br><br>This alarm is activated when P710=2 (current input 4 to 20 mA) and the input current is less than 3mA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>A049</b> | <b>SCB1: No SCI slave connected</b><br>(active in all operating states)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>A050</b> | <b>SCB1: Not all required SCI slaves are available</b><br>(active in all operating states)<br><br>The SCI slave required to perform the parameterized functions is not available                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>A053</b> | <b>Alarm message from free function block FB258</b><br>(active in all operating states)<br><br>The binector connected via parameter U106 Index.002 is in the log. "1" state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>A054</b> | <b>Alarm message from free function block FB259</b><br>(active in all operating states)<br><br>The binector connected via parameter U107 Index.002 is in the log. "1" state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>A059</b> | <b>Remaining time for temporary enabling of the S00 technology option is now less than 100 operating hours</b><br>(active in all operating statuses)<br><br>Remaining time for temporary enabling of the S00 technology option is now less than 100 operating hours. The functions will soon be unavailable.<br><br>If you wish to continue using technology option S00, please contact to your nearest Siemens Regional Office for a PIN number for permanent enabling of technology option S00.<br>You will need to know the serial number of your SIMOREG CM. For further details, please refer to the description of parameters U977 and n978 in Chapter 11 of the Parameter List.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Alarm                            | Description                                                                                                                                                                                                                                                                                           |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A067</b>                      | <b>Converter cooling faulty</b><br>(active in all operating states)<br><br>The heatsink temperature is > 90 °C.<br>The monitoring function is activated 6s after the electronics supply is connected.<br><br>(The current heat sink temperature is indicated at parameter r013 and on connector K050) |
| <b>A081</b><br>to<br><b>A088</b> | <b>CB alarm of 1<sup>st</sup> CB</b><br>(active in all operating states ≤ 011)<br><br>The meaning of these alarms depends on the type of board used.<br>For further information, refer to Section 7.7, Start-Up of Optional Supplementary Boards, in the relevant board description.                  |
| <b>A089</b><br>to<br><b>A096</b> | <b>CB alarm of 2<sup>nd</sup> CB</b><br>(active in all operating states ≤ 011)<br><br>The meaning of these alarms depends on the type of board used.<br>For further information, refer to Section 7.7, Start-Up of Optional Supplementary Boards, in the relevant board description.                  |
| <b>A097</b><br>to<br><b>A128</b> | <b>TB alarms</b><br>(active in operating states ≤ 011)<br><br>For more information about TECH BOARD alarms, please refer to Operating Instructions or Configuring Guide of the relevant board.                                                                                                        |



# 11 Parameter list

## Overview

| Range of parameter numbers | Function                                                                         |
|----------------------------|----------------------------------------------------------------------------------|
| r000                       | Operating display                                                                |
| r001 - P050                | General visualization parameters                                                 |
| P051- r059                 | Access authorization levels                                                      |
| r060 - r065                | Definition of SIMOREG CM                                                         |
| r067 - P079                | Definition of SIMOREG CM power section                                           |
| P080 - P098                | Setting values for converter control                                             |
| P100 - P139                | Definition of motor                                                              |
| P140 - P148                | Definition of pulse encoder, speed sensing using pulse encoder                   |
| P150 - P165                | Closed-loop armature current control, auto-reversing stage, armature gating unit |
| P169 - P191                | Current limitation, torque limitation                                            |
| P192                       | Auto-reversing stage, armature gating unit                                       |
| P200 - P236                | Speed controller (further parameters for the speed controller P550 - P567)       |
| P250 - P265                | Closed-loop field current control, field gating unit                             |
| P272 - P284                | Closed-loop EMF control                                                          |
| P295 - P319                | Ramp-function generator                                                          |
| P320 - P323                | Setpoint processing                                                              |
| P330                       | Ramp-function generator                                                          |
| P351 - P364                | Setting values for monitoring functions and limits                               |
| P370 - P399                | Setting values for limit-value monitors                                          |
| P401 - P416                | Settable fixed values                                                            |
| P421 - P428                | Fixed control bits                                                               |
| P430 - P445                | Digital setpoint input (fixed setpoint, inching and crawling setpoints)          |
| P450 - P453                | Position sensing with pulse encoder                                              |
| P455 - P458                | Connector selector switches                                                      |
| P460 - P473                | Motorized potentiometer                                                          |
| P480 - P485                | Oscillation                                                                      |
| P490 - P498                | Definition of "Motor interface"                                                  |
| P500 - P503                | Configuring of torque shell input                                                |
| P509 - P515                | Speed limiting controller                                                        |
| P519 - P530                | Friction compensation                                                            |
| P540 - P546                | Compensation of moment of inertia (dv/dt injection)                              |
| P550 - P567                | Speed controller (further parameters for the speed controller P200 - P236)       |
| P580 - P583                | Field reversal                                                                   |
| P590 - P597                | Input quantities for signals                                                     |
| P600 - P647                | Configuring of closed-loop control                                               |
| P648 - P691                | Control word, status word                                                        |
| P692 - P698                | Further configuring measures                                                     |
| P700 - P746                | Analog inputs (main actual value, main setpoint, selectable inputs)              |
| P749 - P769                | Analog outputs                                                                   |
| P770 - P778                | Binary outputs                                                                   |
| P780 - P819                | Configuration of serial interfaces on basic converter                            |
| P820 - P821                | Deactivation of monitoring functions                                             |
| r824 - r829                | Compensation values                                                              |
| P830                       | Thyristor diagnosis                                                              |
| P831 - P899                | Parameters for DriveMonitor and OP1S                                             |
| P918 - P927                | Profile parameters                                                               |
| r947 - P952                | Fault memory                                                                     |



| Range of parameter numbers | Function                                                                           |
|----------------------------|------------------------------------------------------------------------------------|
| r953 - r960                | Visualization parameters: Alarms                                                   |
| r964                       | Device identification                                                              |
| r967 - r968                | Visualization parameters: Control and status word                                  |
| P970 - r999                | Resetting and storing parameters, list of existing and modified P and r parameters |
| U005 - U007                | Password protection, key/lock mechanism                                            |
| n009                       | Processor utilization                                                              |
| n024 - U098                | Miscellaneous                                                                      |
| U116 - U118                | Binector / connector converter for the serial interfaces                           |
| U607 - U608                | Setpoint reduction                                                                 |
| U616                       | Definition of the function of inputs and outputs                                   |
| U619                       | Definition of the function of the relay output at terminals 109 / 110              |
| U651 - U657                | Starting pulse speed controller                                                    |
| n560 - U583                | Commutation monitoring                                                             |
| U660 - U668                | Evaluation of a 4-step master switch for cranes                                    |
| U690 - n699                | Configuration of SCB1 with SCI                                                     |
| U710 - n739                | Configuration of supplementary boards in board locations 2 and 3                   |
| U740 - U753                | Configuration of the SIMOLINK board                                                |
| U755 - n770                | Configuration of the EB1 expansion board                                           |
| U773 - n788                | Configuration of the EB2 expansion board                                           |
| U790 - U796                | Configuration of the SBP pulse encoder board                                       |
| U800 - n813                | Configuration of paralleling interface                                             |
| U819 - U825                | Definition of the external power section                                           |
| U826 - U835                | Miscellaneous                                                                      |
| U838                       | Rated DC current of external field device                                          |
| U840                       | Simulation operation                                                               |
| n845 - n909                | Parameters for DriveMonitor                                                        |
| U910                       | Slot deactivation                                                                  |
| U911 - n949                | Parameters for DriveMonitor                                                        |
| n953 - n959                | Parameters for DriveMonitor                                                        |
| U979                       | Parameter access for experts                                                       |
| n980 - n999                | List of existing and modified U and n parameters                                   |

## Parameters for technology software in the basic converter, S00 option ("freely assignable function blocks")

| Range of parameter numbers | Function                                                                                        |
|----------------------------|-------------------------------------------------------------------------------------------------|
| n010 - n023                | Displays                                                                                        |
| U099                       | Settable fixed values                                                                           |
| U100 - U107                | Triggering of faults and alarms                                                                 |
| U110 - U115                | Connector/binector converters, binector/connector converters                                    |
| U120 - U171                | Mathematical functions                                                                          |
| U172 - U173                | Processing of connectors (averager)                                                             |
| U175 - U218                | Limiter, limit-value monitors                                                                   |
| U220 - U259                | Processing of connectors                                                                        |
| U260 - U299                | Integrators, DT1 elements, characteristics, dead zones, setpoint branching                      |
| U300 - U303                | Simple ramp-function generator                                                                  |
| U310 - U313                | Multiplexer                                                                                     |
| n314 - U317                | Counter                                                                                         |
| U318 - U411                | Logic functions                                                                                 |
| U415 - U474                | Storage elements, timers and binary signal selector switches                                    |
| U480 - U512                | Technology controller                                                                           |
| U515 - U523                | Velocity/speed calculators                                                                      |
| U525 - U529                | Variable moment of inertia                                                                      |
| U530 - U545                | PI controller                                                                                   |
| U550 - U554                | Closed-loop control elements                                                                    |
| U670 - U677                | Position/positional deviation acquisition                                                       |
| U680 - U684                | Root extractor                                                                                  |
| U950 - U952                | Sampling times                                                                                  |
| U960 - U969                | Altering the processing sequence of function blocks                                             |
| U977 - n978                | Enabling of technology software in basic unit, S00 option ("freely assignable function blocks") |

## Overview of abbreviations

Example:

| PNU                                                     | Description                                                                                             | Value range<br>[Unit]          | No. indices                        | See<br>Change                      |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------|------------------------------------|
| <b>P520</b><br>* 1)<br>FDS 2)<br>8) 9)<br>(G153)<br>10) | <b>Friction at 0% speed</b><br><br>Setting as % of converter rated DC current or converter rated torque | 0.0 to 100.0<br>[%]<br>0.1% 4) | Ind: 4<br>FS=0.0 5)<br>Type: O2 3) | P052 = 3<br>P051 ≥ 20<br>Online 6) |

1) An \* under the parameter number means that the parameter requires confirmation, i.e. the altered value does not take effect until the P key is pressed.

2) Abbreviation indicating that the parameter belongs to a data set (refers only to indexed parameters) (see Section 9.11 "Switch over parameter sets")

FDS Parameter belongs to the function data set (see Section 9.1, subsection "Data sets")

BDS Parameter belongs to the BICO data set (see Section 9.1, subsection "Data sets")

3) Specification of parameter type

O2 Unsigned 16-bit value

I2 Signed 16-bit value

O4 Unsigned 32-bit value

I4 Signed 32-bit value

V2 Bit-coded quantity

L2 Nibble-coded quantity

4) Setting steps for access via PKW mechanism

5) Factory setting

6) Minimum setting required (P052) to allow display of the relevant parameter

Minimum access level required (P051) to allow modification of the relevant parameter

Online: The parameter can be changed in all converter operating states

Offline: The parameter can only be changed in converter operating states of ≥ 01.0

8)

S00 Parameter belongs to the technology software in the basic converter, S00 option

9) The "OP parameter number" (i.e. the number to be entered via the OP1S operator panel) is specified in brackets in the "PNU" column for all parameters which are not "P parameters" or "r parameters": e.g. (2010) under n010 or (2100) under U100.

10) The parameter is shown in the specified function diagram in Section 8 (here G153).

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

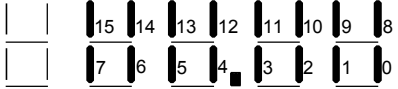
## 11.1 Operating status display

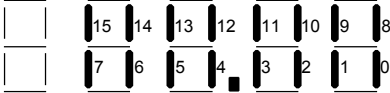
|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |                       |          |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|----------|
| r000 | <p><b>Operating status display</b></p> <p><b>Status display, fault and alarm messages</b></p> <p><b>Torque direction M0, M1 or MII (=RUN)</b></p> <p>-- No torque direction active</p> <p>I Torque direction I active (MI)</p> <p>II Torque direction II active (MII)</p> <p><b>o1 Waiting for operating enable (=READY)</b></p> <p>o1.0 Brake release delay time running.</p> <p>o1.1 Waiting for operating enable at terminal 38.</p> <p>o1.2 Waiting for operating enable via binector (acc. to selection in P661) or control word, bit 3 (acc. to selection in P648)</p> <p>o1.3 Inching command cancellation delay time running.</p> <p>o1.4 Waiting for field to be reversed.</p> <p>Waiting for cancellation of command "Brake by field reversal"</p> <p>o1.5 Waiting for operating enable from optimization run (the optimization run does not output the operating enable signal at the end until <math>n &lt; n_{min}</math> has been reached and SHUTDOWN input).</p> <p>o1.6 Waiting for cancellation of immediate pulse disable via binector (acc. to selection with P177) [SW 1.8 and later]</p> <p><b>o2 Wait for setpoint &gt; P091.002</b></p> <p>o2.0 If <math> n-set </math> (<math> K0193 </math>) and <math> n-actual </math> (<math>K0166</math>) are less than P091.002, the firing pulses are disabled and the drive goes into state o2.0. [SW 2.0 and later]</p> <p><b>o3 Test phase</b></p> <p>o3.0 Waiting for completion of thyristor check (selectable function).</p> <p>o3.1 Waiting for completion of line symmetry check.</p> <p>o3.2 Waiting for a DC contactor to pick up</p> <p>o3.3 Waiting for "Main contactor checkback" (control word 2 bit 31, see P691) [SW 1.8 and later]</p> <p><b>o4 Waiting for voltage (armature)</b></p> <p>o4.0 Waiting for voltage at power terminals 1U1, 1V1, 1W1 (the threshold set in parameters P351 and P353 must be exceeded, see also P078.001)</p> <p>o4.1 Waiting for fuse monitoring to signal OK</p> <p>o4.2 Wait until "external monitor" signals OK (for details see U832 !)</p> <p><b>o5 Waiting for field current</b></p> <p>o5.0 Waiting until actual field current K0266 equals &gt; P396 (FS=50% of field current setpoint K0275) and for "<math>I_{field\ ext} &gt; I_{f\ min}</math>" (see P265).</p> <p>o5.1 Waiting for voltage at power terminals 3U1, 3W1 (the threshold set in parameters P351 and P353 must be exceeded, see also P078.002)</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NOTE</b></p> <p>The converter dwells in states o4 and o5 for a maximum total delay time that is set in parameter P089. The appropriate fault message is output if the corresponding conditions are still not fulfilled at the end of this period.</p> </div> <p><b>o6 Wait status before the line contactor is closed</b></p> <p>o6.0 Waiting for auxiliaries to be switched on (delay in P093)</p> <p>o6.1 Waiting for a setpoint <math>\leq</math> P091 to be applied to the ramp-function generator input (K0193)</p> <p><b>o7 Waiting for switch-on command (=READY TO SWITCH ON)</b></p> <p>o7.0 Waiting for switch-on command via terminal 37.</p> <p>o7.1 Waiting for switch-on command via binector (acc. to selection in P654) or control word, bit 0 (acc. to selection in P648).</p> <p>o7.2 Waiting for cancellation of internal shutdown through input of an internal shutdown command or waiting for cancellation of command "Braking with field reversal"</p> |  | Ind: None<br>Type: O2 | P052 = 3 |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|----------|

| PNU | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------|---------------|
|     | <p>o7.3 Waiting for completion of "Restore factory settings" operation.</p> <p>o7.4 Waiting for switch-on command before execution of an optimization run</p> <p>o7.5 Wait for completion of "Read in parameter set" operation.</p> <p>o7.6 Wait for completion of "Load MLFB" operation (performed at factory)</p> <p>o7.9 reserved for firmware download for optional supplementary modules [SW 2.0 and later]</p> <p><b>o8 Waiting for acknowledgement of starting lockout</b></p> <p>o8.0 Waiting for acknowledgement of starting lockout through input of SHUTDOWN command (OFF1).</p> <p>o8.1 Simulation operation active (see under U840)</p> <p><b>o9 Fast stop (OFF3)</b></p> <p>o9.0 Fast stop has been input via binector (acc. to selection in P658) or control word, bit 2 (acc. to selection in P648).</p> <p>o9.1 Fast stop has been input via binector (acc. to selection in P659).</p> <p>o9.2 Fast stop has been input via binector (acc. to selection in P660).</p> <p>o9.3 Fast stop is stored internally (memory can be reset by cancelling FAST STOP command and entering SHUTDOWN).</p> <p><b>o10 Voltage disconnection (OFF2)</b></p> <p>o10.0 Voltage disconnection has been input via binector (acc. to selection in P655) or control word, bit 1 (acc. to selection in P648).</p> <p>o10.1 Voltage disconnection has been input via binector (acc. to selection in P656).</p> <p>o10.2 Voltage disconnection has been input via binector (acc. to selection in P657).</p> <p>o10.3 E-Stop (safety shutdown) has been input via terminal 105 or 107</p> <p>o10.4 Wait for receipt of a valid telegram on G-SST1 (only if telegram failure time monitoring is set with P787 ≠ 0)</p> <p>o10.5 Waiting for receipt of a valid telegram on G-SST2 (only if telegram failure time monitoring is set with P797 ≠ 0)</p> <p>o10.6 Waiting for receipt of a valid telegram on G-SST3 (only if telegram failure time monitoring is set with P807 ≠ 0)</p> <p><b>o11 Fault</b></p> <p>o11.0 = Fxxx Fault message is displayed, red LED lights up.</p> <p><b>o12 Electronics initialization in progress</b></p> <p>o12.1 Basic converter electronics initialization in progress</p> <p>o12.2 Initialization of supplementary board in location 2 in progress</p> <p>o12.3 Initialization of supplementary board in location 3 in progress</p> <p>o12.4 A7042 not present or defective</p> <p>o12.9 Restructuring of parameters in non-volatile storage after software update (takes approx. 15s)</p> <p><b>o13 Software update in progress</b></p> <p>o13.0 Waiting for arrival of start command from HEXLOAD PC routine (press the DOWN key to abort this status and start a RESET)</p> <p>o13.1 Deletion of Flash EPROM in progress</p> <p>xxxxx Display of address currently being programmed</p> <p>o13.2 The Flash EPROM has been successfully programmed (a RESET is performed automatically after approx. 1 second)</p> <p>o13.3 Programming of the Flash EPROM has <u>failed</u> (press UP key to return to operating state o13.0)</p> <p><b>o14 Loading of boot sector in progress</b><br/>(this operation is performed only in factory)</p> <p><b>o15 Electronics not connected to voltage</b><br/>Dark display: Waiting for voltage at terminals 5U1, 5W1 (electronics supply voltage).</p> |                       |             |               |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.2 General visualization parameters

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                  |                       |          |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------|----------|
| r001<br>(G113) | Display of terminals 4 and 5 (main setpoint)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -200.0 to 199.99<br>[%]<br>0.01% | Ind: None<br>Type: I2 | P052 = 3 |
| r002<br>(G113) | Analog input, terminals 103 and 104 (main actual value)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -200.0 to 199.99<br>[%]<br>0.01% | Ind: None<br>Type: I2 | P052 = 3 |
| r003<br>(G113) | Analog input, terminals 6 and 7 (selectable input 1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -200.0 to 199.99<br>[%]<br>0.01% | Ind: None<br>Type: I2 | P052 = 3 |
| r004<br>(G114) | Analog input, terminals 8 and 9 (selectable input 2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -200.0 to 199.99<br>[%]<br>0.01% | Ind: None<br>Type: I2 | P052 = 3 |
| r005<br>(G114) | Analog input, terminals 10 and 11 (selectable input 3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -200.0 to 199.99<br>[%]<br>0.01% | Ind: None<br>Type: I2 | P052 = 3 |
| r006<br>(G115) | Analog output, terminals 14 and 15<br>Display of output value <u>before</u> normalization and offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -200.0 to 199.99<br>[%]<br>0.01% | Ind: None<br>Type: I2 | P052 = 3 |
| r007<br>(G115) | Analog output, terminals 16 and 17<br>Display of output value <u>before</u> normalization and offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -200.0 to 199.99<br>[%]<br>0.01% | Ind: None<br>Type: I2 | P052 = 3 |
| r008<br>(G116) | Analog output, terminals 18 and 19<br>Display of output value <u>before</u> normalization and offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -200.0 to 199.99<br>[%]<br>0.01% | Ind: None<br>Type: I2 | P052 = 3 |
| r009<br>(G116) | Analog output, terminals 20 and 21<br>Display of output value <u>before</u> normalization and offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -200.0 to 199.99<br>[%]<br>0.01% | Ind: None<br>Type: I2 | P052 = 3 |
| r010<br>(G110) | <b>Display of status of binary inputs</b><br>Representation on operator panel (PMU):<br><br>Segment ON: Corresponding terminal is activated<br>(HIGH level is applied)<br>Segment OFF: Corresponding terminal is not activated<br>(LOW level is applied)<br><br>Segment or bit<br>0 ..... Terminal 36<br>1 ..... Terminal 37 (switch-on)<br>2 ..... Terminal 38 (operating enable)<br>3 ..... Terminal 39<br>4 ..... Terminal 40<br>5 ..... Terminal 41<br>6 ..... Terminal 42<br>7 ..... Terminal 43<br>8 ..... Terminal 211<br>9 ..... Terminal 212<br>10 ..... Terminal 213<br>11 ..... Terminal 214<br>12 ..... Safety shutdown (E-Stop is applied) 1)<br>13 ..... Terminal 122/123 [SW 1.9 and later]<br>14 ..... Terminal 124/125 [SW 1.9 and later]<br>15 ..... (not used)<br><br>1) The safety shutdown command is applied (segment dark) if<br>- terminal XS-105 is open (switch operation, see also Section 9)<br>or<br>- terminal XS-107 (Stop pushbutton) is opened briefly and terminal XS-108 (Reset pushbutton) is not yet activated (pushbutton operation, see also Section 9) |                                  | Ind: None<br>Type: V2 | P052 = 3 |

| PNU                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Value range<br>[Unit]                          | No. indices           | See<br>Change |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------|---------------|
| <b>r011</b><br><br>(G112)<br>(G117) | <b>Display of status of binary outputs</b><br>Representation on operator panel (PMU):<br><br>Segment ON: Corresponding terminal is activated<br>(HIGH level is applied) or overloaded or short-circuited<br>Segment OFF: Corresponding terminal is not activated<br>(LOW level is applied) or not overloaded or not short-circuited<br><br>Display of status of binary output terminals:<br>Segment or bit<br>0 ..... Terminal 46<br>1 ..... Terminal 48<br>2 ..... Terminal 50<br>3 ..... Terminal 52<br>6 ..... Terminal 120/121 (relay contact for fan)<br>[SW 1.9 and later]<br>7 ..... Terminal 109/110 (relay contact for line contactor)<br><br>Display of overloading of binary outputs:<br>Segment or bit<br>8 ..... Terminal 46<br>9 ..... Terminal 48<br>10 .... Terminal 50<br>11 .... Terminal 52<br>12 .... Terminal 26 (15V output)<br>13 .... Terminal 34, 44 and/or 210 (24V output) |                                                | Ind: None<br>Type: V2 | P052 = 3      |
| <b>r012</b><br><br>(G185)           | <b>Motor temperature</b><br>Display of motor temperature when a KTY 84 temperature sensor is connected (P490.x=1).<br>A value of "0" is always output in r012 when a PTC thermistor or no temperature sensor is installed.<br><br>i001: Motor temperature 1 (sensor at terminals 22 / 23)<br>i002: Motor temperature 2 (sensor at terminals 204 / 205)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -58 to +200<br>[°C]<br>1°C                     | Ind: 2<br>Type: I2    | P052 = 3      |
| <b>r013</b><br><br>(G114)           | <b>Heatsink temperature</b><br>Display of heatsink temperature<br>(temperature sensor according to U830 to terminal X6, X7 of the power interface)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | -47 to +200<br>[°C]<br>1°C                     | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r014</b>                         | <b>Temperature rise</b><br><br>i001: Calculated motor temperature rise (see P114)<br>i002: no meaning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.0 to 200.0<br>[%]<br>0.1%                    | Ind: 2<br>Type: O2    | P052 = 3      |
| <b>r015</b>                         | <b>Display of line voltage (armature)</b><br>(generated as arithmetic rectification average, RMS value display applies to sinusoidal voltage, average over 3 line-to-line voltages)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.0 to 2800.0<br>[V]<br>0.1V                   | Ind: None<br>Type: O2 | P052 = 3      |
| <b>r016</b>                         | <b>Display of line voltage (field)</b><br>(generated as arithmetic rectification average, RMS value display applies to sinusoidal voltage)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.0 to 800.0<br>[V]<br>0.1V                    | Ind: None<br>Type: O2 | P052 = 3      |
| <b>r017</b>                         | <b>Display of line frequency</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.00 to 120.00<br>[Hz]<br>0.01Hz               | Ind: None<br>Type: O2 | P052 = 3      |
| <b>r018</b><br><br>(G163)           | <b>Display of firing angle (armature)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.00 to 180.00<br>[degrees]<br>0.01degrees     | Ind: None<br>Type: O2 | P052 = 3      |
| <b>r019</b><br><br>(G162)           | <b>Display of actual armature current</b><br>The internal actual armature current value is displayed (arithmetic average over the last 6 current peaks in each case)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -400.0 to 400.0<br>[% of P100]<br>0.1% of P100 | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r020</b><br><br>(G162)           | <b>Display of the absolute value of armature current setpoint</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.0 to 300.0<br>[% of P100]<br>0.1% of P100    | Ind: None<br>Type: I2 | P052 = 3      |

| PNU                   | Description                                                                                                                                                                                                                                                    | Value range<br>[Unit]                               | No. indices           | See<br>Change |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------|---------------|
| <b>r021</b><br>(G160) | <b>Display of torque setpoint after torque limitation</b><br><br>Steps: $1 \triangleq 0.1\%$ of rated motor torque (=rated motor armature current (P100) * magnetic flux at rated motor field current (P102))                                                  | -400.0 to 400.0<br>[%]<br>0.1% (see column on left) | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r022</b><br>(G160) | <b>Display of torque setpoint before torque limitation</b><br><br>Steps: $1 \triangleq 0.1\%$ of rated motor torque (=rated motor armature current (P100) * magnetic flux at rated motor field current (P102))                                                 | -400.0 to 400.0<br>[%]<br>0.1% (see column on left) | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r023</b><br>(G152) | <b>Display of speed controller setpoint/actual value deviation</b>                                                                                                                                                                                             | -200.00 to 199.99<br>[%]<br>0.01%                   | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r024</b><br>(G145) | <b>Display of actual speed value from pulse encoder</b>                                                                                                                                                                                                        | -200.00 to 199.99<br>[%]<br>0.01%                   | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r025</b><br>(G151) | <b>Display of actual speed controller value</b>                                                                                                                                                                                                                | -200.0 to 199.99<br>[%]<br>0.01%                    | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r026</b><br>(G152) | <b>Display of speed controller setpoint</b>                                                                                                                                                                                                                    | -200.0 to 199.99<br>[%]<br>0.01%                    | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r027</b><br>(G136) | <b>Display of ramp-function generator output</b>                                                                                                                                                                                                               | -200.00 to 199.99<br>[%]<br>0.01%                   | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r028</b><br>(G136) | <b>Display of ramp-function generator input</b>                                                                                                                                                                                                                | -200.00 to 199.99<br>[%]<br>0.01%                   | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r029</b><br>(G135) | <b>Display of main setpoint before limitation</b>                                                                                                                                                                                                              | -200.00 to 199.99<br>[%]<br>0.01%                   | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r034</b><br>(G166) | <b>Display of firing angle (field)</b>                                                                                                                                                                                                                         | 0.00 to 180.00<br>[degrees]<br>0.01degrees          | Ind: None<br>Type: O2 | P052 = 3      |
| <b>r035</b><br>(G166) | <b>Display of field current controller actual value</b>                                                                                                                                                                                                        | 0.0 to 199.9<br>[% of P102]<br>0.1% of P102         | Ind: None<br>Type: O2 | P052 = 3      |
| <b>r036</b><br>(G166) | <b>Display of field current controller setpoint</b>                                                                                                                                                                                                            | 0.0 to 199.9<br>[% of P102]<br>0.1% of P102         | Ind: None<br>Type: O2 | P052 = 3      |
| <b>r037</b><br>(G165) | <b>Display of actual EMF value</b>                                                                                                                                                                                                                             | -1500.0 to 1500.0<br>[V]<br>0.1V                    | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r038</b>           | <b>Display of actual armature voltage value</b>                                                                                                                                                                                                                | -1500.0 to 1500.0<br>[V]<br>0.1V                    | Ind: None<br>Type: I2 | P052 = 3      |
| <b>r039</b><br>(G165) | <b>Display of EMF setpoint</b><br><br>This parameter displays the EMF setpoint which is applied as the control quantity in the field-weakening range.<br>This value is calculated from:<br>$U_{motor_{rated}} - I_{motor_{rated}} * RA (= P101 - P100 * P110)$ | 0.0 to 1500.0<br>[V]<br>0.1V                        | Ind: None<br>Type: O2 | P052 = 3      |



| PNU  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Value range<br>[Unit] | No. indices           | See<br>Change |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|---------------|
| r040 | <b>Display of limitations:</b><br>Representation on operator panel (PMU): <div style="text-align: center;"> </div> Segment ON: Corresponding limitation is reached<br>Segment OFF: Corresponding limitation is not reached<br><br>Segment or bit<br>0 $\alpha_W$ limit (field) reached (P251)<br>1 Negative current limit (field) reached (K0274)<br>2 $\alpha_W$ limit (armature) reached ( $\alpha_W$ acc. to P151 for continuous current, 165° for discontinuous current)<br>3 ..... Negative current limit (armature) reached (K0132)<br>4 ..... Negative maximum speed reached (P513)<br>Speed limiting controller responds (B0201)<br>5 ..... Negative torque limit reached (B0203)<br>6 ..... Neg. limitation at ramp generator output reached (K0182)<br>7 ..... Neg. limitation at ramp generator input reached (K0197)<br>8 ..... $\alpha_G$ limit (field) reached (P250)<br>9 ..... Positive current limit (field) reached (K0273)<br>10 ..... $\alpha_G$ limit (armature) reached (P150)<br>11 ..... Positive current limit (armature) reached (K0131)<br>12 ..... Positive maximum speed reached (P512)<br>Speed limiting controller responds (B0201)<br>13 ..... Positive torque limit reached (B0202)<br>14 ..... Pos. limitation at ramp generator output reached (K0181)<br>15 ..... Pos. limitation at ramp generator input reached (K0196)<br><br>Note: This parameter has the same bit assignments as connector K0810. |                       | Ind: None<br>Type: V2 | P052 = 3      |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |                            |                                 |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------|---------------------------------|
| Connector and binector displays |                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |                            |                                 |
| r041<br>(G121)                  | <b>High-resolution connector display:</b><br>i001: Display of connector selected in P042.01<br>i002: Display of connector selected in P042.02<br><br>The display value is filtered with a time constant of 300ms (see Section 8, Sheet G121)                                                                                                                                                                 | -200.00 to 199.99<br>[%]<br>0.01% | Ind: 2<br>Type: I2         | P052 = 3                        |
| P042<br>*<br>(G121)             | <b>High-resolution connector display:</b><br>i001: Selection of connector to be displayed in r041.01<br>i002: Selection of connector to be displayed in r041.02<br><br>The display value is filtered with a time constant of 300ms (see Section 8, Sheet G121)                                                                                                                                               | All connector numbers<br>1        | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Online |
| r043<br>(G121)                  | <b>Connector display:</b><br>i001: Display of connector selected in P044.01<br>i002: Display of connector selected in P044.02<br>i003: Display of connector selected in P044.03<br>i004: Display of connector selected in P044.04<br>i005: Display of connector selected in P044.05<br>i006: Display of connector selected in P044.06<br>i007: Display of connector selected in P044.07                      | -200.0 to 199.9<br>[%]<br>0.1%    | Ind: 7<br>Type: I2         | P052 = 3                        |
| P044<br>*<br>(G121)             | <b>Connector display:</b><br>i001: Selection of connector displayed in r043.01<br>i002: Selection of connector displayed in r043.02<br>i003: Selection of connector displayed in r043.03<br>i004: Selection of connector displayed in r043.04<br>i005: Selection of connector displayed in r043.05<br>i006: Selection of connector displayed in r043.06<br>i007: Selection of connector displayed in r043.07 | All connector numbers<br>1        | Ind: 7<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Online |
| r045<br>(G121)                  | <b>Binector display:</b><br>i001: Display of binector selected in P046.01<br>i002: Display of binector selected in P046.02<br>i003: Display of binector selected in P046.03<br>i004: Display of binector selected in P046.04                                                                                                                                                                                 | 0 to 1                            | Ind: 4<br>Type: O2         | P052 = 3                        |

| PNU                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Value range<br>[Unit]           | No. indices                   | See<br>Change                       |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------|-------------------------------------|
| <b>P046</b><br>*<br><br>(G121) | <b>Binector display:</b><br><br>i001: Selection of binector displayed in r045.01<br>i002: Selection of binector displayed in r045.02<br>i003: Selection of binector displayed in r045.03<br>i004: Selection of binector displayed in r045.04                                                                                                                                                                                                                                                                                                                                                | All binector numbers<br>1       | Ind: 4<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Online     |
| <b>r047</b>                    | <b>Display of fault diagnostic memory</b><br><br>Provides more detailed information about the cause of a fault after activation of a fault message (see Section 10).<br><br>i001 Word 1 (fault value)<br>i002 Word 2<br>...<br>i016 Word 16 (fault number)                                                                                                                                                                                                                                                                                                                                  | 0 to 65535<br>1                 | Ind: 16<br>Type: O2           | P052 = 3                            |
| <b>r048</b><br><br>(G189)      | <b>Hours run</b><br><br>Display of time (hours) in which drive has been operating in states I, II or - -. All times of $\geq$ approx. 0.1 s are included in the count.                                                                                                                                                                                                                                                                                                                                                                                                                      | 0 to 65535<br>[hours]<br>1 hour | Ind: None<br>Type: O2         | P052 = 3                            |
| <b>r049</b><br><br>(G189)      | <b>Fault time</b><br><br>Display of time at which the current fault, and the last 7 acknowledged faults, were activated.<br><br>i001: Current fault                    hours<br>i002: 1 <sup>st</sup> acknowledged fault        hours<br>i003: 2 <sup>nd</sup> acknowledged fault        hours<br>i004: 3 <sup>rd</sup> acknowledged fault        hours<br>i005: 4 <sup>th</sup> acknowledged fault        hours<br>i006: 5 <sup>th</sup> acknowledged fault        hours<br>i007: 6 <sup>th</sup> acknowledged fault        hours<br>i008: 7 <sup>th</sup> acknowledged fault        hours | 0 to 65535<br>[hours]<br>1 hour | Ind: 8<br>Type: O2            | P052 = 3                            |
| <b>P050</b><br>*               | <b>Language</b><br><br>Language of plaintext display on optional OP1S operator panel and in DriveMonitor PC service routine<br><br>0: German<br>1: English<br>2: Spanish<br>3: French<br>4: Italian                                                                                                                                                                                                                                                                                                                                                                                         | 0 to 4<br>1                     | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 $\geq$ 0<br>Online |

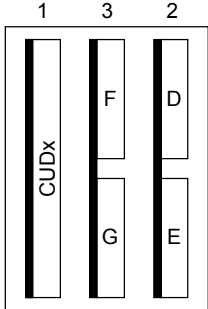
### 11.3 Access authorization levels

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                                |                                     |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|-------------------------------------|
| <b>P051</b><br>* | <b>Key parameters</b><br><br>0 No access authorization<br>6 Do not set (for use by DriveMonitor)<br>7 Do not set (for use by DriveMonitor)<br>9 Do not set (for use by DriveMonitor)<br>21 Restore factory settings<br>All parameters are reset to their defaults (factory settings).<br>Parameter P051 is then automatically reset to factory setting "40".<br><br>22 Execute internal offset compensation (see Section 7.4)<br>25 Optimization run for precontrol and current controller (armature and field) (see Section 7.5)<br>26 Optimization run for speed controller (see Section 7.5)<br>27 Optimization run for field weakening (see Section 7.5)<br>28 Optimization run for compensation of friction and moment of inertia (see Section 7.5)<br>29 Optimization run for the speed controller with an oscillating mechanical system (see Section 7.5)<br>40 Access authorization to parameter values for authorized service personnel | see column on left | Ind: None<br>FS=40<br>Type: O2 | P052 = 3<br>P051 $\geq$ 0<br>Online |
| <b>P052</b><br>* | <b>Selection of display parameters</b><br><br>0 0 Display only parameters that are not set to original factory settings<br>1 Display only parameters for simple applications<br>3 Display all parameters used                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0, 1, 3            | Ind: None<br>FS=3<br>Type: O2  | P052 = 3<br>P051 $\geq$ 0<br>Online |

| PNU                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Value range<br>[Unit] | No. indices                     | See<br>Change                    |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------|----------------------------------|
| <b>P053</b><br>*               | <b>Control word for the permanent memory</b><br>Disabling or enabling write accesses to the permanent memory<br><br>i001: Disabling or enabling write accesses to the <u>parameter memory</u><br>0 Only save parameter P053 in the permanent memory;<br>parameter changes are active immediately but the changed<br>values are only stored temporarily and are lost when the<br>electronics supply voltage is switched off<br>1 Save all parameter values in the permanent memory<br><br>i002: Disabling or enabling write accesses to the memory of the<br><u>nonvolatile process data</u><br>0 Do not save nonvolatile process data in the permanent<br>memory<br>1 Save all nonvolatile process data in the permanent memory<br><br>If the nonvolatile process data are not stored (P053.002=0),<br>data are lost when the electronics supply of the SIMOREG CM<br>is switched off, i.e. they have the value 0 after the electronics<br>supply is switched on again:<br>K0240: Setpoint of the motor potentiometer<br>K0309: Motor heating<br>K9195: Output of the 1st tracking/storage element<br>K9196: Output of the 2nd tracking/storage element | 0 to 1<br>1           | Ind: 2<br>FS=1<br>Type: O2      | P052 = 3<br>P051 = 0<br>on-line  |
| <b>P054</b>                    | <b>OP1S – Background lighting</b><br><br>0 ON continuously<br>1 ON when panel is in use                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0, 1                  | Ind: None<br>FS=0<br>Type: O2   | P052 = 3<br>P051 ≥ 0<br>Online   |
| <b>P055</b><br>*<br><br>(G175) | <b>Copy function data set</b><br>This parameter allows parameter set 1, 2, 3 or 4 to be <u>copied</u> to parameter<br>set 1, 2, 3 or 4. This function is applicable only to parameters with 4 indices<br>in the function data set (see also Section 9.1, Data sets and Section 9.11,<br>and Section 8, Sheet G175).<br><br>0xy <u>Do nothing</u> , automatic resetting value at the end of a copy<br>operation.<br><br>1xy The contents of parameter set x (source data set, x=1, 2, 3 or 4)<br>are <u>copied</u> to parameter set y (target data set, y=1, 2, 3 or 4)<br>(parameter set x remains unchanged, the original contents of<br>parameter set y are overwritten).<br>x and y are the respective parameter set numbers (1, 2, 3 or 4)<br>of the source and target parameter sets.<br><br>The copy operation is started by switching P055 over into parameter mode<br>when P055=1xy.<br>During the copy operation, the numbers of the parameters being copied are<br>displayed on the operator panel (PMU).<br>At the end of the copy operation, P055 is reset to P055=0xy.                                                                     | 011 to 143<br>1       | Ind: None<br>FS=012<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>r056</b><br>(G175)          | <b>Display of active function data set</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1 to 4<br>1           | Ind: None<br>Type: O2           | P052 = 3                         |
| <b>P057</b><br>*<br><br>(G175) | <b>Copy Bico data set</b><br>This parameter allows parameter set 1 or 2 to be <u>copied</u> to parameter set 1<br>or 2. This function is applicable only to parameters with 2 indices in the<br>Bico data set (see also Section 9.1, Data sets and Section 9.11, and<br>Section 8, Sheet G175).<br><br>0xy <u>Do nothing</u> , automatic resetting value at the end of a copy<br>operation.<br><br>1xy The contents of parameter set x (source data set, x=1 or 2) are<br><u>copied</u> to parameter set y (target data set, y=1 or 2) (parameter<br>set x remains unchanged, the original contents of parameter set<br>y are overwritten).<br>x and y are the respective parameter set numbers (1 or 2) of the<br>source and target parameter sets.<br><br>The copy operation is started by switching P057 over into parameter mode<br>when P057=1xy.<br>During the copy operation, the numbers of the parameters being copied are<br>displayed on the operator panel (PMU).<br>At the end of the copy operation, P057 is reset to P057=0xy.                                                                                                           | 011 to 121<br>1       | Ind: None<br>FS=012<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                   | Description                                              | Value range<br>[Unit] | No. indices           | See<br>Change |
|-----------------------|----------------------------------------------------------|-----------------------|-----------------------|---------------|
| <b>r058</b><br>(G175) | <b>Display of active Bico data set</b>                   | 1 to 2<br>1           | Ind: None<br>Type: O2 | P052 = 3      |
| <b>r059</b>           | <b>Display of operating state</b><br>Meaning as for r000 | 0.0 to 14.5<br>0.1    | Ind: None<br>Type: O2 | P052 = 3      |

## 11.4 Definition of SIMOREG CM converter

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                    |          |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------|----------|
| <b>r060</b><br>(G101) | <b>Software version</b><br>Converter software release<br>i001: CUD<br>i002: Slot D (board location 2)<br>i003: Slot E (board location 2)<br>i004: Slot F (board location 3)<br>i005: Slot G (board location 3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.0 to 9.9<br>0.1 | Ind: 5<br>Type: O2 | P052 = 3 |
| <b>r061</b><br>(G101) | <b>Creation date of software</b><br>i001: Year<br>i002: Month<br>i003: Day<br>i004: Hour<br>i005: Minute                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   | Ind: 5<br>Type: O2 | P052 = 3 |
| <b>r062</b><br>(G101) | <b>Checksum</b><br>i001: Converter firmware checksum<br>i002: Boot sector checksum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   | Ind: 2<br>Type: L2 | P052 = 3 |
| <b>r063</b><br>(G101) | <b>Board code</b><br>Identification code of boards mounted in locations 1 to 3 of electronics box.<br><div style="text-align: center;">  <p>Arrangement of board locations 1 to 3 and slots D to G in electronics box</p> </div> i001: Board in location 1<br>71: CUD1<br>72: CUD1 + CUD2<br>i002: Board in slot D (upper slot of location 2)<br>111: Pulse encoder board (SBP) [SW 1.8 and later]<br>131 to 139: Technology board<br>141 to 149: Communications board<br>151, 152, 161: Special board (EB1, EB2, SLB)<br>i003: Board in slot E (lower slot of location 2)<br>111: Pulse encoder board (SBP) [SW 1.8 and later]<br>131 to 139: Technology board<br>141 to 149: Communications board<br>151, 152, 161: Special board (EB1, EB2, SLB)<br>i004: Board in slot F (upper slot of location 3)<br>111: Pulse encoder board (SBP) [SW 1.8 and later]<br>141 to 149: Communications board<br>151, 152, 161: Special board (EB1, EB2, SLB)<br>i005: Board in slot G (lower slot of location 3)<br>111: Pulse encoder board (SBP) [SW 1.8 and later]<br>141 to 149: Communications board<br>151, 152, 161: Special board (EB1, EB2, SLB) |                   | Ind: 5<br>Type: O2 | P052 = 3 |

| PNU                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Value range<br>[Unit] | No. indices        | See<br>Change |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------|---------------|
| <b>r064</b><br>(G101) | <b>Board compatibility</b><br>Compatibility identifier of boards in locations 1 to 3 of electronics box.<br>The compatibility identifier is bit-coded. To ensure the compatibility of a board, it must have a "1" setting at the same bit location of the parameter value as the CUD (in location 1 / index i001).<br><br>Indices:<br>i001: Compatibility identifier of board in location 1<br>i002: Compatibility identifier of board in slot D<br>i003: Compatibility identifier of board in slot E<br>i004: Compatibility identifier of board in slot F<br>i005: Compatibility identifier of board in slot G<br><br>Example:<br>Index    Value        Bit representation        Compatible with CUD<br>i001    253        0000 0000 1111 1101<br>i002    002        0000 0000 0000 0010    no<br>i003    001        0000 0000 0000 0001    yes |                       | Ind: 5<br>Type: O2 | P052 = 3      |
| <b>r065</b><br>(G101) | <b>Software identifiers</b><br>Extended software version identifiers in locations 1, 2, and 3 of the electronics box<br><br>Indices:<br>i001: Software identifier of the board in location 1<br>i002: Software identifier of the board in slot D<br>i003: Software identifier of the board in slot E<br>i004: Software identifier of the board in slot F<br>i005: Software identifier of the board in slot G                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       | Ind: 5<br>Type: O2 | P052 = 3      |

## 11.5 Definition of SIMOREG CM power section

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                              |                               |                                   |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------|-----------------------------------|
| <b>P067</b><br>*      | <b>No meaning</b> [SW 1.8 and later]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1 to 5<br>1                  | Ind: None<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>r068</b><br>(G101) | <b>Options according to rating plate</b><br>0 No option<br>2 Option K00 (terminal expansion)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                              | Ind: None<br>Type: O2         | P052 = 3                          |
| <b>r069</b><br>(G101) | <b>Serial number of SIMOREG CM</b><br>i001: 1 <sup>st</sup> and 2 <sup>nd</sup> places of serial number<br>i002: 3 <sup>rd</sup> and 4 <sup>th</sup> places of serial number<br>i003: 5 <sup>th</sup> and 6 <sup>th</sup> places of serial number<br>i004: 7 <sup>th</sup> and 8 <sup>th</sup> places of serial number<br>i005: 9 <sup>th</sup> and 10 <sup>th</sup> places of serial number<br>i006: 11 <sup>th</sup> and 12 <sup>th</sup> places of serial number<br>i007: 13 <sup>th</sup> and 14 <sup>th</sup> places of serial number<br>i008 to i015: 0<br>i016: Checksum for serial number<br><br>The serial number ASCII code is displayed in this parameter. The number is output in plaintext on the OP1S panel. |                              | Ind: 16<br>Type: L2           | P052 = 3                          |
| <b>r070</b><br>(G101) | <b>MLFB (order number) of SIMOREG CM converter</b><br>The MLFB (60) is displayed in encoded form in this parameter.<br>The MLFB is displayed in plaintext on the OP1S panel.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                              | Ind: None<br>Type: O2         | P052 = 3                          |
| <b>r071</b><br>(G101) | <b>Rated converter connection voltage (armature)</b><br>Rated converter connection voltage (armature) acc. to parameter U820                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10 to 2000<br>[V]<br>1V      | Ind: None<br>Type: O2         | P052 = 3                          |
| <b>r072</b><br>(G101) | <b>Converter rated DC current (armature)</b><br>i001: Converter rated DC current (armature) according to setting in parameter U822 (output DC current at power terminals 1C1 and 1D1)<br>i002: Actual converter rated DC current (armature) according to setting in parameter P076.001                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0.0 to 6553.5<br>[A]<br>0.1A | Ind: 2<br>Type: O2            | P052 = 3                          |

| PNU                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Value range<br>[Unit]                             | No. indices                                                                                      | See<br>Change                    |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------|
| <b>r073</b><br>(G101)      | <b>Converter rated DC current (field)</b><br><br>i001: Converter rated DC current (field) as specified on rating plate (output DC current at power terminals 3C and 3D)<br><br>i002: Actual converter rated DC current (field) as set in parameter P076.002                                                                                                                                                                                                                                                                                   | 0.00 to 100.00<br>[A]<br>0.01A                    | Ind: 2<br>Type: O2                                                                               | P052 = 3                         |
| <b>r074</b><br>(G101)      | <b>Converter rated supply voltage (field)</b><br><br>Converter rated supply voltage (field) as specified on rating plate                                                                                                                                                                                                                                                                                                                                                                                                                      | 10 to 460<br>[V]<br>1V                            | Ind: None<br>Type: O2                                                                            | P052 = 3                         |
| <b>P075</b>                | <b>No function</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                   |                                                                                                  |                                  |
| <b>P076</b><br>*<br>(G101) | <b>Reduction of converter rated DC current</b><br><br>i001: Reduction of converter rated DC current (armature)<br>i002: Reduction of converter rated DC current (field)<br><br>For the purpose of achieving a close match between the converter and motor, the converter rated DC current is reduced to the value entered here.<br><br>The current value of the device rated DC is indicated in parameter r072.002.<br><br>The following values can be set:<br>10.0%, 20.0%, 33.3%, 40.0%, 50.0%, 60.0%, 66.6% 70.0%, 80.0%, 90.0% and 100.0% | see column on left                                | Ind: 2<br>FS=100.0<br>Type: O2                                                                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P077</b>                | <b>No function</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                   |                                                                                                  |                                  |
| <b>P078</b><br>(G101)      | <b>Reduction of converter rated supply voltage</b><br><br>i001: Rated input voltage converter armature<br>i002: Rated input voltage converter field<br><br>The rated voltage value of the power system actually used to supply the power section must be set in this parameter.<br>This setting acts as the reference for the undervoltage, overvoltage and phase failure monitoring functions (see also P351, P352 and P353) as well as for connectors K0285 to K0289, K0291, K0292, K0301 K0302, K0303 and K0305                            | i001: 10 to r071<br>i002: 10 to r074<br>[V]<br>1V | Ind: 2<br>FS=<br>i001: r071<br>i002: 400V<br>except when<br>r071 = 460V<br>then 460V<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P079</b><br>*<br>(G163) | <b>Short pulses / long pulses, armature gating unit</b><br><br>0 <u>Short pulses</u> (0.89 ms=approx. 16 degrees at 50 Hz) are output on the armature gating unit.<br><br>1 <u>Long pulses</u> (pulse duration up to approx. 0.1 ms before next pulse) are output on the armature gating unit (e.g. required in cases where field is supplied via armature terminals).                                                                                                                                                                        | 0 to 1<br>1                                       | Ind: None<br>FS=0<br>Type: O2                                                                    | P052 = 3<br>P051 = 40<br>Offline |

## 11.6 Setting values for converter control

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |        |                               |                                  |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------|----------------------------------|
| <b>P080</b><br>*<br>(G140) | <b>Control word for brake control</b><br><br>1 The brake is a <u>holding brake</u><br>When the "Operating enable" command is cancelled or when the "Voltage disconnection" or "E-Stop" command is input, the "Close brake" command is not input until $n < n_{min}$ (P370, P371) is reached.<br><br>2 The brake is an <u>operating brake</u><br>When the "Operating enable" command is cancelled or when the "Voltage disconnection" or "E-Stop" command is input, the "Close brake" command is input immediately, i.e. while the motor is still rotating. | 1 to 2 | Ind: None<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------|----------------------------------|

| PNU                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Value range<br>[Unit] | No. indices                   | See<br>Change                    |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------|----------------------------------|
| P081<br>*<br><br>(G165) | <b>EMF-dependent field weakening</b><br><br>0 <u>No field-weakening operation as a function of speed or EMF</u><br>(100% of rated motor field current is applied constantly as the<br>internal field current setpoint).<br><br>1 <u>Field-weakening operation by internal closed-loop EMF control</u><br>to ensure that in field-weakening operation, i.e. at speeds above<br>the motor rated speed (= "field-weakening activation limit<br>speed"), the motor EMF is maintained constantly at the setpoint<br>$EMF_{set} (K0289) = P101 - P100 * P110$ (field current setpoint is<br>the product of the EMF controller output and the precontrol<br>component determined by the actual speed according to the<br>field characteristic).<br><br><div style="border: 1px solid black; padding: 5px;"> <b>NOTICE</b><br/>             When P081=1, a valid field characteristic must be available (P117=1),<br/>             otherwise the optimization run for field weakening (P051=27) must be<br/>             executed.           </div> | 0 to 1<br>1           | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Value range<br>[Unit] | No. indices                   | See<br>Change                    |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------|----------------------------------|
| <b>P082</b><br>*<br><br>(G166) | <p><b>Operating mode for field</b></p> <p><b>No field</b></p> <p>0 No field is used (e.g. in the case of permanent-field motors). The field gating pulses are disabled. Unlike all other cases, the motor flux (K0290) is <u>not</u> calculated according to the field characteristic (P120 to P139) as a function of the actual field current (K0265), but set to the value for 100% rated flux.</p> <p><b>Internal field power module</b></p> <p>1 The field is <u>switched with the line contactor</u> - this setting must be selected if the mains supplies for the field and armature power sections are connected or disconnected simultaneously (field gating pulses are enabled/disabled at the same time as the line contactor is closed/opened, the field current decays with the field time constant).</p> <p>2 Automatic injection of <u>standstill field</u> set in P257 after expiry of a time period set in P258, after converter has reached operating state o7 or higher.</p> <p>3 Field <u>ACTIVE continuously</u>.</p> <p>4 The field is switched with the <u>"Auxiliaries ON" (B0251) signal</u></p> <p>11 As setting 1</p> <p>12 As setting 2</p> <p>13 As setting 3</p> <p>14 As setting 4</p> <p><b>External field device</b></p> <p>21 An <u>external field device</u> is used. The setpoint for the external field device is supplied via connector K0268 (e.g. via an analog output or the peer-to-peer interface).<br/>The rated DC current of the external field device is set in parameter U838. This value is also displayed in parameter r073.001. P076.002 is inoperative.<br/>If the external field device supplies an actual field current signal, then this can be fed in at P612. If not, then P263 should be set to 1 or 2.<br/>If the external field device supplies an "I field &lt; I field min" signal, then this can be fed in at P265.<br/>The <u>field is controlled</u> as described in <u>para. 1</u>.</p> <p>22 As described in para. 21, but<br/>the field is controlled as described in para. 2.</p> <p>23 As described in para. 21, but<br/>the field is controlled as described in para. 3.</p> <p>24 As described in para. 21, but<br/>the field is controlled as described in para. 4.</p> <p>[Values 11 to 24 can be set only in SW 1.9 and later]</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NOTICE</b></p> <p>Even though changes to the parameter value from &gt; 0 to = 0 are accepted in operating states of <math>\geq o1.0</math>, they do not take effect until the converter reaches an operating state of <math>\geq o7.0</math>.</p> </div> | 0 to 24<br>1          | Ind: None<br>FS=2<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |



| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Value range [Unit]              | No. indices                      | See Change                       |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------|----------------------------------|
| <b>P083</b><br>*<br>FDS<br>(G151) | <b>Selection of actual speed value</b><br><br>0 Actual speed value is not yet selected (fixed value 0%)<br>1 Actual speed value supplied by "Main actual value" channel (K0013) (terminals XT.103, XT.104)<br>2 Actual speed value supplied by "Actual speed from pulse encoder" channel (K0040)<br>3 Actual speed value supplied by "Actual EMF" channel (K0287), but weighted with P115 (operation without tachometer)<br><u>Note:</u><br>The effectiveness of the overspeed monitoring function (see Section 8, function diagram G188) is restricted, since very high motor speeds can be reached if the EMF is utilized as the actual speed value when the <u>actual field current value is too low</u> .<br>4 Actual speed value is wired up freely (selected in P609)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0 to 4<br>1                     | Ind: 4<br>FS=0<br>Type: O2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>P084</b><br>*<br>(G160)        | <b>Selection of closed-loop speed / current or torque control</b><br><br>1 Operation under closed-loop speed control<br>2 Operation under closed-loop current / torque control<br>The setpoint supplied by the ramp-function generator output is input as a current or torque setpoint (speed controller is bypassed).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1 to 2<br>1                     | Ind: None<br>FS=1<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P085</b>                       | <b>Wait period after cancellation of inching command</b><br><br>After an inching command has been cancelled, the drive dwells in operating state o1.3 for the time period set in this parameter with the controllers disabled, but the line contactor closed. This wait period does not commence until $n < n_{min}$ (P370, P371) is reached. If a new inching command is input within this period, then the drive switches to the next operating state (o1.2 or lower). However, if the time runs out without a new inching command being entered, then the line contactor drops out and the drive switches to operating state o7 (see also Section 9).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.0 to 60.0<br>[s]<br>0.1s      | Ind: None<br>FS=10.0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P086</b>                       | <b>Voltage failure period for automatic restart</b><br><br>If the voltage fails (F001, F004) at one of the terminals 1U1, 1V1, 1W1, 3U1, 3W1, 5U1 or 5W1, or if it drops below a certain threshold (F006 undervoltage) or exceeds a certain threshold (F007 overvoltage), or its frequency is too low (F008 frequency < P363) or too high (F009 frequency > P364), or if the actual field current drops to below 50% of the field current setpoint for more than 0.5s (F005), then the corresponding fault message is activated only if the fault condition has not been eliminated within the "Automatic restart" period set in this parameter.<br><br>The gating pulses and controllers are disabled while the fault conditions are present. The converter dwells in operating state o4 (in the case of armature line voltage fault) or o5 (in the case of field line voltage or field current fault) or in o13.<br><br>Setting this parameter to 0.00s deactivates the "Automatic restart" function.<br><br><b>NOTE:</b><br>Setting values higher than 2.00s are effective only in relation to the voltages at terminals 1U1, 1V1, 1W1, 3U1 and 3W1.<br>A "restart time" of 2.00 s is operative in this case for the voltage at terminals 5U1 and 5W1 (electronics power supply). | 0.00 to 10.00<br>[s]<br>0.01s   | Ind: None<br>FS=0.40<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P087</b><br>(G140)             | <b>Brake release time</b><br><br>-10.00 to -0.01 s<br>The "Release brake" command is delayed in relation to enabling of the gating pulses for thyristors and controllers (i.e. operating state I, II or --) by the delay time set in this parameter. During this period, the motor rotates against the closed brake. This setting is useful, for example, for vertical loads.<br><br>0.00 to +10.00 s<br>When a "Switch-on" or "Inching" or "Crawling" command is input with "Operating enable", the drive dwells in operating state o1.0 for the delay period set in this parameter; the internal controller enabling signal, and thus enabling of the thyristor gating pulses, do not take effect until the delay period has elapsed so as to give the holding brake time to open.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -10.00 to 10.00<br>[s]<br>0.01s | Ind: None<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |

| PNU                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Value range<br>[Unit]          | No. indices                                             | See<br>Change                   |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------|---------------------------------|
| <b>P088</b><br>(G140)<br>(G187) | <b>Brake closing time</b><br><br>When the "Switch-on" or "Inching" or "Crawling" command is cancelled, or when the "Switch-on" command is not applied, or when the "Fast stop" command is input, the internal controller disabling signal, and thus the thyristor gating pulse disabling signal, is not actually activated after $n < n_{min}$ has been reached until the time delay set in this parameter has elapsed. During this period, the drive continues to produce a torque (operating state I, II or –), so as to give the holding brake enough time to close.                                                                                                                                                                                                                                        | 0.00 to 10.00<br>[s]<br>0.01s  | Ind: None<br>FS=0.00<br>Type: O2                        | P052 = 3<br>P051 = 40<br>Online |
| <b>P089</b>                     | <b>Maximum wait time for voltage to appear at power section</b><br><br>When the line contactor has dropped out and the "Switch-on" or "Inching" or "Crawling" command is applied, the converter waits in operating states o4 and o5 for voltage to appear at the power section, for the actual field current value (K0265) to reach > 50% of the field current setpoint (K0268). The corresponding fault message is activated if no power section voltage and no field current is detected. This parameter specifies the maximum total delay period in which the drive may dwell in operating states o4 and o5 (response threshold for function which checks for voltage at power section, see parameter P353).                                                                                                | 0.0 to 60.0<br>[s]<br>0.1s     | Ind: None<br>FS=2.0<br>Type: O2                         | P052 = 3<br>P051 = 40<br>Online |
| <b>P090</b>                     | <b>Stabilization time for line voltage</b><br><br>When the line contactor has dropped out and the "Switch-on" or "Inching" or "Crawling" command is applied, or after a phase failure has been detected in the armature or field mains supply with active "Automatic restart" function (P086>0), the converter dwells in operating state o4 and o5 until voltage appears at the power section. Line voltage is not assumed to be applied to the power terminals until the amplitude, frequency and phase symmetry have remained within the permissible tolerance for a period exceeding the setting in this parameter. The parameter applies to both the armature and field power connections.<br><br>Caution:<br>The setting in P090 must be lower than the settings in P086 (except when P086=0.0) and P089! | 0.01 to 1.00<br>[s]<br>0.01s   | Ind: None<br>FS=0.02<br>Type: O2                        | P052 = 3<br>P051 = 40<br>Online |
| <b>P091</b>                     | <b>Setpoint threshold</b><br><br>i001: <u>Threshold for function "Switch on only if setpoint is low"</u><br>The converter can be switched on only if a setpoint $ K0193  \leq P091.001$ is applied to the ramp-function generator input. If the applied setpoint is higher, the converter dwells in state o6 after "switch-on" until the absolute setpoint value is $\leq P091.001$ .<br><br>i002: <u>Threshold for function</u><br><u>"Automatic pulse disable if setpoint is low"</u> [SW 2.0 and later]<br>If $ n\text{-set}  ( K0193 )$ and $ n\text{-act}  (K0166)$ are less than P091.002, the firing pulses are disabled and the drive goes into state o2.0.                                                                                                                                            | 0.00 to 199.99<br>[%]<br>0.01% | Ind: 2<br>FS=<br>i001: 199.99<br>i002: 0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |

| PNU                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Value range<br>[Unit]          | No. indices                                                                   | See<br>Change                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------|----------------------------------|
| <b>P092</b><br>(G200)      | <b>Delay times for field reversal</b><br>These times are used to control a reversing contactor for reversing the field polarity on a 1-quadrant converter with field reversal.<br>i001: <u>Delay time for the field reduction before opening of the current field contactor</u><br>When field polarity reversal is initiated, the delay time set in P092.i001 elapsed after reaching $I_{\text{field}}$ (K0265) < $I_{\text{field min}}$ (P394) before the current field contactor is opened.<br>i002: <u>Delay time before actuation of the new field contactor</u><br>After opening the current field contactor the delay time set in P092.i002 elapsed before the field contactor for the "new" field direction is actuated (drop-out delay time of the contactor use is usually longer then the pick-up delay time).<br>i003: <u>Delay time for enabling the field firing pulses</u><br>After actuation of the field contactor for the "new" field direction, the delay time acc. to P092.i003 elapses before the field firing pulses are enabled. This time must be longer than the pick-up delay time of the contactor used.<br>i004: <u>Delay time after the field build-up before armature enable</u><br>After - directly following the field firing pulse enable - the actual field current value $I_{\text{field}}$ in the "new" field direction has reached the value $I_{\text{field}}$ (K0265) > $I_{\text{field set}}$ (K0268)*P398/100%, the delay time acc. to P092.i004 elapses. Then the internal (armature) "Operating enable of field reversal" is issued, i.e. the Stopping of the drive in operating state $\geq \sigma 1.4$ is canceled. This delay time permits waiting of the end of overshooting of the actual field current value and therefore overshooting of the EMF of the DC machine straight after the field current has been built up again, before the "armature operating enable" is issued. This is intended to prevent armature overcurrents due to excessive EMF during overshooting. | 0.0 to 10.0<br>[s]<br>0.1s     | Ind: 4<br>FS=<br>i001: 3.0<br>i002: 0.2<br>i003: 0.1<br>i004: 3.0<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| <b>P093</b>                | <b>Pick-up delay for line contactor</b><br>Pick-up of the line contactor is delayed in relation to "Switch on auxiliaries" by the time delay set in this parameter.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.0 to 120.0<br>[s]<br>0.1s    | Ind: None<br>FS=0.0<br>Type: O2                                               | P052 = 3<br>P051 = 40<br>Online  |
| <b>P094</b>                | <b>Switch-off delay for auxiliaries</b><br>Switch-off of the auxiliaries is delayed in relation to dropout of the line contactor by the time delay set in this parameter.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.0 to 6500.0<br>[s]<br>0.1s   | Ind: None<br>FS=0.0<br>Type: O2                                               | P052 = 3<br>P051 = 40<br>Online  |
| <b>P095</b>                | <b>Pick-up time for a contactor in the DC circuit</b><br>If the DC output (terminals 1C1 and 1D1) is switched through to the motor via a contactor, and if this contactor is controlled by the "Relay for line contactor" (terminals 109 and 110), then the gating pulses may not be enabled until the contactor has safely picked up. For this purpose, it may be necessary to parameterize an additional delay time for the pick-up operation. The timer set in P095 commences during a pick-up operation when the converter reaches operating state $\sigma 5$ . If the timer has still not run down by the time the converter exits state $\sigma 4$ , then the converter dwells in state $\sigma 3.2$ until the timer has finished.<br>During the time period set in P095, the "Main contactor checkback" signal must also switch to "1" if this function is activated (see P691). Otherwise the converter dwells in state $\sigma 3.3$ until the timer has finished and fault message F004 is then output with fault value 6.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.00 to 1.00<br>[s]<br>0.01s   | Ind: None<br>FS=0.00<br>Type: O2                                              | P052 = 3<br>P051 = 40<br>Online  |
| <b>P096</b><br>(G117)      | <b>After-running time for the device fan</b><br>After the drive has been shut down (operating state $\geq 7.0$ reached) the device fan continues to run until the power section has cooled down. With this parameter you can set the minimum duration for the after-running time.<br>Note:<br>If the field current is not switched off after the drive is shut down (see P082), the field current can prevent cooling of the power section. In this case, the equipment blower is never switched off.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.0 to 60.0<br>[min]<br>0.1min | Ind: None<br>FS=4.0<br>Type: O2                                               | P052 = 3<br>P051 = 40<br>on-line |
| <b>P097</b><br>*<br>(G166) | <b>Response of field current to fault messages</b> [SW 2.1 and later]<br>0 Field pulses are blocked when a fault message is activated<br>1 Field pulses are not blocked when a fault message is activated, but the field current setpoint cannot be increased above its current setting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0 to 1<br>1                    | Ind: none<br>FS=1<br>Type: O2                                                 | P052 = 3<br>P051 = 40<br>online  |

| PNU              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Value range<br>[Unit] | No. indices                   | See<br>Change                   |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------|---------------------------------|
| <b>P098</b><br>* | <b>Contactor in DC circuit</b> [SW 2.1 and later]<br><br>0 The DC circuit does <u>not</u> include a contactor<br>1 The DC circuit contains a contactor which is controlled by the "relay for the line contactor" (terminals 109 and 110).<br>The values for the armature voltage Ua and for EMF (K0286, K0287, K0291, K0292, r037, r038) are set to 0% whenever B0124 = 0 (request main contactor not active). This is because the motor terminals are separated in this case from output terminals 1C and 1D and it is then impossible to measure the armature voltage Ua (or the EMF). | 0 to 1<br>1           | Ind: none<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>online |

## 11.7 Definition of motor

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                       |                               |                                  |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------|----------------------------------|
| <b>P100</b><br>*<br>FDS<br>(G165) | <b>Rated motor armature current (acc. to motor rating plate)</b><br><br>0.0 Parameter not yet set                                                                                                                                                                                                                                                                                                                                                                                                        | 0.0 to 6553.0<br>[A]<br>0.1A          | Ind: 4<br>FS=0.0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P101</b><br>*<br>FDS<br>(G165) | <b>Rated motor armature voltage (acc. to motor rating plate)</b><br><br>Notes:<br>One of the functions of this parameter is to determine the point at which field-weakening operation commences.<br>If possible, the rated motor armature voltage + the voltage drop in the motor feeder cable (for a current setting acc. to P100) should be set in P101.                                                                                                                                               | 10 to 2800<br>[V]<br>1V               | Ind: 4<br>FS=400<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P102</b><br>*<br>FDS<br>(G165) | <b>Rated motor field current (acc. to motor rating plate)</b><br><br>0.00 Parameter not yet set                                                                                                                                                                                                                                                                                                                                                                                                          | 0.00 to 600.00<br>[A]<br>0.01A        | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P103</b><br>*<br>FDS<br>(G165) | <b>Minimum motor field current</b><br><br>Note:<br>P103 must be set to <50% of P102 to execute the optimization run for field weakening (P051=27).                                                                                                                                                                                                                                                                                                                                                       | 0.00 to 100.00<br>[A]<br>0.01A        | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P104</b><br>*<br>FDS<br>(G161) | <b>Speed n1 (acc. to motor rating plate)</b><br><br>1 <sup>st</sup> point (speed value) in speed-dependent current limitation.<br>This parameter is used together with P105, P106, P107 and P108 to define the characteristic of the current limiting value as a function of actual speed.                                                                                                                                                                                                               | 1 to 10000<br>[rev/min]<br>1rev/min   | Ind: 4<br>FS=5000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P105</b><br>*<br>FDS<br>(G161) | <b>Armature current I1 (acc. to motor rating plate)</b><br><br>1 <sup>st</sup> point (current value) in speed-dependent current limitation.<br>This parameter is used together with P104, P106, P107 and P108 to define the characteristic of the current limiting value as a function of actual speed.                                                                                                                                                                                                  | 0.1 to 6553.0<br>[A]<br>0.1A          | Ind: 4<br>FS=0.1<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P106</b><br>*<br>FDS<br>(G161) | <b>Speed n2 (acc. to motor rating plate)</b><br><br>2 <sup>nd</sup> point (speed value) in speed-dependent current limitation.<br>This parameter is used together with P104, P105, P107 and P108 to define the characteristic of the current limiting value as a function of actual speed.                                                                                                                                                                                                               | 1 to 10000<br>[rev/min]<br>1rev/min   | Ind: 4<br>FS=5000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P107</b><br>*<br>FDS<br>(G161) | <b>Armature current I2 (acc. to motor rating plate)</b><br><br>2 <sup>nd</sup> point (current value) in speed-dependent current limitation.<br>This parameter is used together with P104, P105, P106 and P108 to define the characteristic of the current limiting value as a function of actual speed.                                                                                                                                                                                                  | 0.1 to 6553.0<br>[A]<br>0.1A          | Ind: 4<br>FS=0.1<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P108</b><br>*<br>FDS<br>(G161) | <b>Maximum operating speed n3</b><br><br>When the speed-dependent current limitation is in use, the maximum speed which is defined by the selection of the actual speed source as set in P083, <u>must</u> be entered in this parameter:<br>When P083=1 (analog tacho):<br>Speed at which a tacho voltage as set in P741 is reached<br>When P083=2 (pulse encoder):<br>Same value as maximum speed set in P143<br>When P083=3 (operation without tacho):<br>Speed at which EMF as set in P115 is reached | 1.0 to 10000<br>[rev/min]<br>1rev/min | Ind: 4<br>FS=5000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P109</b><br>*<br>FDS<br>(G161) | <b>Control word for speed-dependent current limitation</b><br><br>0 Speed-dependent current limitation is deactivated<br>1 Speed-dependent current limitation is activated                                                                                                                                                                                                                                                                                                                               | 0 to 1<br>1                           | Ind: 4<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Value range<br>[Unit]                      | No. indices                     | See<br>Change                    |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------|----------------------------------|
| <b>P110</b><br>FDS<br>(G162)<br>(G165) | <b>Armature circuit resistance</b><br><br>This parameter is set automatically during the optimization run for precontrol and current controller (armature and field) (P051=25).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.000 to 32.767<br>[Ω]<br>0.001Ω           | Ind: 4<br>FS=0.000<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P111</b><br>FDS<br>(G162)<br>(G165) | <b>Armature circuit inductance</b><br><br>This parameter is set automatically during the optimization run for precontrol and current controller (armature and field) (P051=25).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.000 to 327.67<br>[mH]<br>0.01mH          | Ind: 4<br>FS=0.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P112</b><br>FDS<br>(G166)           | <b>Field circuit resistance</b><br><br>This parameter is set automatically during the optimization run for precontrol and current controller (armature and field) (P051=25).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.0 to 3276.7<br>[Ω]<br>0.1Ω               | Ind: 4<br>FS=0.0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online  |
| <b>P113</b><br>*<br>FDS                | <b>Continuous current factor torque control / current control</b><br><br>This parameter defines the current to be permitted as a continuous current by the I <sup>2</sup> t motor monitoring function without activation of alarm message A037 or fault message F037.<br><br>This current is the product of calculation P113 * P100.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.50 to 2.00<br>0.01                       | Ind: 4<br>FS=1.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P114</b><br>FDS                     | <b>Thermal time constant of motor</b><br>(see Section 9.14)<br><br>0.0 I <sup>2</sup> t monitoring deactivated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.0 to 80.0<br>[min]<br>0.1min             | Ind: 4<br>FS=10.0<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P115</b><br>FDS<br>(G151)           | <b>EMF at maximum speed in operation without tachometer</b><br><br>This parameter is used to adjust the speed in cases where the internal actual EMF value is applied as the actual speed value. P115 defines the EMF which corresponds to maximum speed as a percentage of P078.001.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1.00 to 140.00<br>[% of P078.001]<br>0.01% | Ind: 4<br>FS=100.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P117</b><br>*<br>FDS                | <b>Control word for field characteristic</b><br><br>0 No valid field characteristic has yet been recorded<br>1 Valid field characteristic (P118 to P139 valid)<br><br>The parameter is set automatically during the field-weakening optimization run (P051=27).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0 to 1<br>1                                | Ind: 4<br>FS=0<br>Type: O2      | P052 = 3<br>P051 = 40<br>Offline |
| <b>P118</b><br>FDS<br>(G165)           | <b>Rated EMF value</b><br><br>EMF that is reached with a full field (according to parameter P102) and a speed as set in parameter P119.<br>The parameter is set automatically during the field-weakening optimization run (P051=27) and specifies in this case the <u>setpoint EMF</u> in the field-weakening range.<br><br>Note:<br>As regards the closed-loop field-weakening control, only the ratio between P118 and P119 is relevant. The EMF setpoint in the field-weakening range is determined by (P101 – P100 * P110). When the setting in P100, P101 or P110 is changed subsequently, the field-weakening optimization run <u>need not be repeated</u> . However, P118 then no longer defines the setpoint EMF in the field-weakening range.<br>When the setting in parameter P102 is changed subsequently, the field-weakening optimization run <u>must be repeated</u> , the same applies if the maximum speed setting is subsequently re-adjusted. | 0 to 2800<br>[V]<br>1V                     | Ind: 4<br>FS=340<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P119</b><br>FDS<br>(G165)           | <b>Rated speed</b><br><br>Speed at which an actual EMF value as set in parameter P118 is reached at full field (according to parameter P102).<br>This parameter is set automatically during the optimization run for field weakening (P051=27) and specifies in this case the <u>field-weakening activation limit speed</u> .<br><br>Note:<br>As regards the closed-loop field-weakening control, only the ratio between P118 and P119 is relevant. When the setting in P100, P101 or P110 is changed subsequently, the field-weakening optimization run <u>need not be repeated</u> . However, P119 then no longer defines the field-weakening activation limit speed.<br>When the setting in parameter P102 is changed subsequently, the field-weakening optimization run <u>must be repeated</u> , the same applies if the maximum speed setting is subsequently re-adjusted.                                                                                | 0.0 to 199.9<br>[%]<br>0.1%                | Ind: 4<br>FS=100.0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Description                                                                  | Value range<br>[Unit]                       | No. indices                   | See<br>Change                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------|-------------------------------|----------------------------------|
| <b>Magnetization characteristic (field characteristic)</b><br><br>Parameters P120 to P139 determine the curve shape of the <u>magnetization characteristic</u> (field characteristic) in normalized representation (see example field characteristic below for further details).<br><br>Note:<br>When the setting in parameter P102 is changed subsequently, the field-weakening optimization run <u>must be repeated</u> , because this alters the degree of saturation and thus the shape of the magnetization characteristic. (When parameter P100, P101 or P110, or the maximum speed adjustment, is subsequently altered, the settings in P120 to P139 remain the same, but the values in P118 and/or P119 are changed). |                                                                              |                                             |                               |                                  |
| <b>P120</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 0% motor flux (field characteristic, point no. 0)</b>   | 0.0<br>[% of P102]<br>0.1% of P102          | Ind: 4<br>Type: O2            | P052 = 3                         |
| <b>P121</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 5% motor flux (field characteristic, point no. 1)</b>   | 0.0 to 100.0<br>[%]<br>0.1% of P102         | Ind: 4<br>FS=3.7<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P122</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 10% motor flux (field characteristic, point no. 2)</b>  | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=7.3<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P123</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 15% motor flux (field characteristic, point no. 3)</b>  | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=11.0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P124</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 20% motor flux (field characteristic, point no. 4)</b>  | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=14.7<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P125</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 25% motor flux (field characteristic, point no. 5)</b>  | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=18.4<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P126</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 30% motor flux (field characteristic, point no. 6)</b>  | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=22.0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P127</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 35% motor flux (field characteristic, point no. 7)</b>  | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=25.7<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P128</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 40% motor flux (field characteristic, point no. 8)</b>  | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=29.4<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P129</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 45% motor flux (field characteristic, point no. 9)</b>  | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=33.1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P130</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 50% motor flux (field characteristic, point no. 10)</b> | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=36.8<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P131</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 55% motor flux (field characteristic, point no. 11)</b> | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=40.6<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P132</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 60% motor flux (field characteristic, point no. 12)</b> | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=44.6<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P133</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 65% motor flux (field characteristic, point no. 13)</b> | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=48.9<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P134</b><br>FDS<br>(G165)<br>(G166)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Field current for 70% motor flux (field characteristic, point no. 14)</b> | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=53.6<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

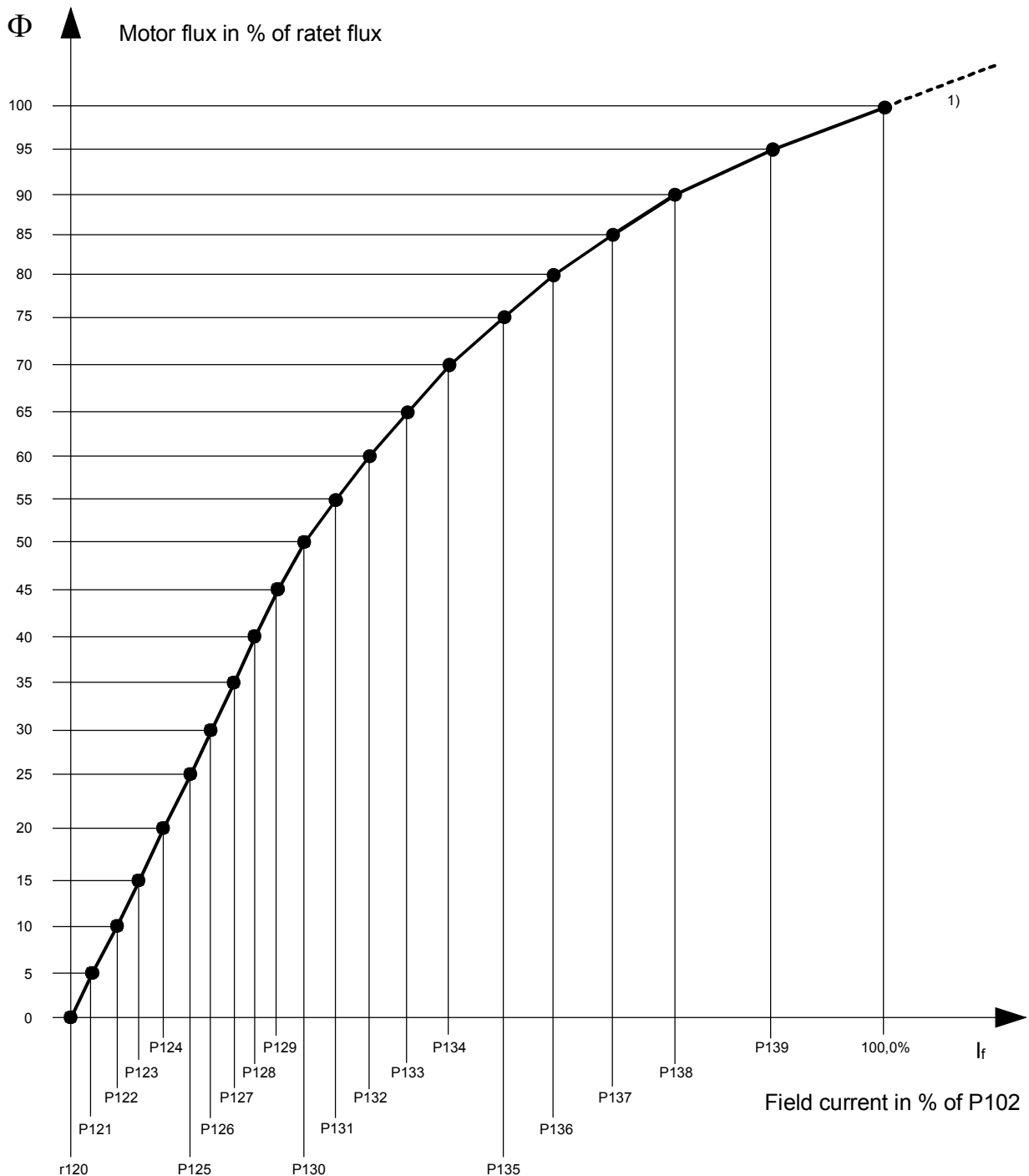


| PNU                                    | Description                                                                  | Value range<br>[Unit]                       | No. indices                   | See<br>Change                    |
|----------------------------------------|------------------------------------------------------------------------------|---------------------------------------------|-------------------------------|----------------------------------|
| <b>P135</b><br>FDS<br>(G165)<br>(G166) | <b>Field current for 75% motor flux (field characteristic, point no. 15)</b> | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=58.9<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P136</b><br>FDS<br>(G165)<br>(G166) | <b>Field current for 80% motor flux (field characteristic, point no. 16)</b> | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=64.9<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P137</b><br>FDS<br>(G165)<br>(G166) | <b>Field current for 85% motor flux (field characteristic, point no. 17)</b> | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=71.8<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P138</b><br>FDS<br>(G165)<br>(G166) | <b>Field current for 90% motor flux (field characteristic, point no. 18)</b> | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=79.8<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P139</b><br>FDS<br>(G165)<br>(G166) | <b>Field current for 95% motor flux (field characteristic, point no. 19)</b> | 0.0 to 100.0<br>[% of P102]<br>0.1% of P102 | Ind: 4<br>FS=89.1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

### Example of a field characteristic

The example characteristic exhibits a sharper curvature (i.e. a lower degree of saturation) than the field characteristic produced by the factory setting.



1) For actual field currents  $I_f$  of > 100% of P102, the characteristic is extended linearly for internal calculation of the motor flux.



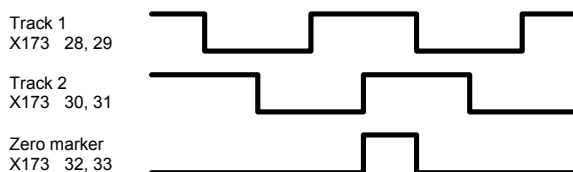
| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.8 Definition of pulse encoder, speed sensing using pulse encoder

The following types of pulse encoder can be used (type selection in P140):

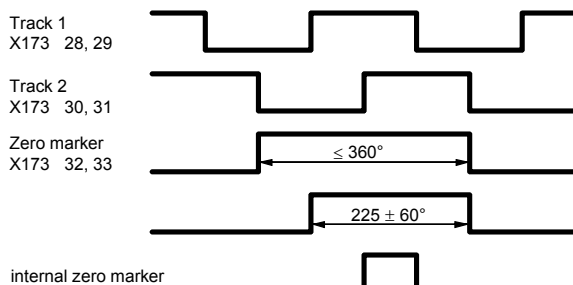
### 1. Pulse encoder type 1

Encoder with two pulse tracks mutually displaced by 90° (with/without zero marker)



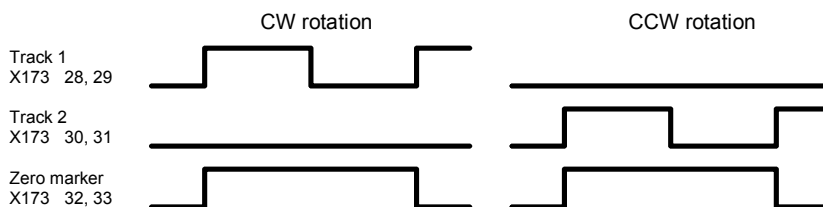
### 2. Pulse encoder type 1a

Encoder with two pulse tracks mutually displaced by 90° (with/without zero marker). The zero marker is converted internally to a signal in the same way as on encoder type 1.



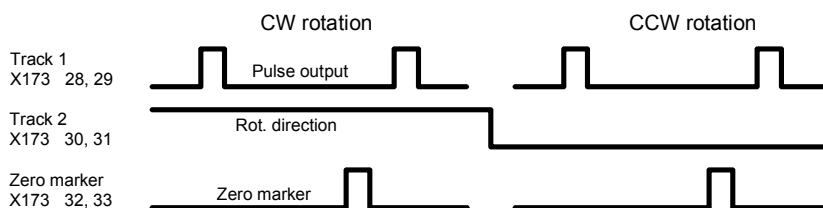
### 3. Pulse encoder type 2

Encoder with one pulse track per direction of rotation (with/without zero marker).



### 4. Pulse encoder type 3

Encoder with one pulse track and one output for direction of rotation (with/without zero marker).



| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

**Notes on selecting a pulse encoder (number of pulses):**

The lowest speed which can be measured by a pulse encoder is calculated with the following equation:

$$n_{min}[\text{rev} / \text{min}] = 21973 \cdot \frac{1}{X \cdot P141}$$

Formula applies with a nominal measuring time of 1 ms when P146=0 and P147=0

The following applies:

X = 1 for 1x evaluation of pulse encoder signals (P144=0)  
 2 for 2x evaluation of pulse encoder signals (P144=1)  
 4 for 4x evaluation of pulse encoder signals (P144=2)  
 see also "Single/multiple evaluation of encoder pulses"

Lower speeds are interpreted as n=0.

The frequency of the pulse encoder signals at terminals 28 and 29 or 30 and 31 must not be higher than 300 kHz.

The highest speed which can be measured by a pulse encoder is calculated with the following equation:

$$n_{max}[\text{rev} / \text{min}] = \frac{18000000}{P141}$$

When selecting a pulse encoder, therefore, it is important to ensure that the lowest possible speed  $\neq 0$  is significantly higher than  $n_{min}$  and the highest possible speed does not exceed  $n_{max}$ .

$$IM > \frac{21973}{X \cdot n_{min}[\text{rev} / \text{min}]}$$

Equations for selection of pulses per revolution IM of pulse encoder

$$IM \leq \frac{18000000}{n_{max}[\text{rev} / \text{min}]}$$

**Single/multiple evaluation of encoder pulses:**

The setting for single/multiple evaluation of encoder pulses is applicable for both the speed and position sensing functions.

1x evaluation: Only the rising edges of one pulse track are evaluated (applies to all encoder types).  
 2x evaluation: The rising and falling edges of one pulse track are evaluated (can be set for encoder types 1, 1a and 2).  
 4x evaluation: The rising and falling edges of both pulse tracks are evaluated (can be set for encoder types 1 and 1a)

See parameters P450 and P451 for position sensing function

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                           |                                 |                                  |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------|----------------------------------|
| <b>P140</b><br>(G145) | <b>Selection of pulse encoder type</b><br>See beginning of this Section (11.8) for pulse encoder types<br>0 No encoder/"Speed sensing with pulse encoder" function not selected<br>1 Pulse encoder type 1<br>2 Pulse encoder type 1a<br>3 Pulse encoder type 2<br>4 Pulse encoder type 3                                                                                                                                                                                                                                                 | 0 to 4<br>1                               | Ind: None<br>FS=0<br>Type: O2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P141</b><br>(G145) | <b>Number of pulses of pulse encoder</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 to 32767<br>[pulses/rev]<br>1 pulse/rev | Ind: None<br>FS=500<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P142</b><br>(G145) | <b>Matching to pulse encoder signal voltage</b><br>0 Pulse encoder outputs 5 V signals<br>1 Pulse encoder outputs 15V signals<br>Matching of internal operating points to signal voltage of incoming pulse encoder signals.<br><br><b>NOTICE</b><br>Resetting parameter P142 to the alternative setting <u>does not</u> switch over the supply voltage for the pulse encoder (terminals X173.26 and 27). Terminal X173.26 always supplies +15V. An external voltage supply is must be provided for pulse encoders requiring a 5V supply. | 0 to 1<br>1                               | Ind: None<br>FS=1<br>Type: O2   | P052 = 3<br>P051 = 40<br>Offline |

| PNU                          | Description                                                                                                                                         | Value range<br>[Unit]                    | No. indices                    | See<br>Change                   |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------|---------------------------------|
| <b>P143</b><br>FDS<br>(G145) | <b>Setting the maximum speed for pulse encoder operation</b><br><br>The speed set in this parameter corresponds to an actual speed (K0040) of 100%. | 1.0 to 6500.0<br>[rev/min]<br>0.1rev/min | Ind: 4<br>FS=500.0<br>Type: O4 | P052 = 3<br>P051 = 40<br>Online |

Control parameters for speed sensing with pulse encoder P144 to P147:

P144 and P147 determine the basic setting for actual speed sensing by means of pulse encoder (single or multiple evaluation of pulse encoder signals and nominal measuring time) and thus also define the lowest possible measurable speed (minimum speed).

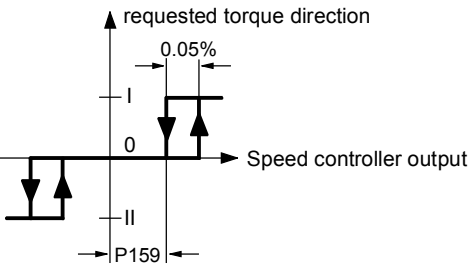
P145 and P146 can be used in special cases to extend the measurable speed range down to even lower speeds, on the basis of the minimum speed defined by the settings in P144 and P147.

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |             |                            |                                  |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|----------------------------------|
| <b>P144</b><br>*<br>FDS<br>(G145) | <b>Multiple evaluation of encoder signals</b><br><br>0 <u>1x</u> evaluation of pulse encoder signals<br>1 <u>2x</u> evaluation of pulse encoder signals (for encoder types 1, 1a, 2)<br>2 <u>4x</u> evaluation of pulse encoder signals (for encoder types 1, 1a)<br><br><u>Note:</u><br>In contrast to the 1x evaluation method, 2x or 4x evaluation reduces the minimum measurable speed by a factor of 2 or 4 respectively, but may produce an "unsteady" actual speed value on encoders with unequal pulse/pause ratio or without an exact 90° displacement between encoder signals.                                                                                                                                                                                                                                                                                                                             | 0 to 2<br>1 | Ind: 4<br>FS=2<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P145</b><br>*<br>FDS<br>(G145) | <b>Automatic measuring range switchover for measurement of low speeds - switchover of multiple evaluation</b><br><br>0 <u>Automatic switchover of multiple evaluation</u> of pulse encoder signals OFF (i.e. P144 is always active)<br>1 <u>Automatic switchover of multiple evaluation</u> of pulse encoder signals ON (i.e. when P144 = 0, 2x evaluation is selected for low speeds and 4x evaluation for very low speeds. When P144 = 1, 4x evaluation is selected for low speeds)<br>As opposed to P145 = 0, this setting reduces the minimum measurable speed by up to a factor of 4.<br><br><u>Caution:</u><br>Switching over the multiple evaluation method for encoder pulses also affects the <u>position sensing function</u> in the measuring channel. For this reason, this setting may not be used in conjunction with positioning operations. Connectors K0042 to K0044 are inoperative when P145 = 1. | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P146</b><br>*<br>FDS<br>(G145) | <b>Automatic measuring range switchover for measurement of low speeds - switchover of measuring time</b><br><br>0 Automatic switchover of measuring time OFF (i.e. P147 is always active)<br>1 Automatic switchover of measuring time ON<br>This setting extends the measuring time for low speeds (based on the measuring time set in P147, i.e. when P147 = 0, the nominal measuring time is switched over to 2 ms for low speeds and to 4 ms for very low speeds. When P147 = 1, the nominal measuring time is switched over to 4 ms for low speeds)<br><br><u>Caution:</u><br>When P146=1, the minimum measurable speed can be reduced by up to a factor of 4 as opposed to a 0 setting. However, this setting results in a longer <u>actual speed sensing delay</u> in the extended minimum speed range.                                                                                                        | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Value range<br>[Unit] | No. indices                | See<br>Change                    |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------|----------------------------------|
| <b>P147</b><br>*<br>FDS<br>(G145) | <b>Nominal measuring time of pulse encoder signal evaluation</b><br><br>0 Nominal measuring time 1 ms, gating-pulse-synchronized measurement<br><br>1 Nominal measuring time 2 ms, gating-pulse-synchronized measurement (produces "steadier" actual speed value than setting 0)<br><br>2 Nominal measuring time 4 ms, gating-pulse-synchronized measurement (for drives with high moment of inertia, produces "steadier" actual speed value than setting 0)<br><br>12 Nominal measuring time 0.2 ms, asynchronous measurement<br>13 Nominal measuring time 0.3 ms, asynchronous measurement<br>...<br>20 Nominal measuring time 1 ms, asynchronous measurement<br><br><u>Note:</u><br>12 to 20 Nominal measuring time 0.2 ms to 1 ms, asynchronous measurement for highly dynamic drives, reduces dead time in the actual speed value channel, but "less steady" actual speed value than achieved with setting 0 to 2 [can be set only in SW 1.9 and later]<br><br><u>Notice:</u><br>When P147=1 or 2 the minimum measurable speed can be reduced by a factor of 2 or 4 respectively as opposed to 0 or 12 to 20. However, these settings increase the <u>actual speed sensing delay</u> . For this reason, P200 should be parameterized to at least 5ms <u>before</u> the optimization run for the speed controller is executed. | 0 to 20<br>1          | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P148</b><br>*<br>FDS<br>(G145) | <b>Pulse encoder monitoring function</b><br><br>0 Pulse encoder monitoring OFF (activation of F048 in response to a defective pulse encoder is disabled)<br><br>1 Pulse encoder monitoring ON (hardware monitoring of pulse encoder signals for implausible behaviour (i.e. frequent speed changes, distance between edges too short, encoder cable defect or short between two encoder cables) may cause activation of F048)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0 to 1<br>1           | Ind: 4<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.9 Closed-loop armature current control, auto-reversing stage, armature gating unit

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                      |                                                             |                                   |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------|-----------------------------------|
| <b>P150</b><br>FDS<br>(G163)      | <b>Alpha G limit (armature)</b><br><br>Rectifier stability limit for firing angle of armature converter.                                                                                                                                                                                                                                                                                                                                                                                                                 | 0 to 165<br>[degrees]<br>1 degrees   | Ind: 4<br>FS=5 / 30<br>(for 1Q / 4Q converters)<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online   |
| <b>P151</b><br>FDS<br>(G163)      | <b>Alpha W limit (armature)</b><br><br>Inverter stability limit for firing angle of armature converter.<br><br>See also parameter P192 (Control word for the Alpha W limit)                                                                                                                                                                                                                                                                                                                                              | 120 to 165<br>[degrees]<br>1 degrees | Ind: 4<br>FS=150<br>Type: O2                                | P052 = 3<br>P051 = 40<br>Online   |
| <b>P152</b><br>*<br>FDS<br>(G163) | <b>Line frequency correction (armature)</b><br><br>The internal line synchronization for the armature gating pulses derived from the power terminals (armature mains infeed) is averaged over the number of line periods set in this parameter. In operation on "weak" power supplies with unstable frequencies, for example, on a diesel-driven generator (isolated operation), this parameter must be set lower than for operation on "constant V/Hz" systems in order to achieve a higher frequency correction speed. | 1 to 20                              | Ind: 4<br>FS=20<br>Type: O2                                 | P052 = 3<br>P051 = 40<br>Online   |
| <b>P153</b><br>*<br>FDS<br>(G162) | <b>Control word for the armature precontrol</b><br><br>0 Armature precontrol disabled, output of the precontrol=165°<br>1 Armature precontrol active<br>2 Armature precontrol active but EMF influence only active on change in torque direction<br>3 Armature precontrol active but without EMF influence., i.e. for precontrol, the EMF is assumed to be 0. (recommended setting for supplying large inductance from armature terminals, e.g. solenoids, field supply)                                                 | 0 to 3<br>1                          | Ind: 4<br>FS=1<br>Type: O2                                  | P052 = 3<br>P051 = 40<br>off-line |

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Value range<br>[Unit]                                 | No. indices                    | See<br>Change                    |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------|----------------------------------|
| <b>P154</b><br>*<br>FDS<br>(G162) | <b>Set armature current controller I component to zero</b><br><br>0 Set controller I component to zero (i.e. to obtain pure P controller)<br>1 Controller I component is active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0 to 1<br>1                                           | Ind: 4<br>FS=1<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>P155</b><br>FDS<br>(G162)      | <b>Armature current controller P gain</b><br>Proportional gain of armature current controller<br>This parameter is automatically set during the optimization run for precontrol and current controller (armature and field) (P051=25).<br>See also parameters P175                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 to 200.00<br>0.01                                | Ind: 4<br>FS=0.10<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P156</b><br>FDS<br>(G162)      | <b>Armature current controller reset time</b><br>This parameter is automatically set during the optimization run for precontrol and current controller (armature and field) (P051=25).<br>See also parameters P176                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.001 to 10.000<br>[s]<br>0.001s                      | Ind: 4<br>FS=0.200<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P157</b><br>*<br>FDS<br>(G162) | <b>Control word for current setpoint integrator</b><br><br>0 Reduced gearbox stressing<br>The integrator is active only after a change in torque direction (acts as ramp-function generator for armature current setpoint only until the output reaches the setpoint at the integrator input for the 1 <sup>st</sup> time after a change in torque direction).<br><br>1 Current setpoint integrator<br>The integrator is always active (acts as ramp-function generator for the armature current setpoint)                                                                                                                                                                                                                                                       | 0 to 1<br>1                                           | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>P158</b><br>FDS<br>(G162)      | <b>Ramp-up time for current setpoint integrator (reduced gearbox stressing)</b><br>Period of an acceleration ramp with a setpoint step change from 0% to 100% at r072.002.<br>For older DC machines (i.e. unsuitable for steep rates of current rise), P157=1 and P158=0.040 must be set.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.000 to 1.000<br>[s]<br>0.001s                       | Ind: 4<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P159</b><br>FDS<br>(G163)      | <b>Switchover threshold for auto-reversing stage (armature)</b><br><br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.00 to 100.00<br>[%]<br>0.01% of n controller output | Ind: 4<br>FS=0.01<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P160</b><br>FDS<br>(G163)      | <b>Additional torque-free interval</b><br>Additional torque-free interval for torque direction change in 4Q operation. It is particularly important to set this parameter to values of > 0 for converter armatures which supply large inductances (e.g. lifting solenoids).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.000 to 2.000<br>[s]<br>0.001s                       | Ind: 4<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P161</b><br>FDS<br>(G163)      | <b>Additional Alpha W pulses with disabled second pulses</b><br>Number of additional Alpha W pulses with disabled second pulses after detection of I=0 message prior to a change in torque direction. It is particularly important to set this parameter to values of > 0 for converter armatures which supply large inductances (e.g. lifting solenoids). These pulses cause the current to decay prior to a change in torque direction. When it drops below the thyristor holding current value, the current is suddenly chopped by the unfired second thyristor and the residual energy stored in the load inductor must be dissipated via a suppressor circuit (e.g. a varistor) to prevent the load inductor from producing a surge voltage. See also P179. | 0 to 100<br>1                                         | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online  |
| <b>P162</b><br>*<br>FDS<br>(G162) | <b>EMF calculation method for armature precontrol</b><br><br>0 The EMF derived from the <u>measured</u> armature voltage is applied<br>1 The EMF derived from the <u>calculated</u> armature voltage is applied (the purpose of this setting is to prevent the occurrence of any low-frequency (< 15 Hz) armature current fluctuations)                                                                                                                                                                                                                                                                                                                                                                                                                          | 0 to 1<br>1                                           | Ind: 4<br>FS=1<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |

| PNU                               | Description                                                                                                                                                                                                                                                                                           | Value range<br>[Unit]     | No. indices                  | See<br>Change                    |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------|----------------------------------|
| <b>P163</b><br>*<br>FDS<br>(G162) | <b>EMF filtering method for armature precontrol</b><br><br>0 No filtering<br>1 Filtering element, filter time constant = approx. 10 ms<br>(for use by works engineers only)<br>2 Averaging over the last 2 EMF values<br>(for use by works engineers only )<br>3 Averaging over the last 3 EMF values | 0 to 3<br>1               | Ind: 4<br>FS=3<br>Type: O2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P164</b><br>*<br>FDS<br>(G162) | <b>Set armature current controller P component to zero</b><br><br>0 Set controller P component to zero (i.e. to obtain pure I<br>controller)<br>1 Controller P component is active                                                                                                                    | 0 to 1<br>1               | Ind: 4<br>FS=1<br>Type: O2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P165</b><br>*<br>BDS<br>(G163) | <b>Select the binector to control the "Enable a torque direction for torque<br/>direction change" function</b><br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br><br>Binector status =<br>0 ... Enable for M0 or MII<br>1 ... Enable for M0 or MI                                            | All binector numbers<br>1 | Ind: 2<br>FS=220<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.10 Current limitation, torque limitation

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                              |                                 |                                   |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------|-----------------------------------|
| <b>P169</b><br>*<br>FDS<br>(G160)      | <b>Select closed-loop torque / current control</b><br>See parameter P170                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0 to 1<br>1                                  | Ind: 4<br>FS=1<br>Type: O2      | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P170</b><br>*<br>FDS<br>(G160)      | <b>Select closed-loop torque / current control</b><br><br><u>P169</u> <u>P170</u><br><br>0 0 Closed-loop current control and current limitation<br>0 1 Closed-loop torque control with torque limitation (the<br>torque setpoint is converted to a current setpoint: Current<br>setpoint = torque setpoint / motor flux)<br>Current limitation is active additionally<br>1 0 Closed-loop current control with torque limitation (the<br>specified torque limit is converted to a current limit:<br>Current limit = torque limit / motor flux)<br>Current limitation is active additionally<br>1 1 Do not set!<br><br>Note:<br>A valid field characteristic (P117=1) must be available when P169 or<br>P170=1. If one is not, the optimization run for field weakening (P051=27)<br>must be executed.<br>P263 determines the input quantity for the motor flux calculation. | 0 to 1<br>1                                  | Ind: 4<br>FS=0<br>Type: O2      | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P171</b><br>FDS<br>(G160)<br>(G161) | <b>System current limit in torque direction I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.0 to 300.0<br>[% of P100]<br>0.1% of P100  | Ind: 4<br>FS=100.0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online   |
| <b>P172</b><br>FDS<br>(G160)<br>(G161) | <b>System current limit in torque direction II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -300.0 to 0.0<br>[% of P100]<br>0.1% of P100 | Ind: 4<br>FS=-100.0<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online   |
| <b>P173</b><br>*<br>BDS<br>(G160)      | <b>Source for "Torque control / Current control" switchover</b><br>[SW 1.9 and later]<br><br>The binector selected here has the same effect as parameter P170.<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | All binector numbers<br>1                    | Ind: 2<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P175</b><br>*<br>FDS<br>(G162)      | <b>Source for variable P gain</b><br>[SW 1.8 and later]<br><br>The content of the selected connector acts as the P gain for the armature<br>current controller after multiplication with P155.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | All connector<br>numbers<br>1                | Ind: 4<br>FS=1<br>Type: L2      | P052 = 3<br>P051 = 40<br>off-line |

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Value range<br>[Unit]                                   | No. indices                      | See<br>Change                     |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------|-----------------------------------|
| <b>P176</b><br>*<br>FDS<br>(G162) | <b>Source for variable Integration time</b> [SW 1.8 and later]<br><br>The content of the selected connector acts as the integration time for the armature current controller after multiplication with P156.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | All connector numbers<br>1                              | Ind: 4<br>FS=1<br>Type: L2       | P052 = 3<br>P051 = 40<br>off-line |
| <b>P177</b><br>*<br>BDS<br>(G163) | <b>Source for the command "no immediate pulse disable"</b> [SW 1.8 and later]<br><br>A low signal causes the armature firing pulses to be disabled immediately without waiting for the I=0 signal or without outputting alpha-W pulses for current reduction. The additional alpha-W pulses (acc. to parameter P161) are not output either. As long as this command is pending, it is not possible to fall below operating state o1.6.<br><br>This command can be used, for example, if it is not a motor that is supplied by the SIMOREG CM but a field and the current is to be reduced via an external parallel-connected de-excitation resistance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | All binector numbers<br>1                               | Ind: 2<br>FS=1<br>Type: L2       | P052 = 3<br>P051 = 40<br>off-line |
| <b>P178</b><br>*<br>BDS<br>(G163) | <b>Source for the command "fire all thyristors simultaneously"</b> [SW 1.8 and later]<br><br>Setting this command (high signal) causes all six thyristors of the thyristor bridge I to be fired continuously and simultaneously. Switchover to long pulses is automatic. This command is only active if no line voltage is applied to the armature power section .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | All binector numbers<br>1                               | Ind: 2<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>off-line |
| <b>P179</b><br>FDS<br>(G163)      | <b>Additional Alpha W pulses with disabled second pulses</b> [SW 1.9 and later]<br><br>Number of additional Alpha W pulses with disabled second pulses after detection of I=0 message prior to a change in torque direction. It is particularly important to set this parameter to values of > 0 for converter armatures which supply large inductances (e.g. lifting solenoids). These pulses cause the current to decay before a change in torque direction; the thyristors are fired in pairs to prevent sudden chopping, and the generation of a surge voltage by the load inductor, when the current drops below the thyristor holding current.<br><br>When a change in torque direction is required, the current in the existing direction must be reduced.<br><br>This is achieved in the following ways:<br><br>If P179 > 0:<br><ol style="list-style-type: none"> <li>1) Alpha W pulses with <u>enabled</u> second pulses until the I=0 signal arrives</li> <li>2) Additional Alpha W pulses with <u>enabled</u> second pulses (number as set in P179.F)</li> <li>3) Additional Alpha W pulses with <u>disabled</u> second pulses (number as set in P161.F)</li> <li>4) Additional torque-free interval (period as set in P160.F)</li> </ol><br>If P179 = 0:<br><ol style="list-style-type: none"> <li>1) Alpha W pulses with <u>disabled</u> second pulses until the I=0 signal arrives</li> <li>2) Additional Alpha W pulses with <u>disabled</u> second pulses (number as set in P161.F)</li> <li>3) Additional torque-free interval (period as set in P160.F)</li> </ol> | 0 to 100<br>1                                           | Ind: 4<br>FS=0<br>Type: O2       | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P180</b><br>FDS<br>(G160)      | <b>Positive torque limit 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -300.00 to 300.00<br>[%]<br>0.01% of rated motor torque | Ind: 4<br>FS=300.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online   |
| <b>P181</b><br>FDS<br>(G160)      | <b>Negative torque limit 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -300.00 to 300.00<br>[%]<br>0.01% of rated motor torque | Ind: 4<br>FS=-300.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online   |
| <b>P182</b><br>FDS<br>(G160)      | <b>Positive torque limit 2</b><br><br>If "Torque limit switchover" is selected (state of binector selected in P694 =1) and the speed is higher than the threshold speed set in parameter P184, then torque limit 2 is activated in place of torque limit 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -300.00 to 300.00<br>[%]<br>0.01% of rated motor torque | Ind: 4<br>FS=300.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online   |
| <b>P183</b><br>FDS<br>(G160)      | <b>Negative torque limit 2</b><br><br>If "Torque limit switchover" is selected (state of binector selected in P694 =1) and the speed is higher than the threshold speed set in parameter P184, then torque limit 2 is activated in place of torque limit 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -300.00 to 300.00<br>[%]<br>0.01% of rated motor torque | Ind: 4<br>FS=-300.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online   |



| PNU                              | Description                                                                                                                                                                                                                                                                                                                        | Value range<br>[Unit]                           | No. indices                   | See<br>Change                    |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------|----------------------------------|
| <b>P184</b><br><br>FDS<br>(G160) | <b>Threshold speed for torque limits</b><br><br>If "Torque limit switchover" is selected (state of binector selected in P694 =1) and the speed (K0166) is higher than the threshold speed set in parameter P184, then torque limit 2 (P182, P183) is activated in place of torque limit 1 (P180, P181).                            | 0.00 to 120.00<br>[%]<br>0.01% of maximum speed | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P190</b><br><br>FDS<br>(G162) | <b>Filter time for setpoint for armature current precontrol</b><br>[SW 1.9 and later]<br><br>Filtering of the armature current setpoint at the input of the precontrol for the armature current controller.<br><br>The purpose of this filter is to decouple the armature current precontrol from the armature current controller. | 0 to 10000<br>[ms]<br>1ms                       | Ind: 4<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>on-line |
| <b>P191</b><br><br>FDS<br>(G162) | <b>Filter time for setpoint for armature current controller</b> [SW 1.9 and later]<br><br>Filtering of the armature current setpoint at the input of the armature current controller.<br><br>The purpose of this filter is to decouple the armature current precontrol from the armature current controller.                       | 0 to 10000<br>[ms]<br>1ms                       | Ind: 4<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>on-line |

## 11.11 Auto-reversing stage, armature gating unit

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                 |             |                            |                                 |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|---------------------------------|
| <b>P192</b><br>*<br>FDS<br>(G163) | <b>Control word for the Alpha W limit (armature)</b> [as of SW 2.1]<br><br>0 <u>Continuous current:</u><br>Inverter stability limit for the delay angle of the armature converter (Alpha W) = value according to parameter P151<br><u>Intermittent current:</u><br>Alpha W = 165°<br><br>1 Inverter stability limit for the delay angle of the armature converter (Alpha W) = value according to parameter P151 | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|---------------------------------|

## 11.12 Speed controller

(further parameters for the speed controller P550 - P567)

| Setting values for speed controller - actual value/setpoint processing |                                                                                                                                                                                                                             |                           |                            |                                 |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|---------------------------------|
| <b>P200</b><br><br>FDS<br>(G152)                                       | <b>Filter time for actual speed controller value</b><br><br>Filtering of the actual speed value by means of a PT1 element.<br>This filter setting is taken into account by the speed controller optimization run (P051=26). | 0 to 10000<br>[ms]<br>1ms | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P201</b><br>FDS<br>(G152)                                           | <b>Band-stop 1: Resonant frequency</b>                                                                                                                                                                                      | 1 to 140<br>[Hz]<br>1Hz   | Ind: 4<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P202</b><br><br>FDS<br>(G152)                                       | <b>Band-stop 1: Quality</b><br><br>0 Quality = 0.5<br>1 Quality = 1<br>2 Quality = 2<br>3 Quality = 3                                                                                                                       | 0 to 3<br>1               | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P203</b><br>FDS<br>(G152)                                           | <b>Band-stop 2: Resonant frequency</b>                                                                                                                                                                                      | 1 to 140<br>[Hz]<br>1Hz   | Ind: 4<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P204</b><br><br>FDS<br>(G152)                                       | <b>Band-stop 2: Quality</b><br><br>0 Quality = 0.5<br>1 Quality = 1<br>2 Quality = 2<br>3 Quality = 3                                                                                                                       | 0 to 3<br>1               | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P205</b><br>FDS<br>(G152)                                           | <b>D element: Derivative-action time</b>                                                                                                                                                                                    | 0 to 1000<br>[ms]<br>1ms  | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P206</b><br>FDS<br>(G152)                                           | <b>D element: Filter time</b>                                                                                                                                                                                               | 0 to 100<br>[ms]<br>1ms   | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |



| PNU                             | Description                                                              | Value range<br>[Unit]            | No. indices           | See<br>Change |
|---------------------------------|--------------------------------------------------------------------------|----------------------------------|-----------------------|---------------|
| <b>r217</b><br>(G151)           | <b>Indication of the active droop of the speed controller</b>            | 0.0 to 10.0<br>[%]<br>0.1%       | Ind: None<br>Type: O2 | P052 = 3      |
| <b>r218</b><br>(G151)<br>(G152) | <b>Indication of the active integration time of the speed controller</b> | 0.010 to 10.000<br>[s]<br>0.001s | Ind: None<br>Type: O2 | P052 = 3      |
| <b>r219</b><br>(G151)<br>(G152) | <b>Display of effective P gain of speed controller</b>                   | 0.01 to 200.00<br>0.01           | Ind: None<br>Type: O2 | P052 = 3      |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                 |                               |                                 |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------|---------------------------------|
| <b>P221</b><br>FDS<br>(G152) | <b>Speed controller: Hysteresis for speed-dependent PI/P controller switchover</b><br>[SW 1.9 and later]<br><br>See P222 for further details.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.00 to 100.00<br>[%]<br>0.01% of maximum speed | Ind: 4<br>FS=2.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P222</b><br>FDS<br>(G152) | <b>Speed controller: Speed-dependent switchover threshold for PI / P controller</b><br><br>0.00 Automatic switchover from PI to P controller deactivated.<br><br>> 0.00 Depending on the actual speed (K0166), the PI controller switches over to a P controller if the speed drops below the threshold set in parameter P222. The integrator is not switched in again (with value of 0) until the actual speed is > P222 + P221.<br><br>This function allows the drive to be stopped without overshoot using a zero setpoint with the controllers enabled.<br><br>This function is active only if the binector selected in P698 is in the log. "1" state. | 0.00 to 10.00<br>[%]<br>0.01% of maximum speed  | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |

#### Setting values for speed controller

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                  |                                |                                  |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------|----------------------------------|
| <b>P223</b><br>*<br>FDS<br>(G152) | <b>Control word for speed controller precontrol</b><br><br>0 Speed controller precontrol disabled<br>1 Speed controller precontrol acts as torque setpoint (is added to n controller output)                                                                                                                                                                                                                                                                 | 0 to 1<br>1                      | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>P224</b><br>*<br>FDS<br>(G152) | <b>Control word for speed controller I component</b><br><br>0 Set controller I component to 0 (i.e. to achieve a pure P controller)<br>1 Controller I component is active<br>The I component is stopped when a torque or current limit is reached<br>2 Controller I component is active<br>The I component is stopped when a torque limit is reached<br>3 Controller I component is active<br>The I component is stopped only when $\pm 199.99\%$ is reached | 0 to 3<br>1                      | Ind: 4<br>FS=1<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>P225</b><br>FDS<br>(G151)      | <b>Speed controller P gain</b><br><br>See also setting values for "Speed controller adaptation" function (P550 to P559).<br>This parameter is set automatically during the speed controller optimization run (P051=26).                                                                                                                                                                                                                                      | 0.10 to 200.00<br>0.01           | Ind: 4<br>FS=3.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P226</b><br>FDS<br>(G151)      | <b>Speed controller reset time</b><br><br>This parameter is set automatically during the speed controller optimization run (P051=26).                                                                                                                                                                                                                                                                                                                        | 0.010 to 10.000<br>[s]<br>0.001s | Ind: 4<br>FS=0.650<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |

#### Speed controller droop

Function: A parameterizable feedback loop can be connected in parallel to the I and P components of the speed controller (acts on summation point of setpoint and actual value).

|                              |                                                                                                                                                                                                                                                                             |                            |                              |                                 |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------|---------------------------------|
| <b>P227</b><br>FDS<br>(G151) | <b>Speed controller droop</b><br><br>A 10% speed droop setting causes a 10% deviation in the speed from the setpoint at a 100% controller output (100% torque or armature current setpoint) ("softening" of closed-loop control).<br><br>See also P562, P563, P630 and P684 | 0.0 to 10.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------|---------------------------------|

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Value range<br>[Unit]     | No. indices                 | See<br>Change                    |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------|----------------------------------|
| <b>P228</b><br>FDS<br>(G152)      | <b>Filter time for speed setpoint</b><br><br>Filtering of setpoint by means of a PT1 element.<br>This parameter is automatically set to the same value as the speed controller reset time during the speed controller optimization run (P051=26). It may be useful to parameterize lower values when the ramp-function generator is in use.                                                                                                                                                                                                                                                                | 0 to 10000<br>[ms]<br>1ms | Ind: 4<br>FS=0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P229</b><br>*<br>FDS<br>(G152) | <b>Control of I component tracking for slave drive</b><br><br>0 On a slave drive, the I component of the speed controller is made to follow such that $M(\text{set}, n\text{contr.}) = M(\text{set}, \text{limit})$ , the speed setpoint is set to the actual speed value<br><br>1 Tracking deactivated                                                                                                                                                                                                                                                                                                    | 0 to 1<br>1               | Ind: 4<br>FS=0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P230</b><br>FDS<br>(G152)      | <b>Setting period of speed controller integrator</b> [SW 1.9 and later]<br><br>After a positive edge at the binector set in P695, the integrator of the speed controller is set to the instantaneous value of the connector set in P631. If a time of > 0 is set on P230, this setting operation is not performed just once, but the speed controller integrator is set continually to the setting value for the parameterized time period.                                                                                                                                                                | 0 to 10000<br>[ms]<br>1ms | Ind: 4<br>FS=0<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line |
| <b>P234</b><br>*<br>FDS<br>(G152) | <b>Set speed controller P component to zero</b><br><br>0 Set controller P component to zero (i.e. to obtain a pure I controller)<br><br>1 Controller P component is active                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0 to 1<br>1               | Ind: 4<br>FS=1<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P236</b><br>*<br>FDS           | <b>Specifying the dynamic response of the speed control loop</b> [SW 2.0 and later]<br><br>The parameter value is used as the optimization criterion for the speed control loop.<br><br>Note:<br>Changes to this value do not take effect until the speed controller optimization run (P051 = 26, see Section 7.5) has been executed.<br><br>Setting instructions:<br>- For drives, for example, with gear backlash, optimization should be started with low dynamic response values (from 10%).<br>- For drives with top synchronism and dynamic response requirements, values up to 100% should be used. | 10 to 100<br>[%]<br>1     | Ind: 4<br>FS=75<br>Type: O2 | P052 = 3<br>P051 = 40<br>online  |

### 11.13 Closed-loop field current control, field gating unit

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |                              |                                  |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------|----------------------------------|
| <b>P250</b><br>FDS<br>(G166)      | <b>Alpha G limit (field)</b><br><br>Rectifier stability limit for firing angle of field converter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0 to 180<br>[degrees]<br>1 degree | Ind: 4<br>FS=0<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P251</b><br>FDS<br>(G166)      | <b>Alpha W limit (field)</b><br><br>Inverter stability limit for firing angle of field converter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0 to 180<br>[degrees]<br>1 degree | Ind: 4<br>FS=180<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P252</b><br>*<br>FDS<br>(G166) | <b>Filtering of line frequency correction (field)</b><br><br>The internal line synchronization for the field gating pulses derived from the field mains infeed terminals is filtered with this time constant. In operation on "weak" power supplies with unstable frequencies, for example, on a diesel-driven generator (isolated operation), the filter time constant must be set lower than for operation on "constant V/Hz" systems in order to achieve a higher frequency correction speed.<br><br>Using the units position, the line synchronization function can be altered <u>additionally</u> as follows:<br>When the parameter is set to an <u>uneven</u> number, the measured line zero crossings for line synchronization are subjected to an extra "filter", may improve performance in the case of difficulties with brief mains interruptions (e.g. power supply via sliding current collectors), but may only be set for constant V/Hz power supplies (not for weak isolated supply systems). | 0 to 200<br>[ms]<br>1ms           | Ind: 4<br>FS=200<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P253</b><br>*<br>FDS<br>(G166) | <b>Control word for field precontrol</b><br><br>0 Field precontrol disabled, precontrol output = 180°<br><br>1 Field precontrol active, output is dependent on field current setpoint, field line voltage, P112                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 1<br>1                       | Ind: 4<br>FS=1<br>Type: O2   | P052 = 3<br>P051 = 40<br>Offline |

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Value range<br>[Unit]               | No. indices                    | See<br>Change                     |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------------|-----------------------------------|
| <b>P254</b><br>*<br>FDS<br>(G166) | <b>Set field current controller I component to zero</b><br><br>0 Set controller I component to zero<br>(i.e. to obtain pure P controller)<br>1 Controller I component is active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0 to 1<br>1                         | Ind: 4<br>FS=1<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P255</b><br>FDS<br>(G166)      | <b>Field current controller P gain</b><br><br>This parameter is set automatically during the optimization run for precontrol and current controller (armature and field) (P051=25).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.01 to 100.00<br>0.01              | Ind: 4<br>FS=5.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online   |
| <b>P256</b><br>FDS<br>(G166)      | <b>Field current controller reset time</b><br><br>This parameter is set automatically during the optimization run for precontrol and current controller (armature and field) (P051=25).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.001 to 10.000<br>[s]<br>0.001s    | Ind: 4<br>FS=0.200<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online   |
| <b>P257</b><br>FDS<br>(G166)      | <b>Standstill field</b><br><br>Value to which the field current is reduced when "Automatic field current reduction" function is parameterized (by means of P082=2) or with signal-driven selection of "Standstill excitation" function (selected in P692).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.0 to 100.0<br>[%]<br>0.1% of P102 | Ind: 4<br>FS=0.0<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online   |
| <b>P258</b><br>FDS<br>(G166)      | <b>Delay time with automatic field current reduction</b><br><br>Delay after which the field current is reduced to the value set in parameter P257 with automatic or signal-driven "Field current reduction" function when the drive is stopped after operating state o7.0 or higher is reached.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.0 to 60.0<br>[s]<br>0.1s          | Ind: 4<br>FS=10.0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online   |
| <b>P260</b><br>FDS<br>(G166)      | <b>Filter time for setpoint for field current precontrol</b> [SW 1.9 and later]<br><br>Filtering of the field current setpoint at the input of the precontrol for the field current controller.<br>The purpose of this filter is to decouple the field current precontrol from the field current controller.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0 to 10000<br>[ms]<br>1ms           | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P261</b><br>FDS<br>(G166)      | <b>Filter time for setpoint for field current controller</b> [SW 1.9 and later]<br><br>Filtering of the field current setpoint at the input of the field current controller.<br>The purpose of this filter is to decouple the field current precontrol from the field current controller.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0 to 10000<br>[ms]<br>1ms           | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P263</b><br>*<br>FDS<br>(G166) | <b>Input quantity for motor flux calculation</b><br><br>0 The input quantity for the motor flux calculation is the <u>field current controller actual value according to P612</u> (K0265), to be used in connection with a fully compensated DC machine<br><br>1 The input quantity for the motor flux calculation is the <u>precontrol output for the EMF controller</u> (K0293) (exception: Field current controller setpoint (K0268) with active standstill field or with disabled field pulses), to be used in connection with a non-compensated DC machine. The EMF controller <u>must</u> be active when this setting is selected (EMF controller compensates the armature reaction).<br><br>2 The input quantity for the motor flux calculation is the field current controller setpoint (K0268). Advantage: Quantities derived from the setpoint are generally "steadier" than those derived from actual values. | 0 to 2<br>1                         | Ind: 4<br>FS=1<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P264</b><br>*<br>FDS<br>(G166) | <b>Set field current controller P component to zero</b><br><br>0 Set controller P component to zero (i.e. to obtain pure I controller)<br>1 Controller P component is active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0 to 1<br>1                         | Ind: 4<br>FS=1<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P265</b><br>*<br>BDS<br>(G167) | <b>Source for selection of external field current monitoring signal</b> [SW 1.9 and later]<br><br>Selection of the binector to supply the field monitoring signal when an external field device is used.<br>(status "1" = field current is o.k., If > If-min)<br><br>The converter waits for this signal in state o5.0 as part of the power ON routine. If the signal disappears during operation, the drive is shut down with fault message F005, fault value 4.<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                | All binector numbers<br>1           | Ind: 2<br>FS=1<br>Type: L2     | P052 = 3<br>P051 = 40<br>off-line |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.14 Closed-loop EMF control

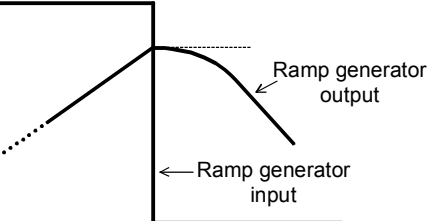
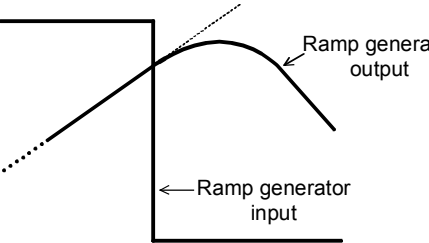
|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                  |                                |                                  |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------|----------------------------------|
| <b>P272</b><br>*<br>(G165)        | <b>Operating mode of closed-loop EMF control</b><br><br>0 <u>Fault message F043 ("EMF too high for braking operation") is active:</u> If the EMF is too high when a <u>torque direction change is requested</u> (i.e. if the calculated firing angle (K0101) for the armature current in the new torque direction is > 165 degrees), both torque directions are disabled. If, at the same time, the absolute value of the armature current required in the new torque direction is > 0.5% of rated converter DC current (P072), fault message F043 is activated (see Section 10 for possible fault causes).<br><br>1 <u>Alarm A043 and automatic field reduction if EMF is too high in braking operation.</u><br>If the EMF is too high in <u>braking operation</u> (i.e. if the following applies to the armature firing angle $\alpha$ before limitation (K0101): $\alpha > (\alpha_W - 5 \text{ degrees})$ ), alarm A043 is activated ( $\alpha_W$ is the inverter stability limit according to P151 or 165 degrees with a discontinuous armature current).<br>The field is reduced with activation of A043. This field reduction is achieved by regulating the armature firing angle to $(\alpha_W - 5 \text{ degrees})$ by means of a P controller, whose output reduces the EMF controller setpoint. "Field weakening operation by internal closed-loop EMF control" (P081=1) must therefore be parameterized so that the field reduction can take effect.<br>When a <u>torque direction change is requested</u> , both torque directions remain disabled until the field, and thus the EMF, have been reduced accordingly (i.e. until the calculated firing angle (K0101) for the armature current required in the new torque direction is <165 degrees). | 0 to 1<br>1                      | Ind: None<br>FS=0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P273</b><br>*<br>FDS<br>(G165) | <b>Control word for EMF controller precontrol</b><br><br>0 EMF controller precontrol disabled, precontrol output = rated motor field current (P102)<br>1 EMF controller precontrol is active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0 to 1<br>1                      | Ind: 4<br>FS=1<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>P274</b><br>*<br>FDS<br>(G165) | <b>Set EMF controller I component to zero</b><br><br>0 Set controller I component to zero (i.e. to obtain pure P controller)<br>1 Controller I component is active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 1<br>1                      | Ind: 4<br>FS=1<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>P275</b><br>*<br>FDS<br>(G165) | <b>EMF controller P gain</b><br>This parameter is automatically set during the field weakening optimization run (P051=27).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.10 to 100.00<br>0.01           | Ind: 4<br>FS=0.60<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P276</b><br>*<br>FDS<br>(G165) | <b>EMF controller reset time</b><br>This parameter is automatically set during the field weakening optimization run (P051=27).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.010 to 10.000<br>[s]<br>0.001s | Ind: 4<br>FS=0.200<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P277</b><br>*<br>FDS<br>(G165) | <b>EMF controller droop</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.0 to 10.0<br>[%]<br>0.1%       | Ind: 4<br>FS=0.0<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P280</b><br>FDS<br>(G165)      | <b>Filter time for setpoint for EMF controller precontrol</b> [SW 1.9 and later]<br>Filtering of the EMF setpoint at the input of the EMF controller precontrol. The purpose of this filter is to decouple the EMF controller precontrol from the EMF controller.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0 to 10000<br>[ms]<br>1ms        | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>on-line |
| <b>P281</b><br>FDS<br>(G165)      | <b>Filter time for setpoint for EMF controller</b> [SW 1.9 and later]<br>Filtering of the EMF setpoint at the input of the EMF controller. The purpose of this filter is to decouple the EMF controller precontrol from the EMF controller.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0 to 10000<br>[ms]<br>1ms        | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>on-line |
| <b>P282</b><br>FDS<br>(G165)      | <b>Filter time for actual value for EMF controller</b> [SW 1.9 and later]<br>Filtering of actual EMF value at the input of the EMF controller.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0 to 10000<br>[ms]<br>1ms        | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>on-line |

| PNU                               | Description                                                                                                                                                                                                                                                                                                                      | Value range<br>[Unit]     | No. indices                | See<br>Change                    |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>P283</b><br>FDS<br>(G165)      | <b>Filter time for actual value for EMF controller precontrol</b><br>[SW 1.9 and later]<br><br>Filtering of actual speed value at the input of the EMF controller precontrol. The purpose of this filter is to stabilize the EMF controller precontrol, even when the actual speed signal is unsteady or distorted by harmonics. | 0 to 10000<br>[ms]<br>1ms | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| <b>P284</b><br>*<br>FDS<br>(G165) | <b>Set EMF controller P component to zero</b><br><br>0 Set controller P component to zero (i.e. to obtain pure I controller)<br>1 Controller P component is active                                                                                                                                                               | 0 to 1<br>1               | Ind: 4<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.15 Ramp-function generator

(see also Section 8, Sheet G136 and Section 9)

See P639 and P640 for ramp-function generator setting parameters

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                 |                               |                                  |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------|----------------------------------|
| <b>P295</b><br>FDS<br>(G136) | <b>Mode for rounding the ramp-function generator</b> [SW 1.9 and later]<br><br>0 If the setpoint is reversed during ramp-up (or ramp-down), acceleration (deceleration) is aborted and initial rounding of the deceleration (acceleration) process begins immediately. The setpoint is not increased (decreased) any further, but the signal at the ramp-function generator output has a breakpoint (i.e. a step change in the acceleration rate).<br><br><br><br>1 If the setpoint is reversed during ramp-up or ramp-down, acceleration/deceleration gradually changes to deceleration/acceleration. The setpoint increases/decreases further, but there is <u>no breakpoint</u> in the signal at the generator output (i.e. there is no step change in the acceleration rate).<br><br> | 0 to 1<br>1                     | Ind: 4<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>on-line |
| <b>P296</b><br>FDS<br>(G136) | <b>Ramp-down time of ramp generator with emergency stop (OFF3)</b><br>[SW 1.9 and later]<br><br>When the "Emergency stop" command is issued, the drive must normally brake down to 0 speed along the current limit. If the mechanical design of the drive makes this option impermissible or undesirable, then a value of > 0 can be set here. In this case, the drive brakes along the deceleration ramp programmed here when the "Emergency stop" command is issued.<br><br>see also parameter P330                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.00 to 650.00<br>[s]<br>0.01 s | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| <b>P297</b><br>FDS<br>(G136) | <b>Lower transition rounding of ramp generator with emergency stop (OFF3)</b><br>[SW 1.9 and later]<br><br>see also parameter P330                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.00 to 100.00<br>[s]<br>0.01s  | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| <b>P298</b><br>FDS<br>(G136) | <b>Upper transition rounding of ramp generator with emergency stop (OFF3)</b><br>[SW 1.9 and later]<br><br>see also parameter P330                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.00 to 100.00<br>[s]<br>0.01s  | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |

| PNU                                                                                                                                                                                                                                                                                                                                                                       | Description                                                     | Value range<br>[Unit]             | No. indices                      | See<br>Change                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| <b>Limitation at ramp-function generator output (setpoint limiting)</b>                                                                                                                                                                                                                                                                                                   |                                                                 |                                   |                                  |                                  |
| The effective limitations are:                                                                                                                                                                                                                                                                                                                                            |                                                                 |                                   |                                  |                                  |
| Upper limit: Minimum value of P300 and the four connectors selected with P632                                                                                                                                                                                                                                                                                             |                                                                 |                                   |                                  |                                  |
| Lower limit: Maximum value of P301 and the four connectors selected with P633                                                                                                                                                                                                                                                                                             |                                                                 |                                   |                                  |                                  |
| Note: The limiting values for both the positive and negative setpoint limits can have a positive or negative sign. The negative setpoint limit, for example, can therefore be parameterized to a positive value and the positive setpoint limit to a negative value.                                                                                                      |                                                                 |                                   |                                  |                                  |
| <b>P300</b><br>FDS<br>(G137)                                                                                                                                                                                                                                                                                                                                              | <b>Positive limitation at ramp-function generator output</b>    | -200.00 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=100.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P301</b><br>FDS<br>(G137)                                                                                                                                                                                                                                                                                                                                              | <b>Negative limitation at ramp-function generator output</b>    | -200.00 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=-100.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P302</b><br>*<br>FDS<br>(G136)                                                                                                                                                                                                                                                                                                                                         | <b>Select ramp-function generator / ramp-up integrator mode</b> | 0 to 3<br>1                       | Ind: 4<br>FS=0<br>Type: O2       | P052 = 3<br>P051 = 40<br>Offline |
| 0 <u>Normal ramp-function generator operation:</u><br>Ramp-function generator setting 1 (P303 to P306) is applied.<br>When a binary selectable input parameterized as "Ramp-function generator setting 2" (P307 to P310) (selected in P637) or "Ramp-function generator setting 3" (P311 to P314) (selected in P638), generator setting 2 or 3 is applied as appropriate. |                                                                 |                                   |                                  |                                  |
| 1 <u>Ramp-up integrator operation:</u><br>When the setpoint is reached for the first time, ramp-function generator setting 1 is switched over to a ramp-up/down times = 0                                                                                                                                                                                                 |                                                                 |                                   |                                  |                                  |
| 2 <u>Ramp-up integrator operation:</u><br>When the setpoint is reached for the first time, ramp-function generator setting 1 is switched over to generator setting 2 (P307 to P310)                                                                                                                                                                                       |                                                                 |                                   |                                  |                                  |
| 3 <u>Ramp-up integrator operation:</u><br>When the setpoint is reached for the first time, ramp-function generator setting 1 is switched over to generator setting 3 (P311 to P314)                                                                                                                                                                                       |                                                                 |                                   |                                  |                                  |

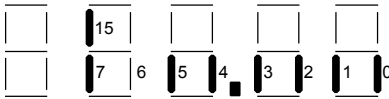
|                                                                          |                                    |                                |                                |                                 |
|--------------------------------------------------------------------------|------------------------------------|--------------------------------|--------------------------------|---------------------------------|
| <b>Ramp-function generator parameter set 1</b> (see also parameter P330) |                                    |                                |                                |                                 |
| <b>P303</b><br>FDS<br>(G136)                                             | <b>Ramp-up time 1</b>              | 0.00 to 650.00<br>[s]<br>0.01s | Ind: 4<br>FS=10.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P304</b><br>FDS<br>(G136)                                             | <b>Ramp-down time 1</b>            | 0.00 to 650.00<br>[s]<br>0.01s | Ind: 4<br>FS=10.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P305</b><br>FDS<br>(G136)                                             | <b>Lower transition rounding 1</b> | 0.00 to 100.00<br>[s]<br>0.01s | Ind: 4<br>FS=0.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |
| <b>P306</b><br>FDS<br>(G136)                                             | <b>Upper transition rounding 1</b> | 0.00 to 100.00<br>[s]<br>0.01s | Ind: 4<br>FS=0.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |

|                                                                                             |                                    |                                |                                |                                 |
|---------------------------------------------------------------------------------------------|------------------------------------|--------------------------------|--------------------------------|---------------------------------|
| <b>Ramp-function generator parameter set 2</b> (see also parameter P330)                    |                                    |                                |                                |                                 |
| Ramp-function generator parameter set 2 is selected via the binector parameterized in P637. |                                    |                                |                                |                                 |
| <b>P307</b><br>FDS<br>(G136)                                                                | <b>Ramp-up time 2</b>              | 0.00 to 650.00<br>[s]<br>0.01s | Ind: 4<br>FS=10.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P308</b><br>FDS<br>(G136)                                                                | <b>Ramp-down time 2</b>            | 0.00 to 650.00<br>[s]<br>0.01s | Ind: 4<br>FS=10.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P309</b><br>FDS<br>(G136)                                                                | <b>Lower transition rounding 2</b> | 0.00 to 100.00<br>[s]<br>0.01s | Ind: 4<br>FS=0.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |
| <b>P310</b><br>FDS<br>(G136)                                                                | <b>Upper transition rounding 2</b> | 0.00 to 100.00<br>[s]<br>0.01s | Ind: 4<br>FS=0.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |

|                                                                                             |                       |                                |                                |                                 |
|---------------------------------------------------------------------------------------------|-----------------------|--------------------------------|--------------------------------|---------------------------------|
| <b>Ramp-function generator parameter set 3</b> (see also parameter P330)                    |                       |                                |                                |                                 |
| Ramp-function generator parameter set 3 is selected via the binector parameterized in P638. |                       |                                |                                |                                 |
| <b>P311</b><br>FDS<br>(G136)                                                                | <b>Ramp-up time 3</b> | 0.00 to 650.00<br>[s]<br>0.01s | Ind: 4<br>FS=10.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |



| PNU                          | Description                        | Value range<br>[Unit]          | No. indices                    | See<br>Change                   |
|------------------------------|------------------------------------|--------------------------------|--------------------------------|---------------------------------|
| <b>P312</b><br>FDS<br>(G136) | <b>Ramp-down time 3</b>            | 0.00 to 650.00<br>[s]<br>0.01s | Ind: 4<br>FS=10.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P313</b><br>FDS<br>(G136) | <b>Lower transition rounding 3</b> | 0.00 to 100.00<br>[s]<br>0.01s | Ind: 4<br>FS=0.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |
| <b>P314</b><br>FDS<br>(G136) | <b>Upper transition rounding 3</b> | 0.00 to 100.00<br>[s]<br>0.01s | Ind: 4<br>FS=0.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |

| Displays              |                                                                                                                                                                                                                                                                                                                                                      |                                        |                       |          |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------------|----------|
| <b>r315</b><br>(G136) | <b>Display of effective times</b><br><br>i001: Display of effective ramp-up time<br>i002: Display of effective ramp-down time<br>i003: Display of effective lower transition rounding<br>i004: Display of effective upper transition rounding                                                                                                        | 0.00 to 650.00 / 10.00<br>[s]<br>0.01s | Ind: 4<br>Type: O2    | P052 = 3 |
| <b>r316</b><br>(G136) | <b>Display of ramp-function generator status</b><br><br>Mode of representation on operator panel (PMU):<br><br><br>Segment:<br>0 RFG enable<br>1 RFG start<br>2 Setpoint enable & /OFF1<br>3 Set RFG<br>4 RFG tracking<br>5 Bypass RFG<br>7 Ramp-down<br>15 Ramp-up |                                        | Ind: None<br>Type: V2 | P052 = 3 |

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                            |                                  |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|----------------------------------|
| <b>P317</b><br>*<br>FDS<br>(G136) | <b>Ramp-function generator tracking</b><br><br>0 Ramp-function generator tracking is not active<br>1 Ramp-function generator tracking is active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P318</b><br>*<br>FDS<br>(G136) | <b>Set ramp-function generator output</b><br><br>This parameter determines how the ramp-function generator output is set at the commencement of a "Shutdown" process:<br><br>0 The ramp-function generator output is <u>not set</u> at the commencement of a "Shutdown" process"<br><br>1 At the commencement of "Shutdown", the output is set to the <u>actual speed value K0167</u> (actual speed value K0167 is "unfiltered")<br><br>2 At the commencement of "Shutdown", the output is set to the <u>actual speed value K0179</u> (value is filtered by PT1 in P200, other filters may also be active) (setting may not be used in conjunction with P205 > 0)<br><br>During a "Shutdown" process, the limitation at the ramp-function generator output is not effective. P318 must be set to 1 or 2 to prevent any (temporary) excess speed during "Shutdown" when the generator output is limited. | 0 to 2<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

|                              |                                                        |                               |                               |                                 |
|------------------------------|--------------------------------------------------------|-------------------------------|-------------------------------|---------------------------------|
| <b>P319</b><br>FDS<br>(G136) | <b>Delay time for enabling ramp-function generator</b> | 0.00 to 10.00<br>[s]<br>0.01s | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
|------------------------------|--------------------------------------------------------|-------------------------------|-------------------------------|---------------------------------|

## 11.16 Setpoint processing

|                              |                                     |                                   |                                 |                                 |
|------------------------------|-------------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| <b>P320</b><br>FDS<br>(G135) | <b>Multiplier for main setpoint</b> | -300.00 to 300.00<br>[%]<br>0.01% | Ind: 4<br>FS=100.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
|------------------------------|-------------------------------------|-----------------------------------|---------------------------------|---------------------------------|

| PNU                               | Description                                                                                                    | Value range<br>[Unit]             | No. indices                     | See<br>Change                    |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|----------------------------------|
| <b>P321</b><br>FDS<br>(G135)      | <b>Multiplier for additional setpoint</b>                                                                      | -300.00 to 300.00<br>[%]<br>0.01% | Ind: 4<br>FS=100.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P322</b><br>*<br>FDS<br>(G135) | <b>Source for multiplier for main setpoint</b><br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.       | All connector<br>numbers<br>1     | Ind: 4<br>FS=1<br>Type: L2      | P052 = 3<br>P051 = 40<br>Offline |
| <b>P323</b><br>*<br>FDS<br>(G135) | <b>Source for multiplier for additional setpoint</b><br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | All connector<br>numbers<br>1     | Ind: 4<br>FS=1<br>Type: L2      | P052 = 3<br>P051 = 40<br>Offline |

## 11.17 Ramp-function generator

|                                   |                                                                                                                                                                                                                                                                                                                                                  |              |                           |                                   |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------------------------|-----------------------------------|
| <b>P330</b><br>*<br>FDS<br>(G136) | <b>Factor for ramp-function generator times</b> [SW 2.1 and later]<br><br>Selection of a factor for the values set in parameters P296, P297, P298, P303 to P314 and P542 (ramp-function generator times).<br><br>0 Factor = 1<br>1 Factor = 60<br>i.e. effective ramp-function generator times = values set in [minutes] instead of in [seconds] | 0 bis 1<br>1 | Ind: 4<br>WE=0<br>Typ: O2 | P052 = 3<br>P051 = 40<br>off-line |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------------------------|-----------------------------------|

## 11.18 Setting values for monitoring functions and limits

| Setting values for monitoring functions |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                             |                              |                                 |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------|---------------------------------|
| <b>P351</b><br>FDS                      | <b>Threshold for undervoltage trip</b><br><br>If the line voltage drops below a specific value (P078) and does not return to the permissible tolerance range within the "Restart time" set in P086, fault message F006 is activated. The drive dwells in operating state o4 or o5 while the line undervoltage persists.                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -90 to 0<br>[%]<br>Armature:<br>1% of P078.001<br>Field:<br>1% of P078.002  | Ind: 4<br>FS=-20<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P352</b><br>FDS                      | <b>Source for overvoltage trip</b><br><br>If the line voltage exceeds a specific value (P078) and does not return to the permissible tolerance range within the "Restart time" set in P086, fault message F007 is activated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0 to 99<br>[%]<br>Armature:<br>1% of P078.001<br>Field:<br>1% of P078.002   | Ind: 4<br>FS=20<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |
| <b>P353</b><br>FDS                      | <b>Response threshold for phase failure monitoring</b><br><br>If the line voltage drops below the permissible value <u>in operating states of <math>\leq o4</math></u> and does not return to an "acceptable" value within the "Restart time" set in P086, fault message F004 or F005 is activated. The drive dwells in operating state o4 or o5 for the period that the line voltage remains below the threshold and during the subsequent voltage stabilization period set in P090.<br><br><u>When a switch-on command is entered</u> , the converter dwells in operating states o4 and o5 for a maximum total delay period for both states set in P089 until the voltages in all phases exceed the threshold set in this parameter before fault message F004 or F005 is activated. | 10 to 100<br>[%]<br>Armature:<br>1% of P078.001<br>Field:<br>1% of P078.002 | Ind: 4<br>FS=40<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |
| <b>P355</b><br>FDS                      | <b>Stall protection time</b><br><br>F035 is activated if the conditions for the "Stall protection" fault message are fulfilled for longer than the period set in P355.<br>When P355=0.0, the "Drive blocked" monitoring function (F035) is deactivated and alarm A035 is likewise suppressed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.0 to 600.0<br>[s]<br>0.1s                                                 | Ind: 4<br>FS=0.5<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P357</b><br>FDS                      | <b>Threshold for tachometer interruption monitoring</b><br><br>F042 is suppressed if the actual EMF value is lower than the value set in P357.<br><br>The setting is entered as a % of the ideal mean DC voltage value at $\alpha=0$ , i.e. as a % of P078.001 * 1.35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10 to 70<br>[%]<br>1%                                                       | Ind: 4<br>FS=10<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |



| PNU                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Value range<br>[Unit]           | No. indices                    | See<br>Change                    |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------------|----------------------------------|
| <b>P360</b><br>(G180)<br>(G181) | <b>Response delay for external faults and alarms</b><br>The fault message or alarm is not activated on the converter until the appropriate input or corresponding control word bit (as selected in P675, P686, P688 or P689) has been in the LOW state for at least the time period set in this parameter (see also Section 8, Sheets G180 and G181).<br><br>i001: Delay for external fault 1<br>i002: Delay for external fault 2<br>i003: Delay for external alarm 1<br>i004: Delay for external alarm 2                                                                                                   | 0 to 10000<br>[ms]<br>1ms       | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online  |
| <b>P361</b><br>FDS              | <b>Delay time for the undervoltage monitoring</b><br>Activation of the fault message F006 (line undervoltage) is delayed by the time that can be set in this parameter. During this delay time firing pulses are output!<br><br>Another time which is parameterized for automatic restarting (P086) only begins after the time set here has elapsed.                                                                                                                                                                                                                                                        | 0 to 60000<br>[ms]<br>1ms       | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>on-line |
| <b>P362</b><br>FDS              | <b>Delay time for the overvoltage monitoring</b><br>Activation of the fault message F007 (line overvoltage) is delayed by the time that can be set in this parameter. During this delay time firing pulses are output!<br><br>Another time which is parameterized for automatic restarting (P086) only begins after the time set here has elapsed.                                                                                                                                                                                                                                                          | 0 to 60000<br>[ms]<br>1ms       | Ind: 4<br>FS=10000<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| <b>P363</b><br>FDS              | <b>Threshold for the minimum line frequency</b> [SW 1.8 and later]<br>If the line frequency falls below the value set here and does not rise above it again within the "restart" time set in P086, the fault message F008 is activated. As long as the line frequency is below the value set here, the drive is kept in operating state o4 or o5.<br>[values < 45.0 Hz can be set in SW 1.9 and later]<br><br><div style="border: 1px solid black; padding: 5px;"> <b>CAUTION</b><br/>           Operation in the extended frequency range between 23 Hz and 110 Hz is available on request.         </div> | 23.0 to 60.0<br>[Hz]<br>0.1 Hz  | Ind: 4<br>FS=45.0<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line |
| <b>P364</b><br>FDS              | <b>Threshold for the maximum line frequency</b> [SW 1.8 and later]<br>If the line frequency rises above the value set here and does not fall below it again within the "restart" time set in P086, the fault message F009 is activated. As long as the line frequency is above the value set here, the drive is kept in operating state o4 or o5.<br><br><div style="border: 1px solid black; padding: 5px;"> <b>CAUTION</b><br/>           Operation in the extended frequency range between 23 Hz and 110 Hz is available on request.         </div>                                                      | 50.0 to 110.0<br>[Hz]<br>0.1 Hz | Ind: 4<br>FS=65.0<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line |

## 11.19 Setting values for limit-value monitors

(see also Section 8, Sheet G187 und G188)

| <b>n &lt; n<sub>min</sub> signal</b> |                                                                                                                                                                                                                                                                                                                                                                      |                                                 |                               |                                 |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------|---------------------------------|
| <b>P370</b><br>FDS<br>(G187)         | <b>Speed threshold n<sub>min</sub></b><br>Speed threshold for n < n <sub>min</sub> limit-value monitor.<br><br>Note:<br>This threshold also affects the sequence of control operations for "Shutdown", "Fast stop", cancellation of the "Inching" or "Crawling" command, the "Braking with field reversal" function and the brake control operation (see Section 9). | 0.00 to 199.99<br>[%]<br>0.01% of maximum speed | Ind: 4<br>FS=0.50<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P371</b><br>FDS<br>(G187)         | <b>Hysteresis for n &lt; n<sub>min</sub> signal</b><br>This value is added to the response threshold if n < n <sub>min</sub> is active.                                                                                                                                                                                                                              | 0.00 to 199.99<br>[%]<br>0.01% of maximum speed | Ind: 4<br>FS=0.50<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |

| PNU                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Value range<br>[Unit]                                                               | No. indices                     | See<br>Change                    |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------|----------------------------------|
| <b>n &lt; n<sub>comp</sub> signal</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                     |                                 |                                  |
| <b>P373</b><br>FDS<br>(G187)                       | <b>Speed threshold n<sub>comp</sub>.</b><br>Speed threshold for n < n <sub>comp</sub> signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.00 to 199.99<br>[%]<br>0.01% of maximum<br>speed                                  | Ind: 4<br>FS=100.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P374</b><br>FDS<br>(G187)                       | <b>Hysteresis for &lt; n<sub>comp</sub> signal (n &lt; n<sub>comp</sub> signal)</b><br>This value is added to the response threshold if n < n <sub>comp</sub> is active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.00 to 199.99<br>[%]<br>0.01% of maximum<br>speed                                  | Ind: 4<br>FS=3.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P375</b><br>FDS<br>(G187)                       | <b>OFF delay for n &lt; n<sub>comp</sub> signal</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.0 to 100.0<br>[s]<br>0.1s                                                         | Ind: 4<br>FS=3.0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online  |
| <b>Setpoint/actual value deviation 2</b>           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                     |                                 |                                  |
| <b>P376</b><br>FDS<br>(G187)                       | <b>Permissible setpoint/actual value deviation 2</b> [SW 1.9 and later]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.00 to 199.99<br>[%]<br>0.01% of maximum<br>speed                                  | Ind: 4<br>FD=3.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>on-line |
| <b>P377</b><br>FDS<br>(G187)                       | <b>Hysteresis for setpoint/actual value deviation 2 signal</b> [SW 1.9 and later]<br>This value is added to the response threshold if a setpoint/actual value deviation signal is active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.00 to 199.99<br>[%]<br>0.01% of maximum<br>speed                                  | Ind: 4<br>FS=1.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>on-line |
| <b>P378</b><br>FDS<br>(G187)                       | <b>Response delay for setpoint/actual value deviation signal 2</b> [SW 1.9 and later]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.0 to 100.0<br>[s]<br>0.1s                                                         | Ind: 4<br>FS=3.0<br>Type: O2    | P052 = 3<br>P051 = 40<br>on-line |
| <b>Overspeed</b>                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                     |                                 |                                  |
| <b>P380</b><br>FDS<br>(G188)                       | <b>Maximum speed in positive direction of rotation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.0 to 199.9<br>[%]<br>0.1% of maximum<br>speed                                     | Ind: 4<br>FS=120.0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P381</b><br>FDS<br>(G188)                       | <b>Maximum speed in negative direction of rotation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | -199.9 to 0.0<br>[%]<br>0.1% of maximum<br>speed                                    | Ind: 4<br>FS=-120.0<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>Setpoint/actual value deviation 1</b>           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                     |                                 |                                  |
| <b>P388</b><br>FDS<br>(G187)                       | <b>Permissible deviation between setpoint and actual value 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.00 to 199.99<br>[%]<br>0.01% of maximum<br>speed                                  | Ind: 4<br>FS=3.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P389</b><br>FDS<br>(G187)                       | <b>Hysteresis for setpoint/actual value deviation signal 1</b><br>This value is added to the response threshold if a setpoint/actual value deviation signal is active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00 to 199.99<br>[%]<br>0.01% of maximum<br>speed                                  | Ind: 4<br>FS=1.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P390</b><br>FDS<br>(G187)                       | <b>Response delay for setpoint/actual value deviation signal 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.0 to 100.0<br>[s]<br>0.1s                                                         | Ind: 4<br>FS=3.0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online  |
| <b>I<sub>f</sub> &lt; I<sub>f min</sub> signal</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                     |                                 |                                  |
| <b>P394</b><br>FDS<br>(G188)                       | <b>Field current threshold I<sub>f min</sub></b><br>Field current threshold for I <sub>f</sub> < I <sub>f min</sub> limit-value monitor.<br><br>Note:<br>This threshold affects the sequence of control operations for the "Direction of rotation reversal using field reversal" and "Braking with field reversal" functions (see Section 9).<br><br>The I <sub>f</sub> < I <sub>f min</sub> signal is connected to binector B0215, the actual value at field current controller input K0265 is applied as I <sub>f</sub> .<br>B0215 = 0 when K0265 > threshold set in P394<br>B0215 = 1 when K0265 < threshold set in P394 + hysteresis set in P395<br>0 → 1 transition takes place when K0265 < P394<br>1 → 0 transition takes place when K0265 > P394 + P395 | 0.00 to 199.99<br>[%]<br>0.01% of converter<br>rated field DC<br>current (r073.i02) | Ind: 4<br>FS=3.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |

| PNU                          | Description                                                                                                                                                            | Value range<br>[Unit]                                                               | No. indices                   | See<br>Change                   |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------|---------------------------------|
| <b>P395</b><br>FDS<br>(G188) | <b>Hysteresis for <math>I_f &lt; I_{f \min}</math> signal</b><br><br>This value is added to the response threshold if $I_f < I_{f \min}$ is active.<br>(see also P394) | 0.00 to 100.00<br>[%]<br>0.01% of converter<br>rated field DC<br>current (r073.i02) | Ind: 4<br>FS=1.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |

**Field current monitoring**

Fault message F005 is activated if the actual field current (K0265) is lower than the percentage of the field current setpoint (K0268) set in P396 for longer than the time set in parameter P397.

Note:

Fault message F005 is only activated, however, if the field current setpoint is > 2% of the converter rated DC current of the field (r073.i02) ist.

|                              |                                                                  |                                                                                        |                               |                                  |
|------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------|----------------------------------|
| <b>P396</b><br>FDS<br>(G167) | <b>Threshold for field current monitoring</b> [SW 1.9 and later] | 1 to 100<br>[%]<br>0.01% of setpoint at<br>field current con-<br>troller input (K0268) | Ind: 4<br>FS=50<br>Type: O2   | P052 = 3<br>P051 = 40<br>on-line |
| <b>P397</b><br>FDS<br>(G167) | <b>Field current monitoring time</b> [SW 1.9 and later]          | 0.02 to 60.00<br>[s]<br>0.01s                                                          | Ind: 4<br>FS=0.50<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |

 **$I_f < I_{f x}$  signal**

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                               |                                |                                 |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------|---------------------------------|
| <b>P398</b><br>FDS<br>(G188) | <b>Field current threshold <math>I_{f x}</math></b><br><br>Setpoint-oriented field current threshold for $I_f < I_{f x}$ limit-value monitor.<br><br>Note:<br>This threshold affects the sequence of control operations for the "Direction of rotation reversal using field reversal" and "Braking with field reversal" functions (see Section 9).<br><br>The $I_f < I_{f x}$ signal is connected to binector B0216, the actual value at field current controller input K0265 is applied as $I_f$ .<br>B0216 = 0 when K0265 > threshold set in P398<br>B0216 = 1 when K0265 < threshold set in P398 + hysteresis set in P399<br>0 → 1 transition takes place when K0265 < P398<br>1 → 0 transition takes place when K0265 > P398 + P399 | 0.00 to 199.99<br>[%]<br>0.01% of setpoint at<br>field current<br>controller input<br>(K0268) | Ind: 4<br>FS=80.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P399</b><br>FDS<br>(G188) | <b>Hysteresis for <math>I_f &lt; I_{f x}</math> signal</b><br><br>This value is added to the response threshold if $I_f < I_{f x}$ is active.<br>(see also P398)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.00 to 100.00<br>[%]<br>0.01% of converter<br>rated field DC<br>current (r073.i02)           | Ind: 4<br>FS=1.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |

**11.20 Settable fixed values**

|                                                                                |                                                              |                                   |                               |                                 |
|--------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------|-------------------------------|---------------------------------|
| Function: The value set in the parameter is applied to the specified connector |                                                              |                                   |                               |                                 |
| <b>P401</b><br>FDS<br>(G120)                                                   | <b>K401 fixed value</b><br><br>is applied to connector K0401 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P402</b><br>FDS<br>(G120)                                                   | <b>K402 fixed value</b><br><br>is applied to connector K0402 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P403</b><br>FDS<br>(G120)                                                   | <b>K403 fixed value</b><br><br>is applied to connector K0403 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P404</b><br>FDS<br>(G120)                                                   | <b>K404 fixed value</b><br><br>is applied to connector K0404 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P405</b><br>FDS<br>(G120)                                                   | <b>K405 fixed value</b><br><br>is applied to connector K0405 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P406</b><br>FDS<br>(G120)                                                   | <b>K406 fixed value</b><br><br>is applied to connector K0406 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P407</b><br>FDS<br>(G120)                                                   | <b>K407 fixed value</b><br><br>is applied to connector K0407 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |

| PNU                          | Description                                              | Value range<br>[Unit]             | No. indices                   | See<br>Change                   |
|------------------------------|----------------------------------------------------------|-----------------------------------|-------------------------------|---------------------------------|
| <b>P408</b><br>FDS<br>(G120) | <b>K408 fixed value</b><br>is applied to connector K0408 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P409</b><br>FDS<br>(G120) | <b>K409 fixed value</b><br>is applied to connector K0409 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P410</b><br>FDS<br>(G120) | <b>K410 fixed value</b><br>is applied to connector K0410 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P411</b><br>FDS<br>(G120) | <b>K411 fixed value</b><br>is applied to connector K0411 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P412</b><br>FDS<br>(G120) | <b>K412 fixed value</b><br>is applied to connector K0412 | -32768 to 32767<br>1              | Ind: 4<br>FS=0<br>Type: I2    | P052 = 3<br>P051 = 40<br>Online |
| <b>P413</b><br>FDS<br>(G120) | <b>K413 fixed value</b><br>is applied to connector K0413 | -32768 to 32767<br>1              | Ind: 4<br>FS=0<br>Type: I2    | P052 = 3<br>P051 = 40<br>Online |
| <b>P414</b><br>FDS<br>(G120) | <b>K414 fixed value</b><br>is applied to connector K0414 | -32768 to 32767<br>1              | Ind: 4<br>FS=0<br>Type: I2    | P052 = 3<br>P051 = 40<br>Online |
| <b>P415</b><br>FDS<br>(G120) | <b>K415 fixed value</b><br>is applied to connector K0415 | -32768 to 32767<br>1              | Ind: 4<br>FS=0<br>Type: I2    | P052 = 3<br>P051 = 40<br>Online |
| <b>P416</b><br>FDS<br>(G120) | <b>K416 fixed value</b><br>is applied to connector K0416 | -32768 to 32767<br>1              | Ind: 4<br>FS=0<br>Type: I2    | P052 = 3<br>P051 = 40<br>Online |

## 11.21 Fixed control bits

|                                                                               |                                                       |             |                            |                                 |
|-------------------------------------------------------------------------------|-------------------------------------------------------|-------------|----------------------------|---------------------------------|
| Function: The value set in the parameter is applied to the specified binector |                                                       |             |                            |                                 |
| <b>P421</b><br>FDS<br>(G120)                                                  | <b>B421 fixed bit</b><br>is applied to binector B0421 | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P422</b><br>FDS<br>(G120)                                                  | <b>B422 fixed bit</b><br>is applied to binector B0422 | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P423</b><br>FDS<br>(G120)                                                  | <b>B423 fixed bit</b><br>is applied to binector B0423 | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P424</b><br>FDS<br>(G120)                                                  | <b>B424 fixed bit</b><br>is applied to binector B0424 | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P425</b><br>FDS<br>(G120)                                                  | <b>B425 fixed bit</b><br>is applied to binector B0425 | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P426</b><br>FDS<br>(G120)                                                  | <b>B426 fixed bit</b><br>is applied to binector B0426 | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P427</b><br>FDS<br>(G120)                                                  | <b>B427 fixed bit</b><br>is applied to binector B0427 | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P428</b><br>FDS<br>(G120)                                                  | <b>B428 fixed bit</b><br>is applied to binector B0428 | 0 to 1<br>1 | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |

## 11.22 Digital setpoint input (fixed setpoint, inching and crawling setpoints)

(see also Section 8, Sheets G127, G129 and G130)

### Fixed setpoint

Function: Up to 8 connectors can be selected in P431 indices .01 to .08. These can be applied as an additional fixed setpoint (K0204, K0209) via the binectors selected in P430, indices .01 to .08 (setpoint is applied when binector switches to log. "1" state). P432 indices .01 to .08 can be set to define for each setpoint individually whether the ramp-function generator must be bypassed on setpoint injection.

If fixed setpoint injection is not selected, the connector set in P433 is applied to K0209.

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                    | Value range<br>[Unit]      | No. indices                 | See<br>Change                    |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------|----------------------------------|
| <b>P430</b><br>*<br>(G127)        | <b>Source for fixed-setpoint injection</b><br>Selection of binector to control injection of the fixed setpoint ("1" state = fixed setpoint injected).<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                  | All binector numbers<br>1  | Ind: 8<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P431</b><br>*<br>(G127)        | <b>Source for fixed setpoint</b><br>Selection of connector to be injected as the fixed setpoint<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                      | All connector numbers<br>1 | Ind: 8<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P432</b><br>*<br>(G127)        | <b>Source for selection of ramp-function generator bypass</b><br>Selection as to whether or not ramp-function generator must be bypassed when the fixed setpoint is injected.<br>The ramp-function generator is bypassed if the AND operation between the binector selected via an index of P430 and the setting in the same index of P432 produces a log. "1" | 0 to 1<br>1                | Ind: 8<br>FS=0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P433</b><br>*<br>FDS<br>(G127) | <b>Source for standard setpoint</b><br>Selection of the connector to be applied if fixed-setpoint injection is not selected<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                          | All connector numbers<br>1 | Ind: 4<br>FS=11<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**Inching setpoint**

Function: Up to 8 connectors can be selected in P436 indices .01 to .08. These can be applied as an inching setpoint (K0202, K0207) via the binectors selected in P435, indices .01 to .08 (setpoint is applied when binector switches to log. "1" state). P437 indices .01 to .08 can be set to define for each setpoint individually whether the ramp-function generator must be bypassed on setpoint injection. If more than one inching setpoint is injected, an output value corresponding to inching setpoint = 0% is applied.

If inching setpoint injection is not selected, the connector set in P438 is applied to K0207.

|                                   |                                                                                                                                                                                                                                                                                                                                                                   |                            |                              |                                  |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------|----------------------------------|
| <b>P435</b><br>*<br>(G129)        | <b>Source for injection of inching setpoint</b><br>Selection of binector to control injection of the inching setpoint ("1" state = inching setpoint injected).<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                            | All binector numbers<br>1  | Ind: 8<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P436</b><br>*<br>(G129)        | <b>Source for inching setpoint</b><br>Selection of connector to be injected as the inching setpoint<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                     | All connector numbers<br>1 | Ind: 8<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P437</b><br>*<br>(G129)        | <b>Source for selection of ramp-function generator bypass</b><br>Selection as to whether or not ramp-function generator must be bypassed when the inching setpoint is injected.<br>The ramp-function generator is bypassed if the AND operation between the binector selected via an index of P435 and the setting in the same index of P437 produces a log. "1". | 0 to 1<br>1                | Ind: 8<br>FS=0<br>Type: O2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P438</b><br>*<br>FDS<br>(G129) | <b>Source for standard setpoint</b><br>Selection of the connector to be applied if inching-setpoint injection is not selected<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                           | All connector numbers<br>1 | Ind: 4<br>FS=208<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Value range<br>[Unit]      | No. indices                   | See<br>Change                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|----------------------------------|
| <b>Crawling setpoint</b><br>Function: Up to 8 connectors can be selected in P441 indices .01 to .08. These can be applied as an additional crawling setpoint (K0201, K0206) via the binectors selected in P440, indices .01 to .08. P445 can be set to define whether the setpoint must be applied when the selected binectors have reached the log. "1" state (when P445=0) or in response to a 0 → 1 transition (when P445=1). When setpoint injection in response to a 0 → 1 transition is selected, the setpoint injection function is reset when the binector selected in P444 switches to the log. "0" state. P442 indices .01 to .08 can be set to define for each setpoint individually whether the ramp-function generator must be bypassed on setpoint injection.<br><br>If crawling setpoint injection is not selected, the connector set in P443 is applied to K0206. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                            |                               |                                  |
| <b>P440</b><br>*<br>(G130)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Source for injection of crawling setpoint</b><br>Selection of binector to control injection of the crawling setpoint.<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | All binector numbers<br>1  | Ind: 8<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P441</b><br>*<br>(G130)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Source for crawling setpoint</b><br>Selection of connector to be injected as the crawling setpoint<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | All connector numbers<br>1 | Ind: 8<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P442</b><br>*<br>(G130)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Source for selection of ramp-function generator bypass</b><br>Selection as to whether or not ramp-function generator must be bypassed when the crawling setpoint is injected.<br>The ramp-function generator is bypassed if the AND operation between the binector selected via an index of P440 and the setting in the same index of P442 produces a log. "1".                                                                                                                                                                                                                                                                                                                                      | 0 to 1<br>1                | Ind: 8<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P443</b><br>*<br>FDS<br>(G130)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Source for standard setpoint</b><br>Selection of the connector to be applied if crawling-setpoint injection is not selected<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | All connector numbers<br>1 | Ind: 4<br>FS=207<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P444</b><br>*<br>BDS<br>(G130)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Source for standstill command</b><br>Selection of the binector to control the standstill operation (OFF1) or resetting of crawling setpoint injection when P445=1 (log. "0" state = reset).<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P445</b><br>*<br>(G130)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Selection of level/edge for switch-on/crawling</b><br>Selection to define whether ON command must be input via terminal 37 and the crawling setpoint injected in response to a log. "1" level or to a 0 → 1 transition<br>0 ON with log. "1" state at terminal 37 and injection of crawling setpoint with binectors selected in P440 in log. "1" state<br>1 ON in response to 0 → 1 transition at terminal 37 and injection of crawling setpoint in response to 0 → 1 transition of binectors selected in P440<br>With this setting, the ON command or injection command for the crawling setpoint is stored. The memory is reset when the binector selected in P444 switches to the log. "0" state. | 0 to 1<br>1                | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.23 Position sensing with pulse encoder

See parameters P140 to P148 for pulse encoder definition and monitoring

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                           |                            |                                   |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|-----------------------------------|
| <b>P450</b><br>*<br>FDS<br>(G145) | <b>Resetting of position counter</b><br><br>0 Reset position counter OFF<br>1 Reset position counter with zero marker<br>2 Reset position counter with zero marker when LOW signal is applied to terminal 39<br>3 Reset position counter when LOW signal is applied to terminal 39<br><br>Note: Counter resetting with P450 = 2 and 3 is executed in the hardware and is not affected by how the binectors controlled by terminal 39 are interconnected | 0 to 3<br>1               | Ind: 4<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P451</b><br>*<br>FDS<br>(G145) | <b>Position counter hysteresis</b><br><br>0 Hysteresis for rotational direction reversal OFF<br>1 Hysteresis for rotational direction reversal ON (the first pulse encoder input pulse after a change in rotational direction is not counted)                                                                                                                                                                                                           | 0 to 1<br>1               | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P452</b><br>*<br>BDS<br>(G145) | <b>Source for "Reset position counter" command</b> [SW 1.9 and later]<br>Selection of binector to control <b>resetting of the position counter</b> .<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                            | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>P453</b><br>*<br>BDS<br>(G145) | <b>Source for "Enable zero marker counter" command</b> [SW 1.9 and later]<br>Selection of binector to control <b>enabling of the zero marker counter</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                        | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

## 11.24 Connector selector switches

(see also Section 8, Function Diagram Sheet G124)

|                            |                                                                                                                                                                                                                        |                            |                            |                                   |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|-----------------------------------|
| <b>P455</b><br>*<br>(G124) | <b>Source for inputs of connector selector switch 1</b> [SW 1.9 and later]<br>Selection of connectors for the input signals for connector selector switch 1.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>P456</b><br>*<br>(G124) | <b>Source for control of connector selector switch 1</b> [SW 1.9 and later]<br>Selection of binectors to control connector selector switch 1.<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                  | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>P457</b><br>*<br>(G124) | <b>Source for inputs of connector selector switch 2</b> [SW 1.9 and later]<br>Selection of connectors for the input signals for connector selector switch 2.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>P458</b><br>*<br>(G124) | <b>Source for control of connector selector switch 2</b> [SW 1.9 and later]<br>Selection of binectors to control connector selector switch 2.<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                  | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |



| PNU | Description | Value range [Unit] | No. indices | See Change |
|-----|-------------|--------------------|-------------|------------|
|-----|-------------|--------------------|-------------|------------|

## 11.25 Motorized potentiometer

(see also Section 8, Sheet G126)

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                |                                  |                                  |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------|----------------------------------|
| <b>P460</b><br>*<br>FDS<br>(G126) | <b>Control word for motorized potentiometer ramp-function generator</b><br><br>0 The motorized potentiometer ramp generator is bypassed in Automatic mode (same effect as for P462 and P463 = 0.01, i.e. the generator output is made to follow the automatic setpoint without delay)<br><br>1 Motorized potentiometer ramp generator is active in Manual and Automatic modes                                                                                                                                                                                                                                                                | 0 to 1<br>1                    | Ind: 4<br>FS=1<br>Type: O2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>P461</b><br>*<br>FDS<br>(G126) | <b>Source for setpoint in Automatic mode</b><br>Selection of the connector to be applied as the <b>Automatic setpoint</b> to the ramp-function generator in the motorized potentiometer<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                            | All connector numbers<br>1     | Ind: 4<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>P462</b><br>FDS<br>(G126)      | <b>Ramp-up time for motorized potentiometer</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.01 to 300.00 [s]<br>0.01s    | Ind: 4<br>FS=10.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P463</b><br>FDS<br>(G126)      | <b>Ramp-down time for motorized potentiometer</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.01 to 300.00 [s]<br>0.01s    | Ind: 4<br>FS=10.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P464</b><br>FDS<br>(G126)      | <b>Time difference for dy/dt</b><br>Setting of $\Delta t$ for the output of dy/dt at a connector, i.e. on K0241 the change in the output quantity (K0240) is output within the time set in P464, multiplied by the factor set in P465 (unit of time setting is [s] if P465=0 or [min] if P465=1)<br>Example: The ramp-function generator is currently ramping up with a ramp-up time of P462=5s, i.e. a ramp-up operation from y=0% to y=100% takes 5s.<br>- A time difference $\Delta t$ of P464=2s is set.<br>- $\Rightarrow$ A dy/dt of 40% appears at connector K0241 since the dy within the set $\Delta t$ of 2 s equals (2s/5s)*100%. | 0.01 to 300.00 [s]<br>0.01s    | Ind: 4<br>FS=10.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P465</b><br>*<br>FDS<br>(G126) | <b>Factor of expansion for motorized potentiometer</b><br>The effective ramp-up time, ramp-down time or time difference for dy/dt is the product of the time setting in parameter P462, P463 and P464 respectively, multiplied by the factor set in this parameter.<br><br>0 Parameters P462, P463 and P464 are multiplied by a <u>factor of 1</u><br>1 Parameters P462, P463 and P464 are multiplied by a <u>factor of 60</u>                                                                                                                                                                                                               | 0 to 1<br>1                    | Ind: 4<br>FS=0<br>Type: O2       | P052 = 3<br>P051 = 40<br>Online  |
| <b>P466</b><br>*<br>FDS<br>(G126) | <b>Source for motorized potentiometer setting value</b><br>Selection of the connector to be injected as the <b>motorized potentiometer setting value</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                           | All connector numbers<br>1     | Ind: 4<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>P467</b><br>FDS<br>(G126)      | <b>Motorized potentiometer starting value</b><br>Starting value of motorized potentiometer after ON when P473 = 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -199.9 to 199.9 [%]<br>0.1%    | Ind: 4<br>FS=0.0<br>Type: I2     | P052 = 3<br>P051 = 40<br>Online  |
| <b>P468</b><br>FDS<br>(G126)      | <b>Setpoint for "Raise motorized potentiometer"</b><br>Motorized potentiometer manual operation: Setpoint for "Raise motorized potentiometer"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -199.99 to 199.99 [%]<br>0.01% | Ind: 4<br>FS=100.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P469</b><br>FDS<br>(G126)      | <b>Setpoint for "Lower motorized potentiometer"</b><br>Motorized potentiometer manual operation: Setpoint for "Lower motorized potentiometer"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -199.99 to 199.99 [%]<br>0.01% | Ind: 4<br>FS=-100.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P470</b><br>*<br>BDS<br>(G126) | <b>Source for clockwise/counter-clockwise switchover</b><br>Selection of binector to control " <b>Clockwise/counter-clockwise switchover</b> " ("0" state = clockwise).<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                              | All binector numbers<br>1      | Ind: 2<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |



| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                              | Value range<br>[Unit]     | No. indices                | See<br>Change                    |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>P471</b><br>*<br>BDS<br>(G126) | <b>Source for manual/automatic switchover</b><br><br>Selection of binector to control <b>"Manual/automatic switchover"</b> ("0" state = manual).<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                 | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P472</b><br>*<br>BDS<br>(G126) | <b>Source for set motorized potentiometer</b><br><br>Selection of binector to control <b>"Set motorized potentiometer"</b> ("0" to "1" transition = set motorized potentiometer).<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P473</b><br>*<br>FDS<br>(G126) | <b>Storage of output value</b><br><br>0 <u>No storage of output value:</u><br>The output is set to 0 in all operating states of >0.5.<br>The starting point after ON is determined by P467 (MOP starting value).<br><br>1 <u>Non-volatile storage of output value:</u><br>The output value remains stored in all operating states and after voltage disconnection or failure. The last value stored is output again after voltage recovery/reconnection. | 0 to 1<br>1               | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.26 Oscillation

Function:

Parameters P480 to P483 define the waveshape of a rectangular signal (oscillation setpoint K0203). The value set in P480 determines the signal level for the time period set in P481 and the value set in P482 the signal level for the time period set in P483.

Oscillation: Selected in P485. The free-running rectangular signal is switched through to the output K0208.

|                                   |                                                                                                                                                                                                                        |                                                 |                               |                                  |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------|----------------------------------|
| <b>P480</b><br>FDS<br>(G128)      | <b>Oscillation setpoint 1</b>                                                                                                                                                                                          | -199.9 to 199.9<br>[%]<br>0.1% of maximum speed | Ind: 4<br>FS=0.5<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P481</b><br>FDS<br>(G128)      | <b>Oscillation time 1</b>                                                                                                                                                                                              | 0.1 to 300.0<br>[s]<br>0.1s                     | Ind: 4<br>FS=0.1<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P482</b><br>FDS<br>(G128)      | <b>Oscillation setpoint 2</b>                                                                                                                                                                                          | -199.9 to 199.9<br>[%]<br>0.1% of maximum speed | Ind: 4<br>FS=-0.4<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P483</b><br>FDS<br>(G128)      | <b>Oscillation time 2</b>                                                                                                                                                                                              | 0.1 to 300.0<br>[s]<br>0.1s                     | Ind: 4<br>FS=0.1<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P484</b><br>*<br>FDS<br>(G128) | <b>Source for standard setpoint</b><br><br>Selection of connector to be injected as the output value when the "Oscillation" function is not selected<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.         | All connector numbers<br>1                      | Ind: 4<br>FS=209<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P485</b><br>*<br>BDS<br>(G128) | <b>Source for oscillation selection</b><br><br>Selection of binector to control activation of the "Oscillation" function (log. "1" state = oscillation active)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1                       | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.27 Definition of "Motor interface"

(see also Section 8, Sheets G185 und G186)

### CAUTION!

The encoders for measurement and monitoring of the brush length, bearing condition, air flow and motor temperature must be safely isolated from the power circuit.

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                         |                            |                                  |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------|----------------------------------|
| <b>P490</b><br>*                  | <b>Selection of temperature sensor for analog monitoring of motor temperature</b><br><br>(G185)<br><br>i001: Temperature sensor at terminals 22 / 23:<br>i002: Temperature sensor at terminals 204 / 205:<br><br>Settings:<br><br>0 No temperature sensor<br>1 KTY84<br>2 PTC thermistor with R=600Ω 1)<br>3 PTC thermistor with R=1200Ω 1)<br>4 PTC thermistor with R=1330Ω 1)<br>5 PTC thermistor with R=2660Ω 1)<br><br>1) PTC thermistor according to DIN 44081 / 44082 with specified R at rated response temperature, 1330Ω on Siemens motors (setting 4 must be selected). When a PTC thermistor is selected as the temperature sensor, it is not necessary to set parameters P491 and P492 (alarm and trip temperatures). These two temperatures are predetermined by the type of PTC thermistor installed. Whether an alarm or fault is output when the operating point of the PTC thermistor is reached depends on how the relevant input is parameterized (P493.F or P494.F). | 0 to 5<br>1             | Ind: 2<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P491</b><br>FDS<br>(G185)      | <b>Analog monitoring of motor temperature: Alarm temperature</b><br><br>Operative only when P490.x=1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0 to 200<br>[°C]<br>1°C | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P492</b><br>FDS<br>(G185)      | <b>Analog monitoring of motor temperature: Trip temperature</b><br><br>Operative only when P490.x=1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0 to 200<br>[°C]<br>1°C | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P493</b><br>*<br>FDS<br>(G185) | <b>Motor temperature analog 1 (temperature sensor at terminals 22 / 23): Tripping of alarm or fault message</b><br><br>Motor temperature grasped with KTY84<br><br>0 Monitoring deactivated<br>1 Alarm (A029) at temperature > P491<br>2 Fault message (F029) at temperature > P492<br>3 Alarm (A029) at temperature > P491 and fault message (F029) at temperature > P492<br><br>Motor temperature grasped with PTC thermistor<br><br>0 Monitoring deactivated<br>1 Alarm message (A029) when operating point of PTC thermistor is reached<br>2 Fault message (F029) when operating point of PTC thermistor is reached<br>3 Illegal setting                                                                                                                                                                                                                                                                                                                                             | 0 to 3<br>1             | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Value range<br>[Unit] | No. indices                | See<br>Change                    |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------|----------------------------------|
| <b>P494</b><br>*<br>FDS<br>(G185) | <b>Motor temperature analog 2 (temperature sensor at terminals 204 / 205): Tripping of alarm or fault message</b><br><br>Motor temperature grasped with KTY84<br><br>0 Monitoring deactivated<br>1 Alarm (A029) at temperature > P491<br>2 Fault message (F029) at temperature > P492<br>3 Alarm (A029) at temperature > P491 and<br>fault message (F029) at temperature > P492<br><br>Motor temperature grasped with PTC thermistor<br><br>0 Monitoring deactivated<br>1 Alarm message (A029) when operating point of PTC thermistor<br>is reached<br>2 Fault message (F029) when operating point of PTC thermistor<br>is reached<br>3 Illegal setting | 0 to 3<br>1           | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P495</b><br>*<br>FDS<br>(G186) | <b>Brush length sensing: Tripping of alarm or fault message</b><br><br>0 No brush length sensing (terminal 211 is not scanned)<br>1 Binary brush length sensing (terminal 211 is scanned)<br>Alarm (A025) in response to 0 signal<br>2 Binary brush length sensing (terminal 211 is scanned)<br>Fault message (F025) in response to 0 signal                                                                                                                                                                                                                                                                                                            | 0 to 2<br>1           | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P496</b><br>*<br>FDS<br>(G186) | <b>Bearing condition: Tripping of alarm or fault message</b><br><br>0 No bearing condition sensing (terminal 212 is not scanned)<br>1 Bearing condition sensing (terminal 212 is scanned)<br>Alarm (A026) in response to 1 signal<br>2 Bearing condition sensing (terminal 212 is scanned)<br>Fault message (F026) in response to 1 signal                                                                                                                                                                                                                                                                                                              | 0 to 2<br>1           | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P497</b><br>*<br>FDS<br>(G186) | <b>Air flow: Tripping of alarm or fault message</b><br><br>0 No air flow monitoring (terminal 213 is not scanned)<br>1 Air flow monitoring (terminal 213 is scanned)<br>Alarm (A027) in response to 0 signal<br>2 Air flow monitoring (terminal 213 is scanned)<br>Fault message (F027) in response to 0 signal                                                                                                                                                                                                                                                                                                                                         | 0 to 2<br>1           | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P498</b><br>*<br>FDS<br>(G186) | <b>Temperature switch: Tripping of alarm or fault message</b><br><br>0 No temperature switch connected (terminal 214 is not scanned)<br>1 Temperature switch connected (terminal 214 is scanned)<br>Alarm (A028) in response to 0 signal<br>2 Temperature switch connected (terminal 214 is scanned)<br>Fault message (F028) in response to 0 signal                                                                                                                                                                                                                                                                                                    | 0 to 2<br>1           | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.28 Configuring of torque shell input

|                                   |                                                                                                                                                                                                              |                               |                              |                                  |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------|----------------------------------|
| <b>P500</b><br>*<br>BDS<br>(G160) | <b>Source for torque setpoint for slave drive</b><br><br>Selection of the connector to be injected as the <b>torque setpoint for a slave drive</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector<br>numbers<br>1 | Ind: 2<br>FS=170<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P501</b><br>*<br>BDS<br>(G160) | <b>Source for additional torque setpoint</b><br><br>Selection of connector to be injected as the <b>additional torque setpoint</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                 | All connector<br>numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |

| PNU                          | Description                                                                                                                                                                                                                                                                                | Value range<br>[Unit]             | No. indices                     | See<br>Change                    |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|----------------------------------|
| <b>P502</b><br>*<br>(G152)   | <b>Source for value to be added to speed controller output</b><br><br>Selection of connector to be injected as the value to be added to the speed controller output (in addition to friction and moment of inertia compensation)<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector<br>numbers<br>1     | Ind: None<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P503</b><br>FDS<br>(G160) | <b>Multiplier for torque setpoint in slave mode</b>                                                                                                                                                                                                                                        | -300.00 to 300.00<br>[%]<br>0.01% | Ind: 4<br>FS=100.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>on-line |

## 11.29 Speed limiting controller

(see also Section 8, Sheet G160)

|                                                                                                                                                                  |                                                                                                                                                                                                                               |                                             |                                 |                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------|----------------------------------|
| The output of the speed limiting controller comprises a positive (K0136) and a negative (K0137) torque limit. These limits are applied to the torque limitation. |                                                                                                                                                                                                                               |                                             |                                 |                                  |
| <b>P509</b><br>*<br>(G160)                                                                                                                                       | <b>Source for input quantity (n-act) of speed limiting controller</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                               | All connector<br>numbers<br>1               | Ind: None<br>FS=167<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P510</b><br>*<br>(G160)                                                                                                                                       | <b>Source for pos. torque limit of speed limiting controller</b><br><br>Selection of the connector to be injected as the <b>limit value for torque limitation 1</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector<br>numbers<br>1               | Ind: None<br>FS=2<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P511</b><br>*<br>(G160)                                                                                                                                       | <b>Source for neg. torque limit of speed limiting controller</b><br><br>Selection of the connector to be injected as the <b>limit value for torque limitation 2</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector<br>numbers<br>1               | Ind: None<br>FS=4<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P512</b><br>FDS<br>(G160)                                                                                                                                     | <b>Maximum speed in positive direction of rotation</b>                                                                                                                                                                        | 0.0 to 199.9<br>[%]<br>0.1% of rated speed  | Ind: 4<br>FS=105.0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P513</b><br>FDS<br>(G160)                                                                                                                                     | <b>Maximum speed in negative direction of rotation</b>                                                                                                                                                                        | -199.9 to 0.0<br>[%]<br>0.1% of rated speed | Ind: 4<br>FS=-105.0<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P515</b><br>FDS<br>(G160)                                                                                                                                     | <b>P gain of speed limiting controller</b>                                                                                                                                                                                    | 0.10 to 200.00<br>0.01                      | Ind: 4<br>FS=3.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |

## 11.30 Friction compensation

(see also Section 8, Sheet G153)

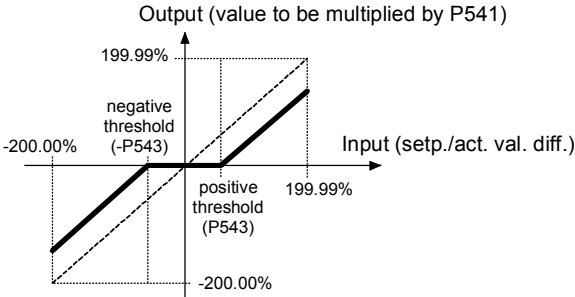
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| <p>Parameters P520 to P530 are the armature current and torque setpoint required for a stationary input signal (factory setting: speed controller actual value K0179) of 0%, 10% to 100% of the maximum value (in steps of 10%).</p> <p>These parameters are intermediate points along the friction curve. Depending on P170 (0 or 1) they are either an armature current or a torque setpoint and are set automatically when the friction and moment of inertia compensation (P051=28) are optimized. P520 is then set to 0.0%.</p> <p>The intermediate points are interpolated linearly during which the output of the friction compensation assumes the sign of the input signal. P530 is specified by the friction compensation even for input signals &gt;100% of the maximum signal.</p> <p>During operation in both directions we recommend leaving P520 at 0.0% in order to avoid armature current vibration at 0% of the input signal.</p> |  |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|

| PNU                          | Description                                                                                                                                                                                                                                                                                                                                          | Value range<br>[Unit]       | No. indices                                       | See<br>Change                    |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------|----------------------------------|
| <b>P519</b><br>*<br>(G153)   | <b>Source for input signal of the friction compensation</b> [SW 2.0 and later]<br><br>Selection of the input signals that are added and led to the input of the friction compensation.<br><br>i001 Input signal, with sign<br>i002 Input signal with absolute value generator<br><br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | All connector numbers<br>1  | Ind: 2<br>FS=<br>i001: 179<br>i002: 0<br>Type: L2 | P052 = 3<br>P051 = 40<br>offline |
| <b>P520</b><br>FDS<br>(G153) | <b>Friction at 0% speed</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                                        | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |
| <b>P521</b><br>FDS<br>(G153) | <b>Friction at 10% speed</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                                       | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |
| <b>P522</b><br>FDS<br>(G153) | <b>Friction at 20% speed</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                                       | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |
| <b>P523</b><br>FDS<br>(G153) | <b>Friction at 30% speed</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                                       | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |
| <b>P524</b><br>FDS<br>(G153) | <b>Friction at 40% speed</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                                       | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |
| <b>P525</b><br>FDS<br>(G153) | <b>Friction at 50% speed</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                                       | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |
| <b>P526</b><br>FDS<br>(G153) | <b>Friction at 60% speed</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                                       | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |
| <b>P527</b><br>FDS<br>(G153) | <b>Friction at 70% speed</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                                       | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |
| <b>P528</b><br>FDS<br>(G153) | <b>Friction at 80% speed</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                                       | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |
| <b>P529</b><br>FDS<br>(G153) | <b>Friction at 90% speed</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                                       | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |
| <b>P530</b><br>FDS<br>(G153) | <b>Friction at 100% speed and higher</b><br><br>Setting as % of converter rated DC current or rated torque                                                                                                                                                                                                                                           | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 4<br>FS=0.0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Online  |

### 11.31 Compensation of moment of inertia (dv/dt injection)

(see also Section 8, Sheet G153)

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |                               |                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|---------------------------------|
| <b>P540</b><br>FDS<br>(G153) | <b>Acceleration time</b><br><br>The acceleration time is the time that would be needed to accelerate the drive from 0% to 100% of maximum speed (with no friction) at 100% converter rated DC current (armature) and 100% rated motor field current (i.e. 100% flux). It is a measure of the moment of inertia on the motor shaft. This parameter is set automatically during the optimization run for friction and moment of inertia compensation (P051=28). | 0.00 to 650.00<br>[s]<br>0.01s | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P541</b><br>FDS<br>(G153) | <b>P gain of acceleration</b><br><br>Proportional gain for "SAD-dependent acceleration" function (see also parameter P543)                                                                                                                                                                                                                                                                                                                                    | 0.00 to 650.00<br>0.01         | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |

| PNU                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Value range<br>[Unit]                           | No. indices                   | See<br>Change                   |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------|---------------------------------|
| <b>P542</b><br><br>FDS<br>(G136) | <b>Time difference for dy/dt of ramp-function generator</b><br><br>Ramp-function generator:<br>Setting of $dt$ for the output of $dy/dt$ at a connector, i.e. at K0191, the change in the output quantity of the ramp-function generator (K0190) is output within the period set in P542<br><br>Example: The ramp-function generator is currently ramping up with a ramp-up time of $P311=5s$ , i.e. a ramp-up operation from $y=0\%$ to $y=100\%$ takes 5s.<br>- A time difference $dt$ of $P542=2s$ is set.<br>- $\Rightarrow$ A $dy/dt$ of 40% appears at connector K0191 since the $dy$ within the set $dt$ of 2 s equals $(2s/5s)*100\%$ ..<br>see also parameter P330 | 0.01 to 300.00<br>[s]<br>0.01s                  | Ind: 4<br>FS=0.01<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P543</b><br><br>FDS<br>(G153) | <b>Threshold for SAD-dependent acceleration</b><br><br>With respect to the SAD-dependent acceleration function, only the component of the speed controller setpoint/actual value difference which has an absolute value in excess of the threshold set in this parameter is switched through (see also parameter P541).<br><br>                                                                                                                                                                                                                                                           | 0.00 to 100.00<br>[%]<br>0.01% of maximum speed | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P546</b><br>FDS<br>(G153)     | <b>Filter time for compensation of moment of inertia</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0 to 10000<br>[ms]<br>1ms                       | Ind: 4<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.32 Speed controller

(see also Section 8, Sheet G151)

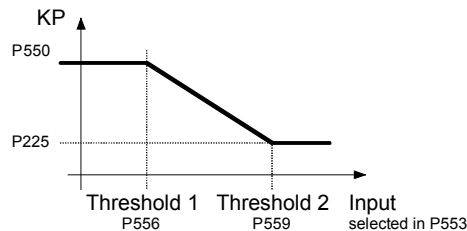
further parameters for the speed controller P200 - P236

### Speed controller adaptation

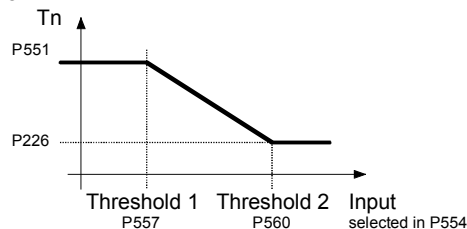
The parameters of the speed controller ( $K_p$ ,  $T_n$ , droop) can be altered as a function of any connector to adapt the speed controller optimally to a changing controlled system.

The diagrams below show the active P gain, the active Integration time and the active droop depending on the value of the set connector.

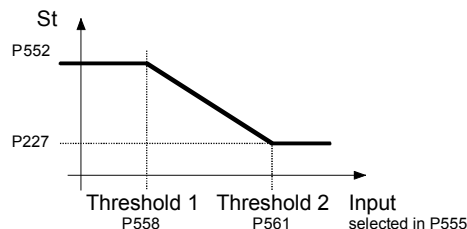
Adaptation of the P gain:



Adaptation of the integration time:



Adaptation of the droop:



For parameter pairs P225/P550, P226/P551 and P227/P552 all values can be set completely mutually independently, e.g., P550 does not have to be greater than P225. The above diagrams show only the effect of the individual parameters.

Threshold 1 must always be set smaller than threshold 2, otherwise the fault message F058 is activated.

|                                   |                                                                                                                                                                                                                                                                       |                                  |                                |                                   |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------|-----------------------------------|
| <b>P550</b><br>FDS<br>(G151)      | <b>P gain in the adaptation range</b><br>Value of $K_p$ , if Influencing quantity $\leq$ Threshold 1                                                                                                                                                                  | 0.10 to 200.00<br>0.01           | Ind: 4<br>FS=3.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P551</b><br>FDS<br>(G151)      | <b>Integration time in the adaptation range</b><br>Value of $T_n$ , if Influencing quantity $\leq$ Threshold 1                                                                                                                                                        | 0.010 to 10.000<br>[s]<br>0.001s | Ind: 4<br>FS=0.650<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P552</b><br>FDS<br>(G151)      | <b>Droop in the adaptation range</b><br>Value of droop, if Influencing quantity $\leq$ Threshold 1                                                                                                                                                                    | 0.0 to 10.0<br>[%]<br>0.1%       | Ind: 4<br>FS=0.0<br>Type: O2   | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P553</b><br>*<br>FDS<br>(G151) | <b>Source for the Influencing quantity of the <math>K_p</math> adaptation</b><br>Selection of which connector is connected at the influencing quantity for adaptation of the n controllers P gain<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.           | All connector<br>numbers<br>1    | Ind: 4<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>off-line |
| <b>P554</b><br>*<br>FDS<br>(G151) | <b>Source for the Influencing quantity of the <math>T_n</math>-adaptation</b><br>Selection of which connector is connected at the influencing quantity for adaptation of the n controllers integration time<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector<br>numbers<br>1    | Ind: 4<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>off-line |

| PNU                               | Description                                                                                                                                                                                                                                         | Value range<br>[Unit]          | No. indices                   | See<br>Change                     |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------------------|
| <b>P555</b><br>*<br>FDS<br>(G151) | <b>Source for the Influencing quantity of the droop adaptation</b><br><br>Selection of which connector is connected at the influencing quantity for adaptation of the n controllers droop<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | All connector<br>numbers<br>1  | Ind: 4<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>off-line |
| <b>P556</b><br>FDS<br>(G151)      | <b>Adaptation n controller P gain: Threshold 1</b>                                                                                                                                                                                                  | 0.00 to 100.00<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P557</b><br>FDS<br>(G151)      | <b>Adaptation n controller integration time: Threshold 1</b>                                                                                                                                                                                        | 0.00 to 100.00<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P558</b><br>FDS<br>(G151)      | <b>Adaptation n controller droop: Threshold 1</b>                                                                                                                                                                                                   | 0.00 to 100.00<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P559</b><br>FDS<br>(G151)      | <b>Adaptation n controller P gain: Threshold 2</b>                                                                                                                                                                                                  | 0.00 to 100.00<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P560</b><br>FDS<br>(G151)      | <b>Adaptation n controller integration time: Threshold 2</b>                                                                                                                                                                                        | 0.00 to 100.00<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>P561</b><br>FDS<br>(G151)      | <b>Adaptation n controller droop: Threshold 2</b>                                                                                                                                                                                                   | 0.00 to 100.00<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |

#### Speed controller - speed droop limitation

|                              |                                        |                                 |                                  |                                 |
|------------------------------|----------------------------------------|---------------------------------|----------------------------------|---------------------------------|
| <b>P562</b><br>FDS<br>(G151) | <b>Positive speed droop limitation</b> | 0.00 to 199.99<br>[%]<br>0.01%  | Ind: 4<br>FS=100.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online |
| <b>P563</b><br>FDS<br>(G151) | <b>Negative speed droop limitation</b> | -199.99 to 0.00<br>[%]<br>0.01% | Ind: 4<br>FS=-100.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |

#### Speed controller optimization for drives with oscillating mechanical system

On drives with oscillating mechanical components, it can be useful to optimize the speed controller using optimization run P051=29. The frequency response of the controlled system for frequencies from 1 Hz to 100 Hz is recorded during optimization.

The drive is first accelerated up to a base speed (P565, FS=20%). A sinusoidal speed setpoint with low amplitude (P566, FS=1%) is then injected. The frequency of this supplementary setpoint is incremented in 1 Hz steps from 1 Hz up to 100 Hz. An average per frequency is calculated over a parameterizable number of current peaks (P567, FS=300).

|             |                                                                                                                                                                                                                                                                                                                                                                                     |                              |                                  |                                  |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------------------------|----------------------------------|
| <b>P565</b> | <b>Base speed for frequency response recording</b> [SW 1.9 and later]                                                                                                                                                                                                                                                                                                               | 1.0 to 30.0<br>[%]<br>0.1%   | Ind: None<br>FS=20.0<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| <b>P566</b> | <b>Amplitude for frequency response recording</b> [SW 1.9 and later]                                                                                                                                                                                                                                                                                                                | 0.01 to 5.00<br>[%]<br>0.01% | Ind: None<br>FS=1.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| <b>P567</b> | <b>Number of current peaks for frequency response recording</b> [SW 1.9 and later]<br><br>While the frequency response is being recorded, an average over the number of current peaks set here is calculated for each measuring frequency. High values improve the result, but extend the measuring time. When P567 = 1000, the frequency response recording takes about 9 minutes. | 100 to 1000<br>1             | Ind: None<br>FS=300<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line |



| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

### 11.33 Field reversal

(see also Section 9)

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                            |                                 |                                   |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------|-----------------------------------|
| <b>P580</b><br>*<br>BDS<br><br>(G200) | <b>Source for selection of "Direction of rotation reversal using field reversal"</b><br><br>Selection of binector to control the "Direction of rotation reversal using field reversal" function<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.<br><br>Signal 0: Positive field direction is selected (B0260 = 1, B0261 = 0), actual speed value is not inverted<br>Signal 1: Negative field direction is selected (B0260 = 0, B0261 = 1), actual speed value is inverted | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P581</b><br>*<br>BDS<br><br>(G200) | <b>Source for selection of "Braking with field reversal"</b><br><br>Selection of binector to control the "Braking with field reversal" function<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.<br><br>Signal change 0→1: Reversal of field direction (causes braking);<br>When n<n-min is reached, the original field direction is selected again. The drive switches to state o7.2                                                                                      | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P582</b><br>*<br>BDS<br><br>(G200) | <b>Source for selection of "Field reversal"</b> [SW 1.9 and later]<br><br>Selection of binector to control "Field reversal" function<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.<br><br>Signal 0: Positive field direction is selected (B0260 = 1, B0261 = 0)<br>Signal 1: Negative field direction is selected (B0260 = 0, B0261 = 1)                                                                                                                                | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>off-line |
| <b>P583</b><br>*<br><br>(G200)        | <b>Source for actual speed signal for field reversal logic</b> [SW 1.9 and later]<br><br>Selection of connector to be used as actual speed value for the field reversal logic.<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                            | All connector numbers<br>1 | Ind: None<br>FS=167<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

### 11.34 Input quantities for signals

(see also Section 8, Sheet G187 and G188)

|                                |                                                                                                                                                                                                                                                                                                    |                            |                                 |                                  |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------|----------------------------------|
| <b>P590</b><br>*<br><br>(G187) | <b>Source for setpoint of "nset = nact signal 1"</b><br><br>Setpoint/actual value deviation signal:<br>Selection of connector to be injected as input quantity "n <sub>set</sub> " for the setpoint/actual value deviation signal.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.       | All connector numbers<br>1 | Ind: None<br>FS=174<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P591</b><br>*<br><br>(G187) | <b>Source for actual value of "n-set = n-act signal 1"</b><br><br>Setpoint/actual value deviation signal:<br>Selection of connector to be injected as input quantity "n <sub>act</sub> " for the setpoint/actual value deviation signal.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=167<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                        | Description                                                                                                                                                                                                                                                                                                         | Value range [Unit]         | No. indices                     | See Change                        |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------|-----------------------------------|
| <b>P592</b><br>*<br>(G187) | <b>Source for actual value of "n &lt; n<sub>comp</sub> signal"</b><br><br>n < n <sub>comp</sub> signal:<br>Selection of connector to be injected as input quantity (n) for the n < n <sub>comp</sub> signal.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                              | All connector numbers<br>1 | Ind: None<br>FS=167<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P593</b><br>*<br>(G187) | <b>Source for actual value of "n &lt; n<sub>min</sub> signal"</b><br><br>n < n <sub>min</sub> signal:<br>Selection of connector to be injected as input quantity (n) for the n < n <sub>min</sub> signal.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                 | All connector numbers<br>1 | Ind: None<br>FS=167<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P594</b><br>*<br>(G188) | <b>Source for input quantity of "Polarity signal"</b><br><br>Polarity signal of speed setpoint:<br>Selection of connector to be injected as input quantity "n <sub>set</sub> " for the polarity signal of the speed setpoint.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                             | All connector numbers<br>1 | Ind: None<br>FS=170<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P595</b><br>*<br>(G188) | <b>Source for actual value of "Overspeed signal"</b><br><br>Overspeed signal:<br>Selection of connector to be injected as input quantity "n <sub>act</sub> " for the overspeed signal.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                    | All connector numbers<br>1 | Ind: None<br>FS=167<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>P596</b><br>*<br>(G187) | <b>Source for setpoint of "nset = nact signal 2"</b> [SW 1.9 and later]<br><br>Setpoint/actual value deviation signal:<br>Selection of connector to be injected as input quantity "n <sub>set</sub> " for the setpoint/actual value deviation signal.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.     | All connector numbers<br>1 | Ind: None<br>FS=174<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>P597</b><br>*<br>(G187) | <b>Source for actual value of "nset = nact signal 2"</b> [SW 1.9 and later]<br><br>Setpoint/actual value deviation signal:<br>Selection of connector to be injected as input quantity "n <sub>act</sub> " for the setpoint/actual value deviation signal.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=167<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

## 11.35 Configuring of closed-loop control

| Setting values for configuring of torque shell |                                                                                                                                                                                                                                                            |                            |                                                                        |                                   |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------------------------------------------------|-----------------------------------|
| <b>P600</b><br>*<br>(G163)                     | <b>Source for gating unit input (armature)</b><br><br>i001 to i004:<br>Selects which connectors are applied as the <b>gating unit input (armature)</b> . All four values are added.<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 4<br>FS=<br>i001: 102<br>i002: 0<br>i003: 0<br>i004: 0<br>Typ: L2 | P052 = 3<br>P051 = 40<br>off-line |

| PNU                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Value range<br>[Unit]      | No. indices                                                                                            | See<br>Change                    |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>P601</b><br>*<br><br>(G160)<br>(G161)<br>(G162) | <b>Source for armature current controller setpoint</b><br><br>i001,i002 Speed limiting controller:<br>Selection of connectors to be injected as <b>input quantities for the speed limiting controller</b> . Both values are added.<br><br>i003,i004 Current limitation:<br>Selection of connectors to be injected as <b>armature current controller setpoint</b> (before current limitation). Both values are added.<br><br>i005,i006 Current control: [SW 1.8 and later]<br>Selection of which connectors are connected as the <b>armature current controller setpoint</b> (before current controller). The two values are added. The magnitude is formed from the value selected with index 6.<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                            | All connector numbers<br>1 | Ind: 6<br>FS=<br>i001: 141<br>i002: 0<br>i003: 134<br>i004: 0<br>i005: 125<br>i006: 0<br>Type: L2      | P052 = 3<br>P051 = 40<br>Offline |
| <b>P602</b><br>*<br><br>(G162)                     | <b>Source for armature current controller actual value</b><br><br>Selection of connector to be injected as <b>armature current controller actual value</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | All connector numbers<br>1 | Ind: None<br>FS=117<br>Type: L2                                                                        | P052 = 3<br>P051 = 40<br>Offline |
| <b>P603</b><br>*<br><br>(G161)                     | <b>Source for variable current limit in torque direction I</b><br><br>i001..i004 Selection of connector to be injected as <u>variable</u> current limit in torque direction I<br>Normalization: +100% corresponds to P100*P171<br><br>i005 Selection of connector to be injected as current limit in torque direction I with <u>Fast Stop or Shutdown</u><br>Normalization: +100% corresponds to P100*P171<br><br>i006 Selection of connector to be injected as <u>variable</u> current limit in torque direction I<br>Normalization: +100% corresponds to r072.002<br>[can be set in SW 1.9 and later]<br><br>i007 Selection of connector to be injected as current limit in torque direction I with <u>Emergency Stop or Shutdown</u><br>Normalization: +100% corresponds to r072.002<br>[can be set in SW 1.9 and later]<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 7<br>FS=<br>i001: 1<br>i002: 1<br>i003: 1<br>i004: 1<br>i005: 1<br>i006: 2<br>i007: 2<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Value range<br>[Unit]      | No. indices                  | See<br>Change                    |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------|----------------------------------|
| <b>P604</b><br>*<br><br>(G161)        | <b>Source for variable current limit in torque direction II</b><br><br>i001..i004 Selection of connector to be injected as <u>variable</u> current limit in torque direction II<br>Normalization: -100% corresponds to P100*P172<br><br>i005 Selection of connector to be injected as current limit in torque direction II with <u>Fast Stop or Shutdown</u><br>Normalization: -100% corresponds to P100*P172<br><br>i006 Selection of connector to be injected as <u>variable</u> current limit in torque direction II<br>Normalization: -100% corresponds to r072.002<br>[can be set in SW 1.9 and later]<br><br>i007 Selection of connector to be injected as current limit in torque direction II with <u>Emergency Stop or Shutdown</u><br>Normalization: -100% corresponds to r072.002<br>[can be set in SW 1.9 and later]<br><br>Settings:<br>0 = connector K0000<br>...<br>8 = connector K0008<br>9 = value as set in parameter P603.ixx * (-1)<br>10 = connector K0010<br>etc. | All connector numbers<br>1 | Ind: 7<br>FS=9<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P605</b><br>*<br><br>(G160)        | <b>Source for variable positive torque limit</b><br><br>Torque limitation:<br>Selection of connectors to be injected as the <b>variable positive torque limit</b><br><br>i001..i004 Normalization:<br>100% of the connector value corresponds to the positive system torque limit according to $I_a=P171$ and $I_f = P102$<br>i005 Normalization:<br>100% of the connector value corresponds to the positive torque limit according to $I_a=r072.002$ and $I_f = P102$<br>[can be set in SW 1.9 and later]<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                    | All connector numbers<br>1 | Ind: 5<br>FS=2<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P606</b><br>*<br><br>(G160)        | <b>Source for variable negative torque limit</b><br><br>Torque limitation:<br>Selection of connectors to be injected as the <b>variable negative torque limit</b><br><br>i001..i004 Normalization:<br>100% of the connector value corresponds to the negative system torque limit according to $I_a=P172$ and $I_f = P102$<br>i005 Normalization:<br>100% of the connector value corresponds to the negative torque limit according to $I_a=r072.002$ and $I_f = P102$<br>[can be set in SW 1.9 and later]<br><br>0 = connector K0000<br>...<br>8 = connector K0008<br>9 = value as set in parameter P605 * (-1)<br>10 = connector K0010<br>etc.                                                                                                                                                                                                                                                                                                                                        | All connector numbers<br>1 | Ind: 5<br>FS=9<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P607</b><br>*<br>BDS<br><br>(G160) | <b>Source for torque setpoint for master drive</b><br><br>Torque limitation:<br>Selection of connector to be injected as the torque setpoint for a master drive<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | All connector numbers<br>1 | Ind: 2<br>FS=148<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Value range<br>[Unit]      | No. indices                                                             | See<br>Change                    |
|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------------------------------------------------|----------------------------------|
| <b>Speed controller</b>                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |                                                                         |                                  |
| <b>P609</b><br>*<br>(G151)                                                 | <b>Source for actual speed controller value</b><br>Selection of connector to be injected as the <b>actual speed controller value</b> when P083=4<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                               | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2                                           | P052 = 3<br>P051 = 40<br>Offline |
| <b>Setting values for configuring of closed-loop field and EMF control</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |                                                                         |                                  |
| <b>P610</b><br>*<br>(G166)                                                 | <b>Source for gating unit input (field)</b><br>Selection of connector to be applied to the <b>gating unit input (field)</b><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                    | All connector numbers<br>1 | Ind: None<br>FS=252<br>Type: L2                                         | P052 = 3<br>P051 = 40<br>Offline |
| <b>P611</b><br>*<br>(G165)                                                 | <b>Source for field current controller setpoint</b><br><b>Limitation at EMF controller output:</b><br>Selection of connectors to be injected as the <b>field current controller setpoint</b> . The connectors selected in the four indices are added.<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                          | All connector numbers<br>1 | Ind: 4<br>FS=<br>i001: 277<br>i002: 0<br>i003: 0<br>i004: 0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P612</b><br>*<br>(G166)                                                 | <b>Source for actual field current controller value</b><br>Selection of connectors to be injected as the <b>field current controller actual value</b> . The two values are added.<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                              | All connector numbers<br>1 | Ind: 2<br>FS=<br>i001: 266<br>i002: 0<br>Type: L2                       | P052 = 3<br>P051 = 40<br>Offline |
| <b>P613</b><br>*<br>(G165)                                                 | <b>Source for variable field current setpoint upper limit</b><br><b>Limitation at EMF controller output</b><br>Selection of connector to be injected as the <b>variable field current setpoint upper limit</b><br>i001..i004 Normalization:<br>100% of the connector value corresponds to the rated excitation current of the motor (P102)<br>i005 Normalization:<br>100% of the connector value corresponds to the actual converter rated DC current (field) (r073.002)<br>[can be set in SW 1.9 and later]<br>0 = connector K0000<br>1 = connector K0001<br>etc.   | All connector numbers<br>1 | Ind: 5<br>FS=1<br>Type: L2                                              | P052 = 3<br>P051 = 40<br>Offline |
| <b>P614</b><br>*<br>(G165)                                                 | <b>Source for variable field current setpoint lower limit</b><br><b>Limitation at EMF controller output</b><br>Selection of connector to be injected as the <b>variable field current setpoint lower limit</b><br>i001..i004 Normalization:<br>100% of the connector value corresponds to the minimum excitation current of the motor (P103)<br>i005 Normalization:<br>100% of the connector value corresponds to the actual converter rated DC current (field) (r073.002)<br>[can be set in SW 1.9 and later]<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 5<br>FS=1<br>Type: L2                                              | P052 = 3<br>P051 = 40<br>Offline |

| PNU                        | Description                                                                                                                                                                                                                                      | Value range [Unit]         | No. indices                                                             | See Change                       |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------------------------------------------------|----------------------------------|
| <b>P615</b><br>*<br>(G165) | <b>Source for EMF controller setpoint</b><br><br>Selection of connectors to be injected as the <b>EMF controller setpoint</b> . The connectors selected in the four indices are added.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 4<br>FS=<br>i001: 289<br>i002: 0<br>i003: 0<br>i004: 0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P616</b><br>*<br>(G165) | <b>Source for actual EMF controller value</b><br><br>Selection of connector to be injected as the <b>actual EMF controller value</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                   | All connector numbers<br>1 | Ind: None<br>FS=286<br>Type: L2                                         | P052 = 3<br>P051 = 40<br>Offline |

#### Configuring of injection of acceleration value

|                            |                                                                                                                                                                                                 |                            |                                 |                                  |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------|----------------------------------|
| <b>P619</b><br>*<br>(G153) | <b>Source for acceleration injection value</b><br><br>Selection of connector to be applied as the <b>acceleration injection value</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=191<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------|----------------------------------|

#### Speed controller

##### Speed controller, setpoint/actual value deviation

Function: The connectors selected in parameters P621 and P622 are added and those selected in P623 and 624 subtracted

|                            |                                                                                                                                                                                                    |                            |                                 |                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------|----------------------------------|
| <b>P620</b><br>*<br>(G152) | <b>Source for speed controller setpoint/actual value deviation</b><br><br>Selection of connector to be injected as the control deviation<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=165<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P621</b><br>*<br>(G152) | <b>Source for speed controller setpoint</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                              | All connector numbers<br>1 | Ind: None<br>FS=176<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P622</b><br>*<br>(G152) | <b>Source for speed controller setpoint</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                              | All connector numbers<br>1 | Ind: None<br>FS=174<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P623</b><br>*<br>(G152) | <b>Source for actual speed controller value</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                          | All connector numbers<br>1 | Ind: None<br>FS=179<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P624</b><br>*<br>(G152) | <b>Source for actual speed controller value</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                          | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |

##### Speed controller: Filtering of setpoint and actual value, band-stop filters

|                                   |                                                                                                                                                                                                             |                            |                              |                                  |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------|----------------------------------|
| <b>P625</b><br>*<br>FDS<br>(G152) | <b>Source for speed controller setpoint</b><br><br>Selection of connector to be injected as the input signal for speed setpoint filtering<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.         | All connector numbers<br>1 | Ind: 4<br>FS=170<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P626</b><br>*<br>FDS<br>(G152) | <b>Source for actual speed controller value</b><br><br>Selection of connector to be injected as the input signal for actual speed value filtering<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 4<br>FS=167<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Description                                                                                                                                                                                                                                                                                      | Value range<br>[Unit]         | No. indices                     | See<br>Change                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------|----------------------------------|
| <b>P627</b><br>*<br><br>(G152)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Source for input of D element</b><br><br>Selection of connector to be injected as the input signal for the D element<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                | All connector<br>numbers<br>1 | Ind: None<br>FS=178<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P628</b><br>*<br><br>(G152)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Source for input of band-stop filter 1</b><br><br>Selection of connector to be injected as the input signal for band-stop filter 1<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                  | All connector<br>numbers<br>1 | Ind: None<br>FS=179<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P629</b><br>*<br><br>(G152)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Source for band-stop filter 2</b><br><br>Selection of connector to be injected as the input signal for band-stop filter 2<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                           | All connector<br>numbers<br>1 | Ind: None<br>FS=177<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>Speed controller droop</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                  |                               |                                 |                                  |
| <b>P630</b><br>*<br><br>(G151)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Source for influencing quantity for speed droop</b><br><br>Selection of connector to be injected as the influencing quantity<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                        | All connector<br>numbers<br>1 | Ind: None<br>FS=162<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>Setting the speed controller I component</b><br><br>Function: When the binector selected in P695 switches state from log. "0" to log. "1", the I component of the speed controller is set to the value of the connector selected in P631.<br>With this function it is possible, for example, to use the same signal (binector) to control controller enabling commands and setting of the I component.                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                  |                               |                                 |                                  |
| <b>P631</b><br>*<br><br>(G152)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Source for setting value for speed controller integrator</b><br><br>Selection of connector to be injected as the setting value for the I component<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                  | All connector<br>numbers<br>1 | Ind: None<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>Setting values for configuring the setpoint processing function and ramp-function generator</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                  |                               |                                 |                                  |
| <b>Limitation at ramp-function generator output (setpoint limitation)</b><br><br>(see also Section 8, Sheet G136)<br><br>The effective limitations are:<br>Upper limit: Minimum value of P300 and the four connectors selected with P632<br>Lower limit: Maximum value of P301 and the four connectors selected with P633<br><br>Note: The limiting values for both the positive and negative setpoint limits can have a positive or negative sign. The negative setpoint limit, for example, can therefore be parameterized to a positive value and the positive setpoint limit to a negative value. |                                                                                                                                                                                                                                                                                                  |                               |                                 |                                  |
| <b>P632</b><br>*<br><br>(G137)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Source for variable positive limitation at ramp-function generator output</b><br><br>Selection of connectors to be injected at the <b>variable positive limitation at the ramp-function generator output</b> (setpoint limitation).<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector<br>numbers<br>1 | Ind: 4<br>FS=1<br>Type: L2      | P052 = 3<br>P051 = 40<br>Offline |

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Value range [Unit]         | No. indices                                       | See Change                       |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------------------|----------------------------------|
| <b>P633</b><br>*<br>(G137)        | <b>Source for variable negative limitation at ramp-function generator output</b><br><br>Selection of connectors to be injected at the <b>variable negative limitation at the ramp-function generator output</b> (setpoint limitation).<br><br>0 = connector K0000<br>...<br>8 = connector K0008<br>9 = value as set in parameter P632 * (-1)<br>10 = connector K0010<br>etc.                                                                                                                                                                               | All connector numbers<br>1 | Ind: 4<br>FS=9<br>Type: L2                        | P052 = 3<br>P051 = 40<br>Offline |
| <b>P634</b><br>*<br>(G137)        | <b>Source for limitation input at ramp-function generator output</b><br><br>Selection of connectors which must be added up to provide the <b>limitation input at the ramp-function generator output</b> (setpoint limitation).<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                   | All connector numbers<br>1 | Ind: 2<br>FS=<br>i001: 190<br>i002: 0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P635</b><br>*<br>FDS<br>(G135) | <b>Source for ramp-function generator setpoint</b><br><br>Selection of connector to be injected as the ramp-function generator setpoint<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                          | All connector numbers<br>1 | Ind: 4<br>FS=194<br>Type: L2                      | P052 = 3<br>P051 = 40<br>Offline |
| <b>P636</b><br>*<br>(G136)        | <b>Source for reduction signal for ramp-function generator times</b><br><br>Selection of connector to be injected as the <b>reduction signal for the ramp-function generator times</b><br><br>i001 acts on ramp-up and ramp-down time (P303, P304)<br>i002 acts on lower and upper transition roundings (P305, P306)<br>i003 acts on ramp-up time (P303)<br>i004 acts on ramp-down time (P304)<br>i005 acts on lower transition rounding (P305)<br>i006 acts on upper transition rounding (P306)<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 6<br>FS=1<br>Type: L2                        | P052 = 3<br>P051 = 40<br>Offline |
| <b>P637</b><br>*<br>BDS<br>(G136) | <b>Source for selection of "Ramp-function generator setting 2"</b><br><br>Selection of binector to control switchover to " <b>Ramp-function generator setting 2</b> ".<br>With a log. "1" signal at the binector, ramp-function generator parameter set 2 (P307 - P310) is selected. This function has a higher priority than the ramp-up integrator function.<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                     | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2                        | P052 = 3<br>P051 = 40<br>Offline |
| <b>P638</b><br>*<br>BDS<br>(G136) | <b>Source for selection of "Ramp-function generator setting 3"</b><br><br>Selection of binector to control switchover to " <b>Ramp-function generator setting 3</b> ".<br>With a log. "1" signal at the binector, ramp-function generator parameter set 3 (P311 - P314) is selected. This function has a higher priority than the ramp-up integrator function.<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                     | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2                        | P052 = 3<br>P051 = 40<br>Offline |

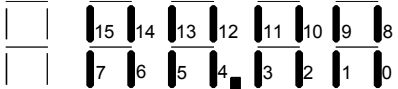
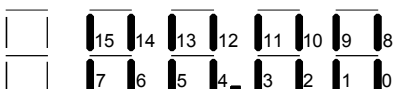


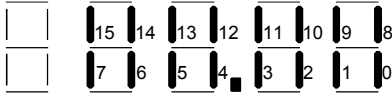
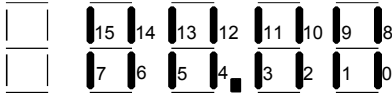
| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Value range<br>[Unit]      | No. indices                  | See<br>Change                      |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------|------------------------------------|
| <b>P639</b><br>*<br>(G136)        | <b>Source for the ramp-function generator setting values</b><br>Selection of the connectors that are connected as the <b>ramp-function generator setting values</b> .<br><br>i001 Setting value for the ramp-function generator output in state log. "1" of the binector selected via P640<br>i002 Setting value for the ramp-function generator output if the drive is not in state "Operating" (B0104=0) <u>and</u> the binector selected via P640 is in state log. "0"<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.                  | All connector numbers<br>1 | Ind: 2<br>FS=167<br>Type: L2 | P052 = 3<br>P051 = 40<br>≥off-line |
| <b>P640</b><br>*<br>BDS<br>(G136) | <b>Source for selection of "Set ramp-function generator"</b><br>Selection of binector to control the <b>"Set ramp-function generator"</b> function<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                           | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline   |
| <b>P641</b><br>*<br>BDS<br>(G136) | <b>Source for selection of "Bypass ramp-function generator"</b><br>Selection of binector to control the <b>"Bypass ramp-function generator"</b> function<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                     | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline   |
| <b>P642</b><br>*<br>(G135)        | <b>Source for variable positive limitation of main setpoint</b><br>Selection of connectors to be injected at the <b>variable positive limitation of the main setpoint</b> .<br>The lowest value in each case of the connectors selected via the 4 indices is applied as the limit.<br><br>Note: Negative values at the selected connectors result in a negative maximum value at the output of the limitation.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                             | All connector numbers<br>1 | Ind: 4<br>FS=2<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline   |
| <b>P643</b><br>*<br>(G135)        | <b>Source for variable negative limitation of main setpoint</b><br>Selection of connectors to be injected at the <b>variable negative limitation of the main setpoint</b> .<br>The lowest value in each case of the connectors selected via the 4 indices is applied as the limit.<br><br>Note: Positive values at the selected connectors result in a positive minimum value at the output of the limitation.<br><br>0 = connector K0000<br>...<br>8 = connector K0008<br>9 = value as set in parameter P642 * (-1)<br>10 = connector K0010<br>etc. | All connector numbers<br>1 | Ind: 4<br>FS=9<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline   |
| <b>P644</b><br>*<br>FDS<br>(G135) | <b>Source for main setpoint</b><br>Selection of connector to be injected as the main setpoint<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                              | All connector numbers<br>1 | Ind: 4<br>FS=206<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline   |
| <b>P645</b><br>*<br>FDS<br>(G135) | <b>Source for additional setpoint</b><br>Selection of connector to be injected as an additional setpoint<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                   | All connector numbers<br>1 | Ind: 4<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline   |

| PNU                               | Description                                                                                                                                                                                                                                               | Value range<br>[Unit]     | No. indices                | See<br>Change                    |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>P646</b><br>*<br>BDS<br>(G136) | <b>Source for enable signal for ramp-up integrator switchover</b><br>Selection of binector to control enabling of the <b>ramp-function integrator switchover function</b> .<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                       | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P647</b><br>*<br>BDS<br>(G136) | <b>Source for enable signal for ramp-function generator tracking</b><br>[SW 2.1 and later]<br>Selection of binector to control enabling of the <b>ramp-function generator tracking function</b> .<br><br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.36 Control word, status word

| Selection of sources of control words 1 and 2 |                                                                                                                                                                                                                                                                                                              |                            |                            |                                  |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------------|
| <b>P648</b><br>*<br>BDS<br>(G180)             | <b>Source for control word 1</b><br>Selection of connector to act as the source for control word 1.<br><br>0 = connector K0000<br>...<br>8 = connector K0008<br>9 = parameters P654 to P675 are effective<br>(every individual bit of control word 1 is input by a binector)<br>10 = connector K0010<br>etc. | All connector numbers<br>1 | Ind: 2<br>FS=9<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P649</b><br>*<br>BDS<br>(G181)             | <b>Source for control word 2</b><br>Selection of connector to act as the source for control word 2.<br><br>0 = connector K0000<br>...<br>8 = connector K0008<br>9 = parameters P676 to P691 are effective<br>(every individual bit of control word 2 is input by a binector)<br>10 = connector K0010<br>etc. | All connector numbers<br>1 | Ind: 2<br>FS=9<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| Display of control words 1 and 2 |                                                                                                                                                                                                                                                                                                                                                                     |  |                       |          |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|----------|
| <b>r650</b><br>(G180)            | <b>Display of control word 1</b><br>Mode of representation on operator panel (PMU):<br><br><br>Segments 0 to 15 correspond to bits 0 to 15 of the control word<br><br>Segment ON: Corresponding bit is in log. "1" state<br>Segment OFF: Corresponding bit is in log. "0" state  |  | Ind: None<br>Type: V2 | P052 = 3 |
| <b>r651</b><br>(G181)            | <b>Display of control word 2</b><br>Mode of representation on operator panel (PMU):<br><br><br>Segments 0 to 15 correspond to bits 16 to 31 of the control word<br><br>Segment ON: Corresponding bit is in log. "1" state<br>Segment OFF: Corresponding bit is in log. "0" state |  | Ind: None<br>Type: V2 | P052 = 3 |

| PNU                                    | Description                                                                                                                                                                                                                                                                                                                                             | Value range<br>[Unit] | No. indices           | See<br>Change |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|---------------|
| <b>Display of status words 1 and 2</b> |                                                                                                                                                                                                                                                                                                                                                         |                       |                       |               |
| <b>r652</b><br>(G182)                  | <b>Display of status word 1</b><br>Mode of representation on operator panel (PMU):<br><br>Segments 0 to 15 correspond to bits 0 to 15 of the status word<br>Segment ON: Corresponding bit is in log. "1" state<br>Segment OFF: Corresponding bit is in log. "0" state  |                       | Ind: None<br>Type: V2 | P052 = 3      |
| <b>r653</b><br>(G183)                  | <b>Display of status word 2</b><br>Mode of representation on operator panel (PMU):<br><br>Segments 0 to 15 correspond to bits 16 to 31 of the status word<br>Segment ON: Corresponding bit is in log. "1" state<br>Segment OFF: Corresponding bit is in log. "0" state |                       | Ind: None<br>Type: V2 | P052 = 3      |

The following parameters are used to select the binectors (some of which are gated with one another or with other signals) to be applied to the individual bits of the control word.

The settings of all these parameters are as follows:

- 0 = binector B0000
- 1 = binector B0001
- etc.

The functions and logic operations are also shown on Sheets G180 and G181 in Section 8.

#### Control word 1

|                                   |                                                                                                                                   |                           |                            |                                  |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>P654</b><br>*<br>BDS<br>(G130) | <b>Source for control word 1, bit0</b><br>(0=OFF1, 1=ON; ANDed with terminal 37)                                                  | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P655</b><br>*<br>BDS<br>(G180) | <b>1st source for control word 1, bit1</b><br>(0=OFF2; ANDed with 2 <sup>nd</sup> and 3 <sup>rd</sup> sources for bit1)           | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P656</b><br>*<br>BDS<br>(G180) | <b>2nd source for control word 1, bit1</b><br>(0=OFF2; ANDed with 1 <sup>st</sup> and 3 <sup>rd</sup> sources for bit1)           | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P657</b><br>*<br>BDS<br>(G180) | <b>3rd source for control word 1, bit1</b><br>(0=OFF2; ANDed with 1 <sup>st</sup> and 2 <sup>nd</sup> sources for bit1)           | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P658</b><br>*<br>BDS<br>(G180) | <b>1st source for control word 1, bit2</b><br>(0=OFF3=Fast stop; ANDed with 2 <sup>nd</sup> and 3 <sup>rd</sup> sources for bit2) | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P659</b><br>*<br>BDS<br>(G180) | <b>2nd source for control word 1, bit2</b><br>(0=OFF3=Fast stop; ANDed with 1 <sup>st</sup> and 3 <sup>rd</sup> sources for bit2) | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P660</b><br>*<br>BDS<br>(G180) | <b>3rd source for control word 1, bit2</b><br>(0=OFF3=Fast stop; ANDed with 1 <sup>st</sup> and 2 <sup>nd</sup> sources for bit2) | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P661</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit3</b><br>(0=pulse disable, 1=enable; ANDed with terminal 38)                                     | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                               | Description                                                                                                                                | Value range<br>[Unit]     | No. indices                | See<br>Change                    |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>P662</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit4</b><br>(0=set ramp-function generator to zero, 1=enable ramp-function generator)                        | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P663</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit5</b><br>(0=ramp-function generator stop, 1=ramp-function generator start)                                | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P664</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit6</b><br>(0=enable setpoint, 1=disable setpoint)                                                          | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P665</b><br>*<br>BDS<br>(G180) | <b>1st source for control word 1, bit7</b><br>(0→1 transition=acknowledge; ORed with 2 <sup>nd</sup> and 3 <sup>rd</sup> sources for bit7) | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P666</b><br>*<br>BDS<br>(G180) | <b>2nd source for control word 1, bit7</b><br>(0→1 transition=acknowledge; ORed with 1 <sup>st</sup> and 3 <sup>rd</sup> sources for bit7) | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P667</b><br>*<br>BDS<br>(G180) | <b>3rd source for control word 1, bit7</b><br>(0→1 transition=acknowledge; ORed with 1 <sup>st</sup> and 2 <sup>nd</sup> sources for bit7) | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P668</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit8</b><br>(1=inching bit0)                                                                                 | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P669</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit9</b><br>(1=inching bit1)                                                                                 | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P671</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit11</b><br>(0=pos. direction of rotation disabled, 1=pos. direction of rotation enabled)                   | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P672</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit12</b><br>(0= neg. direction of rotation disabled, 1= neg. direction of rotation enabled)                 | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P673</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit13</b><br>(1=raise motorized potentiometer)                                                               | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P674</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit14</b><br>(1=lower motorized potentiometer)                                                               | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P675</b><br>*<br>BDS<br>(G180) | <b>Source for control word 1, bit15</b><br>(0=external fault, 1=no external fault)                                                         | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| Control word 2                    |                                                                             |                           |                            |                                  |
|-----------------------------------|-----------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>P676</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, bit16</b><br>(select function data set bit 0) | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P677</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, bit17</b><br>(select function data set bit 1) | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P680</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, bit20</b><br>(select fixed setpoint 0)        | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P681</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, bit21</b><br>(select fixed setpoint 1)        | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Value range<br>[Unit]     | No. indices                   | See<br>Change                    |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------|----------------------------------|
| <b>P684</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, bit24</b><br>(0=n controller speed droop disabled, 1=enabled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P685</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, bit25</b><br>(0=n controller disabled, 1=n controller enabled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P686</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, bit26</b><br>(0=external fault 2, 1=no external fault 2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P687</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, bit27</b><br>(0=master drive, speed control, 1=slave drive, torque control)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P688</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, bit28</b><br>(0=external alarm 1, 1=no external alarm 1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P689</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, bit29</b><br>(0=external alarm 2, 1=no external alarm 2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P690</b><br>*<br>(G181)        | <b>Source for control word 2, bit30</b><br>(0=select Bico data set 1, 1=select Bico data set 2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P691</b><br>*<br>BDS<br>(G181) | <b>Source for control word 2, Bit31</b> [SW 1.8 and later]<br><br>Main contactor checkback signal:<br>(0 = main contactor dropped out, 1 = main contactor picked up)<br><br>This control input is intended as a means of looping an auxiliary contact of the main contactor into the device control.<br>During the Power ON routine, this signal must switch to "1" within the time period set in P095. If it does not, or it disappears during operation, fault message F004 with fault value 6 is activated.<br><br>P691 = 0: Bit 31 of control word 2 is inoperative.<br>(This setting of P691 is always active, regardless of whether control word 2 is input in word mode [P649 = 9] or bit mode [P649 <> 9])<br><br>P691 = 1: Bit 31 of control word 2 is inoperative.<br>(This setting of P691 is active only when control word 2 is input in <u>bit mode</u> , i.e. when P649 <> 9) | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |

## 11.37 Further configuring measures

|                                   |                                                                                                                                                                                                                                                                                                                                    |                           |                            |                                  |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>P692</b><br>*<br>BDS<br>(G166) | <b>Source for selection of injection of standstill field</b><br><br>Selection of binector to control <b>injection of the standstill field</b> ("0" state = inject standstill field)<br><br>Note: The delay time set in P258 is not effective when this function is active.<br><br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P693</b><br>*<br>BDS<br>(G165) | <b>Source for selection of enabling command for EMF controller</b><br><br>Selection of binector which is to control <b>enabling of the EMF controller</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                  | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Value range<br>[Unit]     | No. indices                | See<br>Change                    |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>P694</b><br>*<br>BDS<br>(G160) | <b>Source for selection of enabling command for "Torque limit switchover"</b><br><br>Selection of binector which is to control enabling of the "Torque limit switchover" function (1=enable, see also Sheet G160 in Section 8 and P180 to P183)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                             | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P695</b><br>*<br>BDS<br>(G152) | <b>Source for selection of "Set speed controller I component" function</b><br><br>Selection of binector to control the "Set I component" function<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.<br><br>When the binector selected in P695 switches from log. "0" to log. "1", the I component of the speed controller is set to the value of the connector selected in P631.<br>With this function it is possible, for example, to use the same signal (binector) to control controller enabling commands and setting of the I component. | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P696</b><br>*<br>BDS<br>(G152) | <b>Source for selection of "Stop speed controller I component" function</b><br><br>Selection of binector to control the "Stop I component" function<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.<br><br>When the binector selected in P696 changes to the log. "1" state, the I component of the speed controller is stopped.                                                                                                                                                                                                            | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P697</b><br>*<br>BDS<br>(G153) | <b>Source for selection of enabling of dv/dt injection</b><br><br>Selection of binector to control <b>enabling of dv/dt injection</b> (state "1" = enable)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                  | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P698</b><br>*<br>BDS<br>(G152) | <b>Source for selection of enabling command for speed-dependent speed controller PI / P function switchover</b><br><br>Selection of binector to control enabling of the PI / P controller switchover function (see also P222)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                               | All binector numbers<br>1 | Ind: 2<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

### 11.38 Analog inputs (main actual value, main setpoint, selectable inputs)

(see also Section 8, Sheets G113 and G114)

| Analog input terminals 4 / 5 (main setpoint) |                                                                                                                                                                   |             |                               |                                  |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|----------------------------------|
| <b>P700</b><br>*<br>(G113)                   | <b>Signal type of "Main setpoint" analog input</b><br><br>0 = Voltage input 0 to $\pm 10$ V<br>1 = Current input 0 to $\pm 20$ mA<br>2 = Current input 4 to 20 mA | 0 to 2<br>1 | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Value range<br>[Unit]             | No. indices                      | See<br>Change                    |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| <b>P701</b><br>FDS<br>(G113) | <b>Normalization of "Main setpoint" analog input</b><br>This parameter specifies the percentage value which is generated for an input voltage of 10V (or an input current of 20mA) at the analog input.<br>The following generally applies:<br>For voltage input:<br>$P701 [\%] = 10 V * \frac{Y}{X}$ X .. Input voltage in volts<br>Y .. % value which is generated for input voltage X<br>With current input:<br>$P701 [\%] = 20 mA * \frac{Y}{X}$ X .. Input current in mA<br>Y .. % value which is generated for input current X | -1000.0 to 1000.0<br>[%]<br>0.1%  | Ind: 4<br>FS=100.0<br>Type: I2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P702</b><br>(G113)        | <b>Offset for "Main setpoint" analog input</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P703</b><br>*<br>(G113)   | <b>Mode of signal injection at "Main setpoint" analog input</b><br>0 = Injection of signal with sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted                                                                                                                                                                                                                                                                              | 0 to 3<br>1                       | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P704</b><br>*<br>(G113)   | <b>Source for selection of sign reversal at "Main setpoint" analog input</b><br>Selection of binector to control <b>sign reversal at the analog input</b> ("1" state = reverse sign)<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                             | All binector numbers<br>1         | Ind: None<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P705</b><br>(G113)        | <b>Filtering time for "Main setpoint" analog input</b><br>Note: Hardware filtering of approximately 1 ms is applied as standard.                                                                                                                                                                                                                                                                                                                                                                                                     | 0 to 10000<br>[ms]<br>1ms         | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online  |
| <b>P706</b><br>*<br>(G113)   | <b>Source for enabling of "Main setpoint" analog input</b><br>Selection of binector to control <b>enabling of the analog input</b> ("1" state = enabled)<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                         | All binector numbers<br>1         | Ind: None<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |

| PNU                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Value range<br>[Unit] | No. indices            | See<br>Change |              |    |           |        |         |    |           |        |         |    |           |        |         |    |           |         |         |                            |                                |                                  |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------|---------------|--------------|----|-----------|--------|---------|----|-----------|--------|---------|----|-----------|--------|---------|----|-----------|---------|---------|----------------------------|--------------------------------|----------------------------------|
| P707<br>*<br><br>(G113) | <p><b>Resolution of "Main setpoint" analog input</b></p> <p>The voltage applied to the analog input is converted to a digital value (A/D conversion) for further processing. The method used calculates an average value of the input voltage over a specific measuring time. The A/D conversion process produces a scale for the voltage range of 0 to ± 10V, the number of steps (divisions) along this scale can be set in P707 (i.e. the smallest possible differentiable change in the input voltage (quantization) can be set in this parameter). The number of scale steps or intervals is referred to as "Resolution".</p> <p>The resolution is normally specified in bits:</p> <ul style="list-style-type: none"><li>± 11 bits means 2 * 2048 scale divisions</li><li>± 12 bits means 2 * 4096 scale divisions</li><li>± 13 bits means 2 * 8192 scale divisions</li><li>± 14 bits means 2 * 16384 scale divisions</li></ul> <p>The following applies:</p> <p>The higher the resolution, the longer the averaging time and thus also the delay period between the application of an analog step change and the earliest possible moment of availability of the digital value for further processing.</p> <p>For this reason, it is important to find a compromise between the resolution and delay period.</p> <table><tr><td>Param. value</td><td>Resolution better than</td><td>Quantization</td><td>Delay period</td></tr><tr><td>11</td><td>± 11 bits</td><td>4.4 mV</td><td>0.53 ms</td></tr><tr><td>12</td><td>± 12 bits</td><td>2.2 mV</td><td>0.95 ms</td></tr><tr><td>13</td><td>± 13 bits</td><td>1.1 mV</td><td>1.81 ms</td></tr><tr><td>14</td><td>± 14 bits</td><td>0.56 mV</td><td>3.51 ms</td></tr></table> <p>If the analog input is operating as a current input (0 to 20 mA or 4 to 20 mA), the above applies analogously.</p> | Param. value          | Resolution better than | Quantization  | Delay period | 11 | ± 11 bits | 4.4 mV | 0.53 ms | 12 | ± 12 bits | 2.2 mV | 0.95 ms | 13 | ± 13 bits | 1.1 mV | 1.81 ms | 14 | ± 14 bits | 0.56 mV | 3.51 ms | 11 to 14<br>[Bit]<br>1 bit | Ind: None<br>FS=12<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| Param. value            | Resolution better than                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Quantization          | Delay period           |               |              |    |           |        |         |    |           |        |         |    |           |        |         |    |           |         |         |                            |                                |                                  |
| 11                      | ± 11 bits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 4.4 mV                | 0.53 ms                |               |              |    |           |        |         |    |           |        |         |    |           |        |         |    |           |         |         |                            |                                |                                  |
| 12                      | ± 12 bits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2.2 mV                | 0.95 ms                |               |              |    |           |        |         |    |           |        |         |    |           |        |         |    |           |         |         |                            |                                |                                  |
| 13                      | ± 13 bits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.1 mV                | 1.81 ms                |               |              |    |           |        |         |    |           |        |         |    |           |        |         |    |           |         |         |                            |                                |                                  |
| 14                      | ± 14 bits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.56 mV               | 3.51 ms                |               |              |    |           |        |         |    |           |        |         |    |           |        |         |    |           |         |         |                            |                                |                                  |

| Analog input terminals 6 / 7 (analog selectable input 1) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                  |                                  |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| <b>P710</b><br>*<br>(G113)                               | <b>Signal type of "Analog selectable input 1"</b><br>0 = Voltage input 0 to $\pm 10 V$<br>1 = Current input 0 to $\pm 20 mA$<br>2 = Current input 4 to 20 mA                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0 to 2<br>1                       | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P711</b><br>FDS<br>(G113)                             | <b>Normalization of "Analog selectable input 1"</b><br><p>This parameter specifies the percentage value which is generated for an input voltage of 10V (or an input current of 20mA) at the analog input.</p> <p>The following generally applies:<br/> For voltage input:<br/> <math display="block">P711 [\%] = 10 V * \frac{Y}{X}</math> X .. Input voltage in volts<br/> Y .. % value which is generated for input voltage X<br/> With current input:<br/> <math display="block">P711 [\%] = 20 mA * \frac{Y}{X}</math> X .. Input current in mA<br/> Y .. % value which is generated for input current X</p> | -1000.0 to 1000.0<br>[%]<br>0.1%  | Ind: 4<br>FS=100.0<br>Type: I2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P712</b><br>(G113)                                    | <b>Offset for "Analog selectable input 1"</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P713</b><br>*<br>(G113)                               | <b>Mode of signal injection at "Analog selectable input 1"</b><br>0 = Injection of signal with sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted                                                                                                                                                                                                                                                                                                                                                           | 0 to 3<br>1                       | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P714</b><br>*<br>(G113)                               | <b>Source for selection of sign reversal at "Analog selectable input 1"</b><br><p>Selection of binector to control <b>sign reversal at the analog input</b> ("1" state = reverse sign)</p> 0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                      | All binector numbers<br>1         | Ind: None<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |



| PNU                        | Description                                                                                                                                                                                                     | Value range<br>[Unit]      | No. indices                    | See<br>Change                    |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------|----------------------------------|
| <b>P715</b><br>(G113)      | <b>Filtering time for "Analog selectable input 1"</b><br>Note: Hardware filtering of approximately 1 ms is applied as standard.                                                                                 | 0 to 10000<br>[ms]<br>1ms  | Ind: None<br>FS=0<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>P716</b><br>*<br>(G113) | <b>Source for enabling of "Analog selectable input 1"</b><br>Selection of binector to control <b>enabling of the analog input</b> ("1" state = enabled)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1  | Ind: None<br>FS=1<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>P717</b><br>*<br>(G113) | <b>Resolution of "Analog selectable input 1"</b><br><br>See P707                                                                                                                                                | 10 to 14<br>[Bit]<br>1 bit | Ind: None<br>FS=12<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

**Analog input terminals 8 / 9 (analog selectable input 2)**

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                  |                                  |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| <b>P721</b><br>FDS<br>(G114) | <b>Normalization of "Analog selectable input 2"</b><br>This parameter specifies the percentage value which is generated for an input voltage of 10V (or an input current of 20mA) at the analog input.<br>The following generally applies:<br>For voltage input:<br>$P721 [\%] = 10 V * \frac{Y}{X}$ X .. Input voltage in volts<br>Y .. % value which is generated for input voltage X<br>With current input:<br>$P721 [\%] = 20 mA * \frac{Y}{X}$ X .. Input current in mA<br>Y .. % value which is generated for input current X | -1000.0 to 1000.0<br>[%]<br>0.1%  | Ind: 4<br>FS=100.0<br>Type: I2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P722</b><br>(G114)        | <b>Offset for "Analog selectable input 2"</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P723</b><br>*<br>(G114)   | <b>Mode of signal injection at "Analog selectable input 2"</b><br><br>0 = Injection of signal with sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted                                                                                                                                                                                                                                                                          | 0 to 3<br>1                       | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P724</b><br>*<br>(G114)   | <b>Source for selection of sign reversal at "Analog selectable input 2"</b><br>Selection of binector to control <b>sign reversal at the analog input</b> ("1" state = reverse sign)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                         | All binector numbers<br>1         | Ind: None<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P725</b><br>(G114)        | <b>Filtering time for "Analog selectable input 2"</b><br>Note: Hardware filtering of approximately 1 ms is applied as standard.                                                                                                                                                                                                                                                                                                                                                                                                     | 0 to 10000<br>[ms]<br>1ms         | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online  |
| <b>P726</b><br>*<br>(G114)   | <b>Source for enabling of "Analog selectable input 2"</b><br>Selection of binector to control <b>enabling of the analog input</b> ("1" state = enabled)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                     | All binector numbers<br>1         | Ind: None<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Value range<br>[Unit]             | No. indices                      | See<br>Change                    |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| <b>Analog input terminals 10 / 11</b> (analog selectable input 3) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |                                  |                                  |
| <b>P731</b><br>FDS<br>(G114)                                      | <b>Normalization of "Analog selectable input 3"</b><br>This parameter specifies the percentage value which is generated for an input voltage of 10V (or an input current of 20mA) at the analog input.<br>The following generally applies:<br>For voltage input:<br>$P731 [\%] = 10 V * \frac{Y}{X}$ X .. Input voltage in volts<br>Y .. % value which is generated for input voltage X<br>With current input:<br>$P731 [\%] = 20 mA * \frac{Y}{X}$ X .. Input current in mA<br>Y .. % value which is generated for input current X | -1000.0 to 1000.0<br>[%]<br>0.1%  | Ind: 4<br>FS=100.0<br>Type: I2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P732</b><br>(G114)                                             | <b>Offset for "Analog selectable input 3"</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P733</b><br>*<br>(G114)                                        | <b>Mode of signal injection at "Analog selectable input 3"</b><br>0 = Injection of signal with sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted                                                                                                                                                                                                                                                                              | 0 to 3<br>1                       | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P734</b><br>*<br>(G114)                                        | <b>Source for selection of sign reversal at "Analog selectable input 3"</b><br>Selection of binector to control <b>sign reversal at the analog input</b> ("1" state = reverse sign)<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                             | All binector numbers<br>1         | Ind: None<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P735</b><br>(G114)                                             | <b>Filtering time for "Analog selectable input 3"</b><br>Note: Hardware filtering of approximately 1 ms is applied as standard.                                                                                                                                                                                                                                                                                                                                                                                                     | 0 to 10000<br>[ms]<br>1ms         | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online  |
| <b>P736</b><br>*<br>(G114)                                        | <b>Source for enabling of "Analog selectable input 3"</b><br>Selection of binector to control <b>enabling of the analog input</b> ("1" state = enabled)<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                         | All binector numbers<br>1         | Ind: None<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |

|                                                             |                                                                                                                                                                                                                                                             |                                   |                                  |                                  |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| <b>Analog input terminals 103 / 104</b> (main actual value) |                                                                                                                                                                                                                                                             |                                   |                                  |                                  |
| <b>P741</b><br>FDS<br>(G113)                                | <b>Normalization for "Main actual value"</b><br>Rated value of input voltage at $n_{max}$ (=tachometer voltage at maximum speed)<br>This parameter defines the maximum speed when P083=1.                                                                   | -270.00 to 270.00<br>[V]<br>0.01V | Ind: 4<br>FS=60.00<br>Type: I2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>P742</b><br>(G113)                                       | <b>Offset for "Main actual value" analog input</b>                                                                                                                                                                                                          | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>P743</b><br>*<br>(G113)                                  | <b>Mode of signal injection at "Main actual value" analog input</b><br>0 = Injection of signal with sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted | 0 to 3<br>1                       | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P744</b><br>*<br>(G113)                                  | <b>Source for selection of sign reversal at "Main actual value" analog input</b><br>Selection of binector to control <b>sign reversal at the analog input</b> ("1" state = reverse sign)<br>0 = binector B0000<br>1 = binector B0001<br>etc.                | All binector numbers<br>1         | Ind: None<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>P745</b><br>(G113)                                       | <b>Filtering time for "Main actual value" analog input</b><br>Note: Hardware filtering of approximately 1 ms is applied as standard.                                                                                                                        | 0 to 10000<br>[ms]<br>1ms         | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online  |

| PNU                        | Description                                                                                                                                                                                                              | Value range<br>[Unit]     | No. indices                   | See<br>Change                    |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------|----------------------------------|
| <b>P746</b><br>*<br>(G113) | <b>Source for enabling of "Main actual value" analog input</b><br><br>Selection of binector to control <b>enabling of the analog input</b> ("1" state = enabled)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: None<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.39 Analog outputs

(see also Section 8, Sheets G115 and G116)

### Analog output terminals 12 / 13 (actual current display)

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |                               |                                 |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|---------------------------------|
| <b>P749</b><br>*<br>(G115) | <b>Control word for terminal 12 (actual current display)</b><br><br>0 Output with correct sign<br>(positive voltage: Current in torque direction MI)<br>(negative voltage: Current in torque direction MII)<br>1 Output of absolute value (positive voltage only)<br>2 Output with sign, inverted<br>(positive voltage: Current in torque direction MII)<br>(negative voltage: Current in torque direction MI)<br>3 Output of absolute value, inverted (negative voltage only) | 0 to 3<br>1 | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|---------------------------------|

### Analog output terminals 14 / 15

|                            |                                                                                                                                                                                                                                                        |                                   |                                   |                                 |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------|---------------------------------|
| <b>P750</b><br>*<br>(G115) | <b>Source for output value at analog output 1</b><br><br>Selection of connector whose value is to applied to the analog output<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                               | All connector numbers<br>1        | Ind: None<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>Online |
| <b>P751</b><br>*<br>(G115) | <b>Mode of signal injection at analog output 1</b><br><br>0 = Injection of signal with correct sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted | 0 to 3<br>1                       | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online |
| <b>P752</b><br>(G115)      | <b>Filtering time for analog output 1</b>                                                                                                                                                                                                              | 0 to 10000<br>[ms]<br>1ms         | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online |
| <b>P753</b><br>(G115)      | <b>Normalization of analog output 1</b><br><br>$y[V] = x * \frac{P753}{100\%}$<br><br>x = Normalization input (corresponds to filtering output)<br>y = Normalization output (corresponds to output voltage at analog output with offset = 0)           | -200.00 to 199.99<br>[V]<br>0.01V | Ind: None<br>FS=10.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P754</b><br>(G115)      | <b>Offset for analog output 1</b>                                                                                                                                                                                                                      | -10.00 to 10.00<br>[V]<br>0.01V   | Ind: None<br>FS=0.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online |

### Analog output terminals 16 / 17

|                            |                                                                                                                                                                                                                                                        |                            |                               |                                 |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|---------------------------------|
| <b>P755</b><br>*<br>(G115) | <b>Source for output value at analog output 2</b><br><br>Selection of connector whose value is to applied to the analog output<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                               | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P756</b><br>*<br>(G115) | <b>Mode of signal injection at analog output 2</b><br><br>0 = Injection of signal with correct sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted | 0 to 3<br>1                | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P757</b><br>(G115)      | <b>Filtering time for analog output 2</b>                                                                                                                                                                                                              | 0 to 10000<br>[ms]<br>1ms  | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |

| PNU                   | Description                                                                                                                                                                                                                            | Value range<br>[Unit]             | No. indices                       | See<br>Change                   |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------|---------------------------------|
| <b>P758</b><br>(G115) | <b>Normalization of analog output 2</b><br><br>$y[V] = x * \frac{P758}{100 \%}$ x = Normalization input (corresponds to filtering output)<br>y = Normalization output (corresponds to output voltage at analog output with offset = 0) | -200.00 to 199.99<br>[V]<br>0.01V | Ind: None<br>FS=10.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P759</b><br>(G115) | <b>Offset for analog output 2</b>                                                                                                                                                                                                      | -10.00 to 10.00<br>[V]<br>0.01V   | Ind: None<br>FS=0.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online |

**Analog output terminals 18 / 19**

|                            |                                                                                                                                                                                                                                                        |                                   |                                   |                                 |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------|---------------------------------|
| <b>P760</b><br>*<br>(G116) | <b>Source for output value at analog output 3</b><br>Selection of connector whose value is to applied to the analog output<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                   | All connector<br>numbers<br>1     | Ind: None<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>Online |
| <b>P761</b><br>*<br>(G116) | <b>Mode of signal injection at analog output 3</b><br><br>0 = Injection of signal with correct sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted | 0 to 3<br>1                       | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online |
| <b>P762</b><br>(G116)      | <b>Filtering time for analog output 3</b>                                                                                                                                                                                                              | 0 to 10000<br>[ms]<br>1ms         | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online |
| <b>P763</b><br>(G116)      | <b>Normalization of analog output 3</b><br><br>$y[V] = x * \frac{P763}{100 \%}$ x = Normalization input (corresponds to filtering output)<br>y = Normalization output (corresponds to output voltage at analog output with offset = 0)                 | -200.00 to 199.99<br>[V]<br>0.01V | Ind: None<br>FS=10.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P764</b><br>(G116)      | <b>Offset for analog output 3</b>                                                                                                                                                                                                                      | -10.00 to 10.00<br>[V]<br>0.01V   | Ind: None<br>FS=0.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online |

**Analog output terminals 20 / 21**

|                            |                                                                                                                                                                                                                                                        |                                   |                                   |                                 |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------|---------------------------------|
| <b>P765</b><br>*<br>(G116) | <b>Source for output value at analog output 4</b><br>Selection of connector whose value is to applied to the analog output<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                   | All connector<br>numbers<br>1     | Ind: None<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>Online |
| <b>P766</b><br>*<br>(G116) | <b>Mode of signal injection at analog output 4</b><br><br>0 = Injection of signal with correct sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted | 0 to 3<br>1                       | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online |
| <b>P767</b><br>(G116)      | <b>Filtering time for analog output 4</b>                                                                                                                                                                                                              | 0 to 10000<br>[ms]<br>1ms         | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online |
| <b>P768</b><br>(G116)      | <b>Normalization of analog output 4</b><br><br>$y[V] = x * \frac{P768}{100 \%}$ x = Normalization input (corresponds to filtering output)<br>y = Normalization output (corresponds to output voltage at analog output with offset = 0)                 | -200.00 to 199.99<br>[V]<br>0.01V | Ind: None<br>FS=10.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P769</b><br>(G116)      | <b>Offset for analog output 4</b>                                                                                                                                                                                                                      | -10.00 to 10.00<br>[V]<br>0.01V   | Ind: None<br>FS=0.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.40 Binary outputs

(see also Section 8, Sheet G112)

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           |                               |                                 |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------|---------------------------------|
| <b>P770</b><br>*<br><br>(G112)<br>(G200) | <b>Control word for binary selectable outputs</b><br><br>i001: 0 Binary selectable output at terminal 46 is not inverted<br>1 Binary selectable output at terminal 46 is inverted<br><br>i002: 0 Binary selectable output at terminal 48 is not inverted<br>1 Binary selectable output at terminal 48 is inverted<br><br>i003: 0 Binary selectable output at terminal 50 is not inverted<br>1 Binary selectable output at terminal 50 is inverted<br><br>i004: 0 Binary selectable output at terminal 52 is not inverted<br>1 Binary selectable output at terminal 52 is inverted | 0 to 1<br>1               | Ind: 4<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online |
| <b>P771</b><br>*<br><br>(G112)<br>(G200) | <b>Source for output value at binary output 1</b><br>Selection of binector to be injected at binary selectable output, terminal 46<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                        | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P772</b><br>*<br><br>(G112)<br>(G200) | <b>Source for output value at binary output 2</b><br>Selection of binector to be injected at binary selectable output, terminal 48<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                        | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P773</b><br>*<br><br>(G112)           | <b>Source for output value at binary output 3</b><br>Selection of binector to be injected at binary selectable output, terminal 50<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                        | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P774</b><br>*<br><br>(G112)           | <b>Source for output value at binary output 4</b><br>Selection of binector to be injected at binary selectable output, terminal 52<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                        | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P775</b><br><br>(G112)<br>(G200)      | <b>Delay for output value at binary output 1</b><br>The logic level at the binary selectable output changes only if the internal signal level remains constant for the set delay period (internal signal level changes which do not last as long as this delay period are not switched through to the output)                                                                                                                                                                                                                                                                     | 0 to 10000<br>[ms]<br>1ms | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P776</b><br><br>(G112)<br>(G200)      | <b>Delay for output value at binary output 2</b><br>The logic level at the binary selectable output changes only if the internal signal level remains constant for the set delay period (internal signal level changes which do not last as long as this delay period are not switched through to the output)                                                                                                                                                                                                                                                                     | 0 to 10000<br>[ms]<br>1ms | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P777</b><br><br>(G112)                | <b>Delay for output value at binary output 3</b><br>The logic level at the binary selectable output changes only if the internal signal level remains constant for the set delay period (internal signal level changes which do not last as long as this delay period are not switched through to the output)                                                                                                                                                                                                                                                                     | 0 to 10000<br>[ms]<br>1ms | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P778</b><br><br>(G112)                | <b>Delay for output value at binary output 4</b><br>The logic level at the binary selectable output changes only if the internal signal level remains constant for the set delay period (internal signal level changes which do not last as long as this delay period are not switched through to the output)                                                                                                                                                                                                                                                                     | 0 to 10000<br>[ms]<br>1ms | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.41 Configuration of serial interfaces on basic converter

| G-SST 1 (RS485 / RS232 on X300) (see also Section 8, Sheet G170 and Section 9) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |                                                                                            |                                  |
|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------|----------------------------------|
| <b>P780</b><br>*<br>(G170)                                                     | <b>Selection of protocol for G-SST1 basic converter interface</b><br><br>0 Setting has no function<br>2 USS protocol<br>8 for factory purposes<br>9 For internal factory test purposes                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0, 2, 8, 9<br>1            | Ind: None<br>FS=2<br>Type: O2                                                              | P052 = 3<br>P051 = 40<br>Offline |
| <b>P781</b><br>*<br>(G170)                                                     | <b>Number of process data for G-SST1</b><br><u>When P780 = 0 or 9 is selected:</u> Parameter is irrelevant<br><br><u>When USS protocol (P780=2) is selected:</u> Number of <b>PZD elements</b><br><br>0 No process data are expected or sent in the USS protocol<br>1...16 Number of process data words in USS protocol (same number applies to transmission and receipt)<br>The received PZD elements (1 to max. 16) are available at connectors (K2001 to K2016) and, in some cases, bit-serially at binectors for "internal wiring" purposes.<br>The PZD elements to be transmitted (1 to max. 16) are selected in parameters P784.01 to P784.16. | 0 to 16<br>1               | Ind: None<br>FS=2<br>Type: O2                                                              | P052 = 3<br>P051 = 40<br>Offline |
| <b>P782</b><br>*<br>(G170)                                                     | <b>Length of parameter jobs for G-SST1</b><br><br>This parameter is effective only when P780=2 (USS protocol).<br><br>0 <u>No PKW data</u> are expected or sent in the USS protocol.<br>3, 4 <u>3 or 4 PKW data words</u> are expected in the USS protocol and 3 or 4 PKW data words are also sent (for transmission of parameter values).<br><br>127 Number of PKWs is determined by the telegram length                                                                                                                                                                                                                                            | 0, 3, 4, 127<br>1          | Ind: None<br>FS=127<br>Type: O2                                                            | P052 = 3<br>P051 = 40<br>Offline |
| <b>P783</b><br>*<br>(G170)                                                     | <b>Baud rate for G-SST1</b><br><br>1 300 baud<br>2 600 baud<br>3 1200 baud<br>4 2400 baud<br>5 4800 baud<br>6 9600 baud<br>7 19200 baud<br>8 38400 baud<br>9 56700 baud<br>11 93750 baud<br>13 187500 baud                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1 to 13<br>1               | Ind: None<br>FS=6<br>Type: O2                                                              | P052 = 3<br>P051 = 40<br>Offline |
| <b>P784</b><br>*<br>(G170)                                                     | <b>Source for transmit data for G-SST1</b><br><br>Selection of connectors to be transferred as transmit data to the USS master via USS interface 1.<br><br>i001: Selection for word 1<br>i002: Selection for word 2<br>...<br>i016: Selection for word 16<br><br>Applicable settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                          | All connector numbers<br>1 | Ind: 16<br>FS=<br>i001: 32<br>i002: 167<br>i003: 0<br>i004: 33<br>i005-i016: 0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P785</b><br>(G170)                                                          | <b>Options for G-SST1</b><br><br>i001: 0 = Bus terminator OFF<br>1 = Bus terminator ON<br>i002: 0 = Bit 10 of the 1 <sup>st</sup> receive word does <u>not</u> function as "Control by PLC".<br>1 = Bit 10 of the 1 <sup>st</sup> receive word does function as "Control by PLC", i.e. when bit 10 = 0, all other bits of the 1 <sup>st</sup> receive word, as well as receive words 2 to 16, are <u>not</u> written to connectors K2001 to K2016, or to binectors B2100 to B2915. All these connectors and binectors retain their old values.                                                                                                       | 0 to 1<br>1                | Ind: 2<br>FS=0<br>Type: O2                                                                 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Value range<br>[Unit]            | No. indices                       | See<br>Change                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| <b>P786</b><br>*<br>(G170) | <b>USS bus address for G-SST1</b><br><br>This parameter is functional only when P780=2 (USS protocol). Address via which the unit can be addressed in USS bus operation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0 to 30<br>1                     | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>P787</b><br>(G170)      | <b>Telegram failure time for G-SST1</b><br><br>The failure time set in this parameter is valid when setting P780=2 (USS protocol) is selected.<br><br>0.000 No time monitoring<br>0.001...65.000 Time which may elapse between the receipt of two telegrams addressed to the unit before a fault message is activated.<br><br>Fault message F011 is activated if no valid telegram is received within this time period.<br><br>Note:<br>The telegram monitoring function is active <ul style="list-style-type: none"> <li>from the receipt of the first error-free telegram after connection of the electronics power supply</li> <li>from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout).</li> </ul>                                                                                                                                                                                                                                                                                                       | 0.000 to 65.000<br>[s]<br>0.001s | Ind: None<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P788</b><br>*<br>(G170) | <b>Source for activation of F011</b><br><br>Selection of binector which will activate fault message F011 when it switches to log. "1"<br><br>2030 = binector B2030<br>2031 = binector B2031                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2030, 2031                       | Ind: None<br>FS=2030<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>r789</b><br>(G170)      | <b>Diagnostic information for G-SST1</b><br><br>Free-running counter, overflow at 65535<br><br>i001: Number of <u>error-free</u> telegrams<br>i002: Number of <u>errored</u> telegrams:<br>Byte frame, parity, overrun or BCC error<br>i003: Number of byte frame errors<br>i004: Number of overrun errors<br>i005: Parity error<br>i006: STX error:<br>Start interval before STX not observed,<br>telegram residual transfer time not observed,<br>delay time of LGE character too long,<br>erroneous STX, i.e. ≠ 02<br>i007: Violation of telegram residual transfer time<br>i008: Block check error<br>i009: Incorrect telegram length:<br>With P782=3 or 4 only:<br>The length of the received telegram is ≠ P781 + P782<br>(Note: If the received values are correct, they will be processed even when this error has been detected)<br>i010: Timeout error:<br>No valid telegram has been received for a period exceeding the setting in P787. After the occurrence of a timeout error, this counter is not activated again until the next valid telegram is received. |                                  | Ind: 10<br>Type: O2               | P052 = 3                         |

**G-SST 2 (RS485 on X172)** (see also Section 8, Sheets G171 and G173 and Section 9)

|                                      |                                                                                                                                                                                                |                 |                               |                                  |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------|----------------------------------|
| <b>P790</b><br>*<br>(G171)<br>(G173) | <b>Selection of protocol for G-SST2 basic converter interface</b><br><br>0 Setting has no function<br>2 USS protocol<br>5 "Peer-to-peer" communication<br>9 For internal factory test purposes | 0, 2, 5, 9<br>1 | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------|----------------------------------|



| PNU                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Value range<br>[Unit]      | No. indices                                                                                | See<br>Change                    |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------|----------------------------------|
| <b>P791</b><br>*<br>(G171)<br>(G173) | <b>Number of process data for G-SST2</b><br><u>When P790 = 0 or 9 is selected:</u> Parameter is irrelevant<br><br><u>When USS protocol (P790=2) is selected:</u> Number of <b>PZD elements</b><br><br>0 No process data are expected or sent in the USS protocol<br>1...16 Number of process data words in USS protocol (same number applies to transmission and receipt)<br>The received PZD elements (1 to max. 16) are available at connectors (K6001 to K6016) and, in some cases, bit-serially at binectors for "internal wiring" purposes.<br>The PZD elements to be transmitted (1 to max. 16) are selected in parameters P794.01 to P794.16.<br><br><u>When peer-to-peer (P790= 5) is selected:</u> Number of <b>transferred words</b><br><br>0 Illegal setting<br>1...5 Number of transferred words<br>6...16 Illegal setting | 0 to 16<br>1               | Ind: None<br>FS=2<br>Type: O2                                                              | P052 = 3<br>P051 = 40<br>Offline |
| <b>P792</b><br>*<br>(G171)           | <b>Length of parameter jobs for G-SST2</b><br><br>This parameter is effective only when P790=2 (USS protocol).<br><br>0 No PKW data are expected or sent in the USS protocol.<br>3, 4 3 or 4 PKW data words are expected in the USS protocol and 3 or 4 PKW data words are also sent (for transmission of parameter values).<br>127 Number of PKWs is determined by the telegram length                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0, 3, 4, 127<br>1          | Ind: None<br>FS=127<br>Type: O2                                                            | P052 = 3<br>P051 = 40<br>Offline |
| <b>P793</b><br>*<br>(G171)<br>(G173) | <b>Baud rate for G-SST2</b><br><br>1 300 baud<br>2 600 baud<br>3 1200 baud<br>4 2400 baud<br>5 4800 baud<br>6 9600 baud<br>7 19200 baud<br>8 38400 baud<br>9 56700 baud<br>11 93750 baud<br>13 187500 baud                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1 to 13<br>1               | Ind: None<br>FS=6<br>Type: O2                                                              | P052 = 3<br>P051 = 40<br>Offline |
| <b>P794</b><br>*<br>(G171)<br>(G173) | <b>Source for transmit data for G-SST2</b><br><br>Selection of connectors to be transferred as <u>transmit data</u> via basic converter interface 2<br><br><u>When USS protocol (P790=2) is selected:</u><br><br>i001: Selection for word 1<br>i002: Selection for word 2<br>...<br>i016: Selection for word 16<br><br><u>When peer-to-peer (P790=5) is selected:</u><br><br>i001: Selection for word 1<br>i002: Selection for word 2<br>...<br>i005: Selection for word 5<br><br>i006: Not used<br>...<br>i016: Not used<br><br>Applicable settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                            | All connector numbers<br>1 | Ind: 16<br>FS=<br>i001: 32<br>i002: 167<br>i003: 0<br>i004: 33<br>i005-i016: 0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |



| PNU                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Value range<br>[Unit]            | No. indices                       | See<br>Change                    |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| <b>P795</b><br>(G171)<br>(G173)      | <b>Options for G-SST2</b><br><br>i001: 0 = Bus terminator OFF<br>1 = Bus terminator ON<br>i002: 0 = Bit 10 of the 1 <sup>st</sup> receive word does <u>not</u> function as "Control by PLC".<br>1 = Bit 10 of the 1 <sup>st</sup> receive word does function as "Control by PLC", i.e. when bit 10 = 0, all other bits of the 1 <sup>st</sup> receive word, as well as receive words 2 to 16, are <u>not</u> written to connectors K6001 to K6016, or to binectors B6100 to B6915. All these connectors and binectors retain their old values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0 to 1<br>1                      | Ind: 2<br>FS=0<br>Type: O2        | P052 = 3<br>P051 = 40<br>Offline |
| <b>P796</b><br>*<br>(G171)           | <b>USS bus address for G-SST2</b><br><br>This parameter is functional only when P790=2 (USS protocol). Address via which the unit can be addressed in USS bus operation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0 to 30<br>1                     | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>P797</b><br>(G171)<br>(G173)      | <b>Telegram failure time for G-SST2</b><br><br>The failure time set in this parameter is valid when setting P790=2 (USS protocol) or P790=5 (peer-to-peer) is selected.<br><br>0.000           No time monitoring<br>0.001...65.000 Time which may elapse between the receipt of two telegrams addressed to the unit before a fault message is activated.<br><br>Fault message F012 is activated if no valid telegram is received within this time period.<br><br>Note:<br>The telegram monitoring function is active <ul style="list-style-type: none"> <li>from the receipt of the first error-free telegram after connection of the electronics power supply</li> <li>from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout).</li> </ul> Since the telegram transfer time is dependent on the set baud rate, the following minimum setting values for P797 are recommended:<br><br>Baud rate as set in P793:       Recommended minimum value for P797:<br><br>300 baud                   0.520s<br>600 baud                   0.260s<br>1200 baud                  0.140s<br>2400 baud                  0.080s<br>≥ 4800 baud               0.040s<br><br>Note:<br>If the "Automatic restart" function is selected (P086>0) on the peer-to-peer communication partner, then only a parameter setting of P797>P086 (on the communication partner) is meaningful. | 0.000 to 65.000<br>[s]<br>0.001s | Ind: None<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P798</b><br>*<br>(G171)<br>(G173) | <b>Source for activation of F012</b><br><br>Selection of binector which will activate fault message F012 when it switches to log. "1"<br><br>6030 = binector B6030<br>6031 = binector B6031                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6030, 6031                       | Ind: None<br>FS=6030<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Value range<br>[Unit] | No. indices         | See<br>Change |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|---------------|
| <b>r799</b><br><br>(G171)<br>(G173) | <b>Diagnostic information for G-SST2</b><br>Free-running counter, overflow at 65535<br><br>i001: Number of <u>error-free</u> telegrams<br>i002: Number of <u>errored</u> telegrams:<br>Byte frame, parity, overrun or BCC error<br>i003: Number of byte frame errors<br>i004: Number of overrun errors<br>i005: Parity error<br>i006: STX error:<br>Start interval before STX not observed,<br>telegram residual transfer time not observed,<br>delay time of LGE character too long,<br>erroneous STX, i.e. $\neq 02$<br>i007: Violation of telegram residual transfer time (USS prot. only)<br>i008: Block check error<br>i009: Incorrect telegram length:<br>With P792=3 or 4 only:<br>The length of the received telegram is $\neq P791 + P792$<br>(Note: If the received values are correct, they will be processed<br>even when this error has been detected)<br>i010: Timeout error:<br>No valid telegram has been received for a period exceeding the<br>setting in P797. After the occurrence of a timeout error, this<br>counter is not activated again until the next valid telegram is<br>received. |                       | Ind: 10<br>Type: O2 | P052 = 3      |

**G-SST 3 (RS485 on X162)** (see also Section 8, Sheets G172 and G174 and Section 9)

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                                 |                                  |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------|----------------------------------|
| <b>P800</b><br>*<br>(G172)<br>(G174) | <b>Selection of protocol for G-SST3 basic converter interface</b><br><br>0 Setting has no function<br>2 USS protocol<br>5 "Peer-to-peer" communication<br>9 For internal factory test purposes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0, 2, 5, 9<br>1   | Ind: None<br>FS=0<br>Type: O2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P801</b><br>*<br>(G172)<br>(G174) | <b>Number of process data for G-SST3</b><br><u>When P800 = 0 or 9 is selected:</u> Parameter is irrelevant<br><br><u>When USS protocol (P800=2) is selected:</u> Number of <b>PZD elements</b><br><br>0 No process data are expected or sent in the USS protocol<br>1...16 Number of process data words in USS protocol (same number<br>applies to transmission and receipt)<br>The received PZD elements (1 to max. 16) are available at<br>connectors (K6001 to K6016) and, in some cases, bit-serially at<br>binectors for "internal wiring" purposes.<br>The PZD elements to be transmitted (1 to max. 16) are selected<br>in parameters P804.01 to P804.16.<br><br><u>When peer-to-peer (P800= 5) is selected:</u> Number of <b>transferred words</b><br><br>0 Illegal setting<br>1...5 Number of transferred words<br>6...16 Illegal setting | 0 to 16<br>1      | Ind: None<br>FS=2<br>Type: O2   | P052 = 3<br>P051 = 40<br>Offline |
| <b>P802</b><br>*<br>(G172)           | <b>Length of parameter jobs for G-SST3</b><br><br>This parameter is effective only when P800=2 (USS protocol).<br><br>0 <u>No PKW data</u> are expected or sent in the USS protocol.<br>3, 4 <u>3 or 4 PKW data words</u> are expected in the USS protocol and 3<br>or 4 PKW data words are also sent (for transmission of<br>parameter values).<br>127 Number of PKWs is determined by the telegram length                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0, 3, 4, 127<br>1 | Ind: None<br>FS=127<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Value range<br>[Unit]      | No. indices                                                                                | See<br>Change                    |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------|----------------------------------|
| <b>P803</b><br>*<br>(G172)<br>(G174) | <b>Baud rate for G-SST3</b><br><br>1      300 baud<br>2      600 baud<br>3      1200 baud<br>4      2400 baud<br>5      4800 baud<br>6      9600 baud<br>7      19200 baud<br>8      38400 baud<br>9      56700 baud<br>11     93750 baud<br>13     187500 baud                                                                                                                                                                                                                                                                                                                                                                     | 1 to 13<br>1               | Ind: None<br>FS=13<br>Type: O2                                                             | P052 = 3<br>P051 = 40<br>Offline |
| <b>P804</b><br>*<br>(G172)<br>(G174) | <b>Source for transmit data for G-SST3</b><br><br>Selection of connectors to be transferred as <u>transmit data</u> via basic converter interface 3<br><br><u>When USS protocol (P800=2) is selected:</u><br><br>i001:    Selection for word 1<br>i002:    Selection for word 2<br>...<br>i016:    Selection for word 16<br><br><u>When peer-to-peer (P800=5) is selected:</u><br><br>i001:    Selection for word 1<br>i002:    Selection for word 2<br>...<br>i005:    Selection for word 5<br><br>i006:    Not used<br>...<br>i016:    Not used<br><br>Applicable settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 16<br>FS=<br>i001: 32<br>i002: 167<br>i003: 0<br>i004: 33<br>i005-i016: 0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P805</b><br>(G172)<br>(G174)      | <b>Options for G-SST3</b><br><br>i001:    0 = Bus terminator OFF<br>1 = Bus terminator ON<br>i002:    0 = Bit 10 of the 1 <sup>st</sup> receive word does <u>not</u> function as "Control by PLC".<br>1 = Bit 10 of the 1 <sup>st</sup> receive word does function as "Control by PLC", i.e. when bit 10 = 0, all other bits of the 1 <sup>st</sup> receive word, as well as receive words 2 to 16, are <u>not</u> written to connectors K9001 to K9016, or to binectors B9100 to B9915. All these connectors and binectors retain their old values.                                                                                | 0 to 1<br>1                | Ind: 2<br>FS=0<br>Type: O2                                                                 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P806</b><br>*<br>(G172)           | <b>USS bus address for G-SST3</b><br><br>This parameter is functional only when P800=2 (USS protocol). Address via which the unit can be addressed in USS bus operation.                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0 to 30<br>1               | Ind: None<br>FS=0<br>Type: O2                                                              | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Value range<br>[Unit]            | No. indices                       | See<br>Change                    |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| <b>P807</b><br><br>(G172)<br>(G174)  | <b>Telegram failure time for G-SST3</b><br><br>The failure time set in this parameter is valid when setting P800=2 (USS protocol) or P800=5 (peer-to-peer) is selected.<br><br>0.000 No time monitoring<br>0.001...65.000 Time which may elapse between the receipt of two telegrams addressed to the unit before a fault message is activated.<br><br>Fault message F013 is activated if no valid telegram is received within this time period.<br><br>Note:<br>The telegram monitoring function is active <ul style="list-style-type: none"> <li>from the receipt of the first error-free telegram after connection of the electronics power supply</li> <li>from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout).</li> </ul> Since the telegram transfer time is dependent on the set baud rate, the following minimum setting values for P807 are recommended:<br><br>Baud rate as set in P803:      Recommended minimum value for P807:<br><br>300 baud                      0.520s<br>600 baud                      0.260s<br>1200 baud                    0.140s<br>2400 baud                    0.080s<br>≥ 4800 baud                0.040s<br><br>Note:<br>If the "Automatic restart" function is selected (P086>0) on the peer-to-peer communication partner, then only a parameter setting of P807>P086 (on the communication partner) is meaningful. | 0.000 to 65.000<br>[s]<br>0.001s | Ind: None<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P808</b><br>*<br>(G172)<br>(G174) | <b>Source for activation of F013</b><br><br>Selection of binector which will activate fault message F013 when it switches to log. "1"<br><br>9030 = binector B9030<br>9031 = binector B9031                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 9030, 9031                       | Ind: None<br>FS=9030<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>r809</b><br><br>(G172)<br>(G174)  | <b>Diagnostic information for G-SST3</b><br><br>Free-running counter, overflow at 65535<br><br>i001: Number of <u>error-free</u> telegrams<br>i002: Number of <u>errored</u> telegrams:<br>Byte frame, parity, overrun or BCC error<br>i003: Number of byte frame errors<br>i004: Number of overrun errors<br>i005: Parity error<br>i006: STX error:<br>Start interval before STX not observed,<br>telegram residual transfer time not observed,<br>delay time of LGE character too long,<br>erroneous STX, i.e. ≠ 02<br>i007: Violation of telegram residual transfer time (USS prot. only)<br>i008: Block check error<br>i009: Incorrect telegram length:<br>With PP802=3 or 4 only:<br>The length of the received telegram is ≠ P801 + P802<br>(Note: If the received values are correct, they will be processed even when this error has been detected)<br>i010: Timeout error:<br>No valid telegram has been received for a period exceeding the setting in P807. After the occurrence of a timeout error, this counter is not activated again until the next valid telegram is received.                                                                                                                                                                                                                                                                                                                                   |                                  | Ind: 10<br>Type: O2               | P052 = 3                         |

| PNU                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Value range<br>[Unit] | No. indices         | See<br>Change |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|---------------|
| <b>r810</b><br><br>(G170)           | <b>Receive data on G-SST1</b><br>Display of data received via <b>USS interface 1</b><br>i001: Display process data word 1<br>...<br>i016: Display process data word 16<br>i017: Display parameter data word 1<br>...<br>i020: Display parameter data word 4                                                                                                                                                                                                                                                                                                                  |                       | Ind: 20<br>Type: L2 | P052 = 3      |
| <b>r811</b><br><br>(G170)           | <b>Transmit data on G-SST1</b><br>Display of the data to be transmitted via <b>USS interface 1</b><br>i001: Display process data word 1<br>...<br>i016: Display process data word 16<br>i017: Display parameter data word 1<br>...<br>i020: Display parameter data word 4                                                                                                                                                                                                                                                                                                    |                       | Ind: 20<br>Type: L2 | P052 = 3      |
| <b>r812</b><br><br>(G171)<br>(G173) | <b>Receive data on G-SST2</b><br><u>When USS protocol (P790=2) is selected:</u><br>Display of data received via <b>USS interface 2</b><br>i001: Display process data word 1<br>...<br>i016: Display process data word 16<br>i017: Display parameter data word 1<br>...<br>i020: Display parameter data word 4<br><br><u>When peer-to-peer (P790=5) is selected:</u><br>Display of data received via <b>peer-to-peer interface 2</b><br>i001: Receive data word 1<br>...<br>i005: Receive data word 5<br>i006: Not used<br>...<br>i020: Not used                              |                       | Ind: 20<br>Type: L2 | P052 = 3      |
| <b>r813</b><br><br>(G171)<br>(G173) | <b>Transmit data on G-SST2</b><br><u>When USS protocol (P790=2) is selected:</u><br>Display of the data to be transmitted via <b>USS interface 2</b><br>i001: Display process data word 1<br>...<br>i016: Display process data word 16<br>i017: Display parameter data word 1<br>...<br>i020: Display parameter data word 4<br><br><u>When peer-to-peer (P790=5) is selected:</u><br>Display of the data to be transmitted via <b>peer-to-peer interface 2</b><br>i001: Transmit data word 1<br>...<br>i005: Transmit data word 5<br>i006: Not used<br>...<br>i020: Not used |                       | Ind: 20<br>Type: L2 | P052 = 3      |

| PNU                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Value range<br>[Unit] | No. indices         | See<br>Change |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|---------------|
| <b>r814</b><br><br>(G172)<br>(G174) | <b>Receive data on G-SST3</b><br><u>When USS protocol (P800=2) is selected:</u><br>Display of data received via <b>USS interface 3</b><br><br>i001: Display process data word 1<br>...<br>i016: Display process data word 16<br>i017: Display parameter data word 1<br>...<br>i020: Display parameter data word 4<br><br><u>When peer-to-peer (P800=5) is selected:</u><br>Display of data received via <b>peer-to-peer interface 3</b><br><br>i001: Receive data word 1<br>...<br>i005: Receive data word 5<br>i006: Not used<br>...<br>i020: Not used                              |                       | Ind: 20<br>Type: L2 | P052 = 3      |
| <b>r815</b><br><br>(G172)<br>(G174) | <b>Transmit data on G-SST3</b><br><u>When USS protocol (P800=2) is selected:</u><br>Display of the data to be transmitted via <b>USS interface 3</b><br><br>i001: Display process data word 1<br>...<br>i016: Display process data word 16<br>i017: Display parameter data word 1<br>...<br>i020: Display parameter data word 4<br><br><u>When peer-to-peer (P800=5) is selected:</u><br>Display of the data to be transmitted via <b>peer-to-peer interface 3</b><br><br>i001: Transmit data word 1<br>...<br>i005: Transmit data word 5<br>i006: Not used<br>...<br>i020: Not used |                       | Ind: 20<br>Type: L2 | P052 = 3      |

**Peer-to-peer interfaces: Enable transmission and receipt of telegrams:**

If transmission on a peer-to-peer interface is disabled, the associated output drivers are connected to high impedance. If reception is disabled on a peer-to-peer interface, then the telegram failure monitoring function is deactivated.

|                           |                                                                                                                          |                           |                               |                                  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------|----------------------------------|
| <b>P816</b><br><br>(G173) | <b>Peer-to-peer 2: Source for data reception enabling command</b><br>0 = binector B0000<br>1 = binector B0001<br>etc.    | All binector numbers<br>1 | Ind: None<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P817</b><br><br>(G173) | <b>Peer-to-peer 2: Source for data transmission enabling command</b><br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: None<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P818</b><br><br>(G174) | <b>Peer-to-peer 3: Source for data reception enabling command</b><br>0 = binector B0000<br>1 = binector B0001<br>etc.    | All binector numbers<br>1 | Ind: None<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P819</b><br><br>(G174) | <b>Peer-to-peer 3: Source for data transmission enabling command</b><br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: None<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.42 Deactivation of monitoring functions



### WARNING

If monitoring functions are deactivated, there may be a risk to the safety of operating personnel or of substantial property damage if a fault or error actually occurs!

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |               |                                                     |                                 |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------|---------------------------------|
| <b>P820</b><br>* | <b>Deactivation of fault messages</b><br><br>The numbers of all fault messages to be deactivated must be entered in this parameter. Fault numbers can be entered in any order. 0 must be entered for any unused indices of the parameter.<br><br>Factory setting:<br>i001 = 7 (overvoltage)<br>i002 = 18 (short circuit at binary outputs)<br>i003 = 31 (monitoring of speed controller)<br>i004 = 35 (drive blocked)<br>i005 = 36 (armature current cannot flow)<br>i006 = 37 (I <sup>2</sup> t motor monitoring function has responded)<br>i007 to i099 = 0 | 0 to 147<br>1 | Ind: 99<br>FS=<br>see column<br>on left<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P821</b><br>* | <b>Deactivation of alarms</b><br><br>The numbers of all alarm messages to be deactivated must be entered in this parameter. Alarm numbers can be entered in any order. 0 must be entered for any unused indices of the parameter.                                                                                                                                                                                                                                                                                                                             | 0 to 147<br>1 | Ind: 99<br>FS= 0<br>Type: O2                        | P052 = 3<br>P051 = 40<br>Online |

## 11.43 Compensation values

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                |                                 |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------|---------------------------------|
| <b>r824</b>           | <b>A7006 compensation values</b><br><br>These data contain compensation values for the analog section of electronics board A7006                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0 to 65535<br>1                        | Ind: 10<br>Type: O2            | P052 = 3                        |
| <b>P825</b>           | <b>Offset compensation for actual field current channel</b><br><br>These data contain compensation values for the actual field current sensing function. They are automatically set during "Restore factory settings" (P051=21) and during the automatic offset compensation run (P051=22).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 13000 to 25000<br>1                    | Ind: 3<br>FS=19139<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online |
| <b>P826</b><br>(G163) | <b>Correction of natural commutation timing</b><br><br>If there is a variation in the armature current peak value (in spite of a constant firing angle), it can be corrected by offsetting the firing angle reference time of the appropriate line phase in parameter P826. One line phase (UV, UW, VW, VU, WU, WV) is assigned to each parameter index (i001 to i006).<br>Increasing the parameter setting by a value of 1 corresponds to an increase of 1.333 µs in the firing angle (0.024 degrees at 50Hz line frequency), consequently reducing the armature current peak in the appropriate line phase.<br>P826 is automatically set during the optimization run for precontrol and current controller (armature and field) (P051=25) (only when U800=0; when U800=1 or 2, parameters P826.001 to 006 are set to 0).<br><br>Caution:<br>Even an asymmetrical system causes variations in the magnitude of armature current peaks. However, the system asymmetry may also change. | -100 to 100 * 1.333<br>[µs]<br>1.333µs | Ind: 6<br>FS=0<br>Type: I2     | P052 = 3<br>P051 = 40<br>Online |
| <b>r827</b>           | <b>Internal diagnosis</b><br><br>i001: Number of write access operations to EEPROM<br>i002: Number of Page-Write access operations to EEPROM<br>i003: Counter for DUAL-PORT RAM timeouts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 65535<br>1                        | Ind: 3<br>Type: O2             | P052 = 3                        |
| <b>r828</b>           | <b>MLFB data</b><br><br>These data contain details about the power section design (model)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0 to 65535<br>1                        | Ind: 16<br>Type: O2            | P052 = 3                        |

| PNU  | Description                                                                                                                      | Value range<br>[Unit] | No. indices         | See<br>Change |
|------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|---------------|
| r829 | <b>A7001 compensation values</b><br><br>These data contain compensation values for the analog section of electronics board A7001 | 0 to 65535<br>1       | Ind: 68<br>Type: O2 | P052 = 3      |

## 11.44 Thyristor diagnosis

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                               |                                  |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|----------------------------------|
| P830<br>* | <b>Control word for thyristor diagnosis</b><br><br>0 Thyristor check function deactivated<br>1 Thyristors are checked on initial SWITCH-ON or INCHING command after connection of the electronics supply voltage.<br>2 Thyristors are checked on every SWITCH-ON or INCHING command.<br>3 Thyristors will be checked on the next SWITCH-ON or INCHING command. Parameter P830 is set to 0 if no fault is detected.<br><br>Note:<br>The thyristor check function may not be activated (setting P830=0 must be selected)<br>– when the "Enable a torque direction for torque direction change by parallel drive" function is in use (see also parameter P165) or<br>– when the converter is used to supply large inductances (e.g. field supply from armature terminals, supply of lifting solenoids, etc.). | 0 to 3<br>1 | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|----------------------------------|

## 11.45 Parameters for DriveMonitor and OP1S

|                    |                                                                                                                                                                                                      |  |  |          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|----------|
| P831<br>to<br>r849 | <b>Parameters for the Trace function of DriveMonitor</b><br><br>These parameters are settings for the data exchange between DriveMonitor and the SIMOREG converter. They must <u>not</u> be changed! |  |  | P052 = 3 |
| r850<br>to<br>P899 | <b>Parameters for the OP1S</b><br><br>These parameters are settings for the data exchange between OP1S and the SIMOREG converter. They must <u>not</u> be changed!                                   |  |  | P052 = 3 |

## 11.46 Profile parameters

|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                               |                                  |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------|----------------------------------|
| P918<br><br>(Z110)<br>(Z111)                                | <b>CB bus address</b><br><br>Protocol-dependent bus address for communication boards<br><br>Note:<br>The validity of the bus address is monitored by the communication board. (Bus addresses 0 to 2 are reserved for Master stations on PROFIBUS boards and must not therefore be set for other purposes). If the value is not accepted by the COM BOARD, fault F080 is displayed with fault value 5                                                                                                                                                                                                                                                                                                                                                                                                                    | 0 to 200<br>1 | Ind: 2<br>FS=3<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| P927<br>*<br>(G170)<br>(G171)<br>(G172)<br>(Z110)<br>(Z111) | <b>Parameterization enable</b><br><br>Enabling of interfaces for parameterization. A parameter value can only be altered via an enabled interface.<br><br>0: None<br>1: Communications board (CB)<br>2: Parameterizing unit (PMU)<br>4: G-SST1 serial interface and OP1S<br>8: Reserved<br>16: Technology board (TB)<br>32: G-SST2 serial interface<br>64: G-SST3 serial interface<br><br>Setting information:<br>Every interface has a numeric code.<br>The number for one specific interface, or the sum of various numbers assigned to several interfaces, must be entered in this parameter in order to enable the relevant interface(s) for use as a parameterization interface.<br>Example:<br>Factory setting value 6 (=4+2) means that the PMU and G-SST1 interfaces are enabled for parameterization purposes. | 0 to 127<br>1 | Ind: None<br>FS=6<br>Type: V2 | P052 = 3<br>P051 = 40<br>Offline |



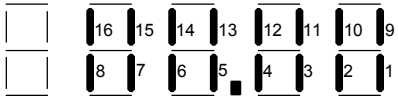
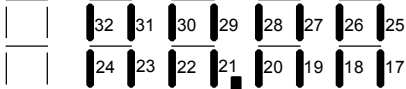
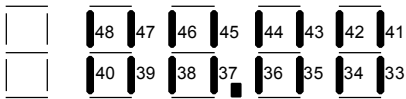
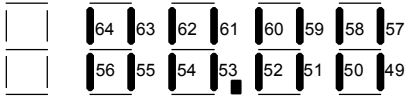
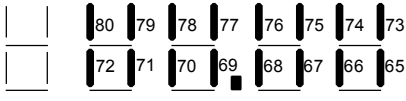
| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

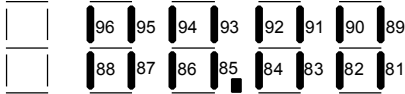
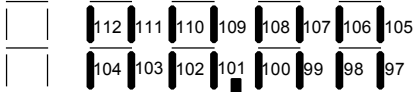
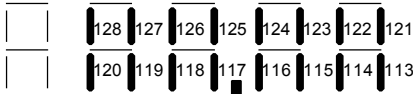
## 11.47 Fault memory

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |                      |          |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|----------|
| <b>r947</b><br>(G189) | <p><b>Fault memory</b></p> <p>Display of fault messages generated in response to recent faults. A <u>fault value</u> and <u>fault time</u> is assigned to each <u>fault number</u> (see Section 10 for details of fault numbers and fault values). The interrelationship between the associated parameters is shown in the diagram below.</p> <p>The <u>fault numbers</u> of the last (maximum 8) fault events are stored under the indices of parameter P947. r947.001 displays the fault number of the current (still not acknowledged) fault, index 9 displays the number of the most recent acknowledged fault, index 17 the fault number of the second most recent acknowledged fault, etc. An entry of "0" means that no "earlier" fault has occurred. Since only one fault message can be stored with respect to any fault event on the SIMOREG CM, only indices 1, 9, 17, 25, 33, 41, 49 and 57 are relevant.</p> <p>A <u>fault value</u> is assigned to each fault number in the corresponding index of parameter r949. This provides further information about the nature of the fault.</p> <p>In addition, the <u>fault time</u> (the current reading of the hours run counter as the fault occurred (r048)), is stored for each fault in r049. The data for the current (not yet acknowledged) fault are stored as the "Hours run counter reading" in index 1. The data for earlier, already acknowledged faults are stored under the following indices.</p> <p>Plaintext information about the fault numbers is available under the corresponding index of parameter r951.</p> |                 | Ind: 64<br>Type: O2  | P052 = 3 |
| <b>r949</b><br>(G189) | <p><b>Fault value</b></p> <p>Fault value of faults, allows more detailed diagnosis for a variety of parameters. The fault values are stored in the same indices as the associated fault numbers (r947) - see parameter r947.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 | Ind: 64<br>Type: O2  | P052 = 3 |
| <b>r951</b>           | <b>Fault text</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0 to 65535<br>1 | Ind: 101<br>Type: O2 | P052 = 3 |

| PNU  | Description                                                                                                                                                                                                                                           | Value range<br>[Unit] | No. indices                   | See<br>Change                    |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------|----------------------------------|
| P952 | <b>Number of faults</b><br>Settings:<br>0 Deletes the entire fault memory (r947, r949 and r049) by resetting to 0<br>Note: P952 cannot be reset while a fault is pending<br>>0 Display of the faults stored in the fault memory (r947, r949 and r049) | 0 to 65535<br>1       | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.48 Visualization parameters: Alarms

|      |                                                                                                                                                                                                                                                                                                                                               |  |                       |          |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|----------|
| r953 | <b>Alarm parameter 1</b><br>Display of active alarms in bit-coded form (A001 to A016).<br>If one of the alarms between 1 and 16 is generated, the corresponding segment in the display lights up.<br><br>See Section 10.2 for meaning of individual alarms.  |  | Ind: None<br>Type: V2 | P052 = 3 |
| r954 | <b>Alarm parameter 2</b><br>Display of active alarms in bit-coded form (A017 to A032).<br>If one of the alarms between 17 and 32 is generated, the corresponding segment in the display lights up.<br><br>See Section 10.2 for meaning of individual alarms |  | Ind: None<br>Type: V2 | P052 = 3 |
| r955 | <b>Alarm parameter 3</b><br>Parameter alarms 3<br>If one of the alarms between 33 and 48 is generated, the corresponding segment in the display lights up.<br>                                                                                             |  | Ind: None<br>Type: V2 | P052 = 3 |
| r956 | <b>Alarm parameter 4</b><br>Parameter alarms 4<br>If one of the alarms between 49 and 64 is generated, the corresponding segment in the display lights up.<br>                                                                                             |  | Ind: None<br>Type: V2 | P052 = 3 |
| r957 | <b>Alarm parameter 5</b><br>Parameter alarms 5<br>If one of the alarms between 65 and 80 is generated, the corresponding segment in the display lights up..<br>                                                                                            |  | Ind: None<br>Type: V2 | P052 = 3 |

| PNU  | Description                                                                                                                                                                                                                                                     | Value range<br>[Unit] | No. indices           | See<br>Change |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|---------------|
| r958 | <b>Alarm parameter 6</b><br>Parameter alarms 6 (CB alarms)<br>If one of the alarms between 81 and 96 is generated, the corresponding segment in the display lights up.<br>     |                       | Ind: None<br>Type: V2 | P052 = 3      |
| r959 | <b>Alarm parameter 7</b><br>Parameter alarms 7 (TB alarms 1)<br>If one of the alarms between 97 and 112 is generated, the corresponding segment in the display lights up.<br>  |                       | Ind: None<br>Type: V2 | P052 = 3      |
| r960 | <b>Alarm parameter 8</b><br>Parameter alarms 8 (TB alarms 2)<br>If one of the alarms between 113 and 128 is generated, the corresponding segment in the display lights up.<br> |                       | Ind: None<br>Type: V2 | P052 = 3      |

## 11.49 Device identification

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |                    |          |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------|----------|
| r964 | <b>Parameters for device identification on the PROFIBUS</b><br>[SW 2.0 and later]<br>Display parameters to support overview and diagnosis of all nodes on the PROFIBUS-DP during and after commissioning (coding according to PROFIBUS profile V3)<br>i001: Display of the manufacturer of the SIMOREG CM:<br>SIEMENS = 42<br>i002: Display of device type: SIMOREG CM = 4110<br>i003: Display of the software version of the SIMOREG CM<br>(see r060.001)<br>i004: Display of year of generation of the software of the SIMOREG CM: y y y y<br>(see r061.001)<br>i005: Display of the month and day of generation of the software of the SIMOREG CM: d d m m<br>(see r061.003 and r061.002)<br>i006: Display of the controlled axes of the SIMOREG CM: 1 | 0 to 65535<br>1 | Ind: 6<br>Type: O2 | P052 = 1 |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------|----------|

## 11.50 Visualization parameters: Control and status word

|      |                                                                                                                                  |  |                       |          |
|------|----------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|----------|
| r967 | <b>Display of control word 1</b><br>Visualization parameter for control word 1 (bits 0-15)<br>Identical to r650 (control word 1) |  | Ind: None<br>Type: V2 | P052 = 3 |
| r968 | <b>Display of status word 1</b><br>Visualization parameter for status word 1 (bits 0 - 15)<br>Identical to r652 (status word 1)  |  | Ind: None<br>Type: V2 | P052 = 3 |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

### 11.51 Resetting and storing parameters, list of existing and modified P and r parameters

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |             |                               |                                  |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|----------------------------------|
| <b>P970</b><br>* | <b>Restore factory setting</b><br>Reset parameters to factory setting (default)<br><br>0: Parameter reset: All parameters are reset to their original values (factory setting). This parameter is then automatically reset to 1.<br>1: No parameter reset<br><br>Note: Function can also be selected by setting P051=21.                                                                                                                                        | 0 to 1<br>1 | Ind: None<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>P971</b><br>* | <b>EEPROM transfer</b><br>Transfer of parameter values from RAM to EEPROM on switchover from 0 to 1.<br>It takes approximately 15s to process all values. The PMU remains in value mode for this period.                                                                                                                                                                                                                                                        | 0 to 1<br>1 | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>r980</b>      | <b>List of existing parameter numbers, start</b><br>Visualization parameter for displaying the first 100 parameter numbers in the P or r parameter range (0 to 999). The parameter numbers are listed in ascending sequence.<br>Repetition of a number over several indices means that there are no further parameter numbers in the 0 to 999 range.<br>The list is continued at the parameter whose number is displayed under index 101.<br>See also r989      |             | Ind: 101<br>Type: O2          | P052 = 3                         |
| <b>r981</b>      | <b>List of existing parameter numbers, continuation</b><br>See r980.                                                                                                                                                                                                                                                                                                                                                                                            |             | Ind: 101<br>Type: O2          | P052 = 3                         |
| <b>r982</b>      | <b>List of existing parameter numbers, continuation</b><br>See r980.                                                                                                                                                                                                                                                                                                                                                                                            |             | Ind: 101<br>Type: O2          | P052 = 3                         |
| <b>r983</b>      | <b>List of existing parameter numbers, continuation</b><br>See r980.                                                                                                                                                                                                                                                                                                                                                                                            |             | Ind: 101<br>Type: O2          | P052 = 3                         |
| <b>r984</b>      | <b>List of existing parameter numbers, continuation</b><br>See r980.                                                                                                                                                                                                                                                                                                                                                                                            |             | Ind: 101<br>Type: O2          | P052 = 3                         |
| <b>r985</b>      | <b>List of existing parameter numbers, continuation</b><br>See r980.                                                                                                                                                                                                                                                                                                                                                                                            |             | Ind: 101<br>Type: O2          | P052 = 3                         |
| <b>r986</b>      | <b>List of existing parameter numbers, continuation</b><br>See r980.                                                                                                                                                                                                                                                                                                                                                                                            |             | Ind: 101<br>Type: O2          | P052 = 3                         |
| <b>r987</b>      | <b>List of existing parameter numbers, continuation</b><br>See r980.                                                                                                                                                                                                                                                                                                                                                                                            |             | Ind: 101<br>Type: O2          | P052 = 3                         |
| <b>r988</b>      | <b>List of existing parameter numbers, continuation</b><br>See r980.                                                                                                                                                                                                                                                                                                                                                                                            |             | Ind: 101<br>Type: O2          | P052 = 3                         |
| <b>r989</b>      | <b>List of existing parameter numbers, continuation</b><br>Continuation of the list can be found under index 101. Please note:<br>860 = r860 (TECH BOARD installed)<br>2980 = n980<br>See also r980.                                                                                                                                                                                                                                                            |             | Ind: 101<br>Type: O2          | P052 = 3                         |
| <b>r990</b>      | <b>List of modified parameter numbers, start</b><br>Visualization parameter for displaying the first 100 modified parameters in the P or r parameter range (0 to 999). The parameter numbers are listed in ascending sequence.<br>Repetition of a number over several indices means that there are no further modified parameters in the 0 to 999 range.<br>The list is continued at the parameter whose number is displayed under index 101.<br>See also r999. |             | Ind: 101<br>Type: O2          | P052 = 3                         |

| PNU  | Description                                                                                                                                              | Value range<br>[Unit] | No. indices          | See<br>Change |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------|---------------|
| r991 | List of modified parameter numbers, continuation<br>See r990.                                                                                            |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| r992 | List of modified parameter numbers, continuation<br>See r990.                                                                                            |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| r993 | List of modified parameter numbers, continuation<br>See r990.                                                                                            |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| r994 | List of modified parameter numbers, continuation<br>See r990.                                                                                            |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| r995 | List of modified parameter numbers, continuation<br>See r990.                                                                                            |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| r996 | List of modified parameter numbers, continuation<br>See r990.                                                                                            |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| r997 | List of modified parameter numbers, continuation<br>See r990.                                                                                            |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| r998 | List of modified parameter numbers, continuation<br>See r990.                                                                                            |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| r999 | List of modified parameter numbers, continuation<br>Continuation of the list can be found under index 101. Please note:<br>2990 = n990<br>See also r990. |                       | Ind: 101<br>Type: O2 | P052 = 3      |

## 11.52 Password protection, key/lock mechanism

### Key/lock mechanism

To prevent unintended parameterization of the devices and to protect the know-how stored in the parameterization, you can restrict access to the (basic converter) parameters and define your own passwords (=pairs of numbers that you can choose). This done in parameters:

- **U005** key and
- **U006** lock.

If U005 and U006 are parameterized differently, it is only possible to access the following parameters:

- All visualization parameters (rxxx, nxxx)
- All parameters that can be changed with P051 = 0 (See parameter list)
- All "user parameters" (see Parameter U007)

All other parameters neither be read nor altered.

Only when U005 and U006 are parameterized to the same values, are these restrictions removed again.

When using the key-lock-mechanism you should follow this procedure:

1. Program the den lock parameter U006 in both parameter indices with your specific password.
2. Set Parameter P051 to the value 0. This activates the password you have just set (in U006).

After that, P051 can be set to 40 again and the password protection remains active.

Examples:

| Lock                                       | Key                                        | Result                                                                                                                                                                                    |
|--------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U006.1 = 0 (factory setting)<br>U006.2 = 0 | U005.1 = 0 (factory setting)<br>U005.2 = 0 | The key and lock are parameterized identically,<br>all parameters are accessible                                                                                                          |
| U006.1 = 12345<br>U006.2 = 54321           | U005.1 = 0<br>U005.2 = 0                   | The key and lock are parameterized <u>differently</u> ,<br>only the visualization parameters, the parameters that can be<br>altered with P051=0, and the "user parameters" are accessible |
| U006.1 = 12345<br>U006.2 = 54321           | U005.1 = 12345<br>U005.2 = 54321           | The key and lock are parameterized identically,<br>all parameters are accessible                                                                                                          |

NOTE: If you forget or lose your password, you can only regain access to all parameters by restoring the factory setting (P051=21).

|                            |                                                                               |                 |                            |                                  |
|----------------------------|-------------------------------------------------------------------------------|-----------------|----------------------------|----------------------------------|
| <b>U005</b><br>(2005)<br>* | <b>Key</b><br>Parameter for entering the keys for the key/lock mechanism      | 0 to 65535<br>1 | Ind: 2<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 0<br>on-line  |
| <b>U006</b><br>(2006)<br>* | <b>Lock</b><br>Parameter for entering the password for the key/lock mechanism | 0 to 65535<br>1 | Ind: 2<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |

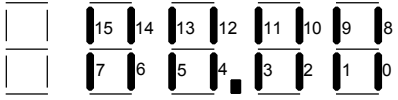
| PNU                        | Description                                                                                                                                                                                                                              | Value range<br>[Unit]                         | No. indices                  | See<br>Change                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------------------|----------------------------------|
| <b>U007</b><br>(2007)<br>* | <b>Numbers of the user parameters</b><br><br>Parameters for entering the numbers of those parameters that are to be accessible if the key and lock are set differently.<br>NOTE: Parameters U000 to U999 must be entered as 2000 to 2999 | 0 to 999<br>2000 to 2005<br>2008 to 2999<br>1 | Ind: 100<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |

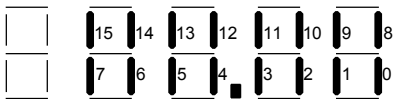
## 11.53 Processor utilization

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |                    |          |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------|----------|
| <b>n009</b><br>(2009) | <b>Processor utilization</b><br><br>This parameter is particularly relevant as regards the selection of function blocks of technology software in the basic unit (option S00) and the definition of the time slices in which these function blocks are processed (see also Section 8, Function Diagram B101 and parameters U950 to U952).<br><br>i001: Current total processor utilization<br>i002: Extrapolated total processor utilization for maximum line frequency<br>i003: Current total processor utilization by programs in time slice 10<br>i004: Current total processor utilization by programs in time slice 4<br>i005: Current total processor utilization by programs in time slice 2<br>i006: Current total processor utilization by programs in time slice 1 | 0.0 to 100.0<br>[%]<br>0.1% | Ind: 6<br>Type: O2 | P052 = 3 |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------|----------|

## 11.54 Display parameters for technology functions with S00

Only active with optional technology software S00

| Connector/binector converters          |                                                                                                                                                                                                                                                                                                                                                                       |  |                       |          |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|----------|
| <b>n010</b><br>(2010)<br>S00<br>(B120) | <b>Connector/binector converter 1</b> (bit field 1) <b>FB 10</b><br><br>Displays the status of the bits in the bit field on the bars of the 7-segment display<br><br><br>Segment ON: Corresponding bit is in log. "1" state<br>Segment OFF: Corresponding bit is in log. "0" state |  | Ind: None<br>Type: V2 | P052 = 3 |
| <b>n011</b><br>(2011)<br>S00<br>(B120) | <b>Connector/binector converter 2</b> (bit field 2) <b>FB 11</b><br><br>As for n010                                                                                                                                                                                                                                                                                   |  | Ind: None<br>Type: V2 | P052 = 3 |
| <b>n012</b><br>(2012)<br>S00<br>(B120) | <b>Connector/binector converter 3</b> (bit field 3) <b>FB 12</b><br><br>As for n010                                                                                                                                                                                                                                                                                   |  | Ind: None<br>Type: V2 | P052 = 3 |

| Binector/connector converters          |                                                                                                                                                                                                                                                                                                                                                                       |  |                       |          |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|----------|
| <b>n013</b><br>(2013)<br>S00<br>(B121) | <b>Binector/connector converter 1</b> (bit field 4) <b>FB 13</b><br><br>Displays the status of the bits in the bit field on the bars of the 7-segment display<br><br><br>Segment ON: Corresponding bit is in log. "1" state<br>Segment OFF: Corresponding bit is in log. "0" state |  | Ind: None<br>Type: V2 | P052 = 3 |
| <b>n014</b><br>(2014)<br>S00<br>(B121) | <b>Binector/connector converter 2</b> (bit field 5) <b>FB 14</b><br><br>As for n013                                                                                                                                                                                                                                                                                   |  | Ind: None<br>Type: V2 | P052 = 3 |

| PNU                                    | Description                                                                     | Value range<br>[Unit] | No. indices           | See<br>Change |
|----------------------------------------|---------------------------------------------------------------------------------|-----------------------|-----------------------|---------------|
| <b>n015</b><br>(2015)<br>S00<br>(B121) | <b>Binector/connector converter 3</b> (bit field 6) <b>FB 15</b><br>As for n013 |                       | Ind: None<br>Type: V2 | P052 = 3      |

| Technology controller                  |                                                              |                               |                       |          |
|----------------------------------------|--------------------------------------------------------------|-------------------------------|-----------------------|----------|
| <b>n016</b><br>(2016)<br>S00<br>(B170) | <b>Actual value display</b> <b>FB 260</b>                    | -200.0 to 199.9<br>[%]<br>0.1 | Ind: None<br>Type: I2 | P052 = 3 |
| <b>n017</b><br>(2017)<br>S00<br>(B170) | <b>Setpoint display</b> <b>FB 260</b>                        | -200.0 to 199.9<br>[%]<br>0.1 | Ind: None<br>Type: I2 | P052 = 3 |
| <b>n018</b><br>(2018)<br>S00<br>(B170) | <b>Display of effective Kp factor</b> <b>FB 260</b>          | 0.00 to 30.00<br>0.01         | Ind: None<br>Type: O2 | P052 = 3 |
| <b>n019</b><br>(2019)<br>S00<br>(B170) | <b>Display of technology controller output</b> <b>FB 260</b> | -200.0 to 199.9<br>[%]<br>0.1 | Ind: None<br>Type: I2 | P052 = 3 |

| Velocity/speed calculator              |                                                   |                                    |                       |          |
|----------------------------------------|---------------------------------------------------|------------------------------------|-----------------------|----------|
| <b>n020</b><br>(2020)<br>S00<br>(B190) | <b>Display of actual speed</b> <b>FB 261</b>      | -200.0 to 199.9<br>[%]<br>0.1      | Ind: None<br>Type: I2 | P052 = 3 |
| <b>n021</b><br>(2021)<br>S00<br>(B190) | <b>Display of actual velocity</b> <b>FB 261</b>   | -32.768 to 32767<br>[m/s]<br>0.001 | Ind: None<br>Type: I2 | P052 = 3 |
| <b>n022</b><br>(2022)<br>S00<br>(B190) | <b>Display of setpoint velocity</b> <b>FB 261</b> | -32.768 to 32767<br>[m/s]<br>0.001 | Ind: None<br>Type: I2 | P052 = 3 |
| <b>n023</b><br>(2023)<br>S00<br>(B190) | <b>Display of setpoint speed</b> <b>FB 261</b>    | -200.0 to 199.9<br>[%]<br>0.1      | Ind: None<br>Type: I2 | P052 = 3 |

## 11.55 Miscellaneous

|                       |                                                                                                                                                                                                                                         |                               |                    |          |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------|----------|
| <b>n024</b><br>(2024) | <b>Display of the speed actual value in rpm</b> [SW 2.0 and later]<br><br>i001: Display of the speed actual value from the pulse generator input of basic device X173<br>i002: Display of speed actual value from tachometer module SBP | -32768 to 32767<br>[rpm]<br>1 | Ind: 2<br>Type: I2 | P052 = 2 |
| <b>U040 to U041</b>   | <b>Reserved for later use</b> [SW 2.0 and later]<br>These parameters must <u>not</u> be changed by the user!                                                                                                                            |                               |                    | P052 = 3 |

| PNU                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Value range<br>[Unit]      | No. indices                   | See<br>Change                  |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|--------------------------------|
| <b>n042</b><br>(2042)                    | <b>Warning memory</b> [SW 2.0 and later]<br><br>Warning memory for flagging warnings that have occurred since the electronics supply voltage was last switched on.<br>The contents of the warning memory are lost when the electronics supply voltage is switched off and can be deleted with U043.<br>The warnings are displayed in bit code as for r953 to r960<br>i001: Display of warnings 1 to 16<br>i002: Display of warnings 17 to 32<br>i003: Display of warnings 33 to 48<br>i004: Display of warnings 49 to 64<br>i005: Display of warnings 65 to 80<br>i006: Display of warnings 81 to 96<br>i007: Display of warnings 97 to 112<br>i008: Display of warnings 113 to 128<br><br>See Section 10.2 for the meaning of the individual warnings |                            | Ind: 8<br>Type: V2            | P052 = 2                       |
| <b>U043</b><br>(2043)<br>*               | <b>Deleting the warning memory</b> [SW 2.0 and later]<br><br>Settings:<br>0 Deletes the entire warning memory n042 by resetting it to 0. Subsequently the parameter is automatically set back to value 1.<br>1 Not active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0 to 1<br>1                | Ind: none<br>FS=1<br>Type: O2 | P052 = 3                       |
| <b>U044</b><br>(2044)<br>*<br><br>(G121) | <b>Connector display, decimal</b> [SW 2.0 and later]<br><br>Selects those connectors whose value is to be displayed as a decimal with n045<br><br>i001: Selects the connector to be displayed with n045.01<br>i002: Selects the connector to be displayed with n045.02<br>i003: Selects the connector to be displayed with n045.03<br>i004: Selects the connector to be displayed with n045.04<br>i005: Selects the connector to be displayed with n045.05                                                                                                                                                                                                                                                                                             | All connector numbers<br>1 | Ind: 5<br>FS=0<br>Type: L2    | P052 = 3<br>P051 =40<br>online |
| <b>n045</b><br>(2045)<br><br>(G121)      | <b>Connector display, decimal</b> [SW 2.0 and later]<br><br>Decimal display with sign of the values of the connectors selected with U044. In the case of double-word connectors the H word is displayed.<br><br>i001: Display of the connector selected with U044.01<br>i002: Display of the connector selected with U044.02<br>i003: Display of the connector selected with U044.03<br>i004: Display of the connector selected with U044.04<br>i005: Display of the connector selected with U044.05                                                                                                                                                                                                                                                   | -32768 to 32767<br>1       | Ind:5<br>Type: I2             | P052 = 3                       |
| <b>U046</b><br>(2046)<br>*<br><br>(G121) | <b>Connector display, hexadecimal</b> [SW 2.0 and later]<br><br>Selection of connectors whose value is to be displayed as a hexadecimal value with n047I<br><br>i001: Selection of the connector to be displayed with n047.01<br>i002: Selection of the connector to be displayed with n047.02<br>i003: Selection of the connector to be displayed with n047.03<br>i004: Selection of the connector to be displayed with n047.04<br>i005: Selection of the connector to be displayed with n047.05                                                                                                                                                                                                                                                      | All connector numbers<br>1 | Ind: 5<br>FS=0<br>Type: L2    | P052 = 3<br>P051 =40<br>online |
| <b>n047</b><br>(2047)<br><br>(G121)      | <b>Connector display, hexadecimal</b> [SW 2.0 and later]<br><br>Hexadecimal display of values of connectors selected with U046. In the case of double-word connectors the H word is displayed.<br><br>i001: Display of the connector selected with U046.01<br>i002: Display of the connector selected with U046.02<br>i003: Display of the connector selected with U046.03<br>i004: Display of the connector selected with U046.04<br>i005: Display of the connector selected with U046.05                                                                                                                                                                                                                                                             | 0000h to FFFFh<br>1        | Ind:5<br>Type: L2             | P052 = 3                       |



| PNU                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                | Value range<br>[Unit] | No. indices                                                                          | See<br>Change                   |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------|---------------------------------|
| <b>U049</b><br>(2049) | <b>OP1S operating display</b> [SW 1.9 and later]<br>Function parameter for selecting parameters whose values must be included in the operating display of the optional OP1S convenience operator panel.<br><br>i001: 1 <sup>st</sup> line on left<br>i002: 1 <sup>st</sup> line on right<br>i003: 2 <sup>nd</sup> line (actual value), visualization parameter only<br>i004: 3 <sup>rd</sup> line (setpoint)<br>i005: 4 <sup>th</sup> line | 0 to 3999<br>1        | Ind:5<br>FS=<br>i001: 19<br>i002: 38<br>i003: 25<br>i004: 28<br>i005: 59<br>Type: O2 | P052 = 3<br>P051 =40<br>on-line |

**Connector type converters** (only active with optional technology software S00)

2 connectors are converted into one double word connector.

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                               |                            |                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------|-----------------------------------|
| <b>U098</b><br>(2098)<br>*<br>S00<br>(B151) | <b>Operands for 1<sup>st</sup> connector type converter</b> (result = KK9498) <b>FB 298</b><br><b>Operands for 2<sup>nd</sup> connector type converter</b> (result = KK9499) <b>FB 299</b><br>[SW 1.9 and later]<br><br>i001: Source for the low word of output connector KK9498<br>i002: Source for the high word of output connector KK9498<br>i003: Source for the low word of output connector KK9499<br>i004: Source for the high word of output connector KK9499<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector<br>numbers<br>1 | Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------|-----------------------------------|

## 11.56 Settable fixed values

Only active with optional technology software S00

|                                        |                                                                                                                          |                                   |                                 |                                  |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|----------------------------------|
| <b>U099</b><br>(2099)<br>S00<br>(B110) | <b>Fixed value</b> [SW 1.8 and later]<br>The values set in Index .001 to .100 are connected to connectors K9501 to K9600 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 100<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>on-line |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|----------------------------------|

## 11.57 Activation of fault messages and alarm messages

Only active with optional technology software S00

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                           |                            |                                   |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|-----------------------------------|
| <b>U100</b><br>(2100)<br>*<br>S00<br>(B115) | <b>Source for the activation of F023 and F019</b> <b>FB 2, FB 286</b><br>Selection of the binectors that activate fault messages F023 or F019 on log.<br>"1"<br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br><br>Up to SW 1.7: F023 (without fault value) if binector = 1 (FB 2)<br><br>SW 1.8 and later:<br>i001: F023 with fault value 1 (FB 2)<br>i002: F023 with fault value 2<br>i003: F023 with fault value 3<br>i004: F023 with fault value 4<br>i005: F019 with fault value 1 (FB 286)<br>i006: F019 with fault value 2<br>i007: F019 with fault value 3<br>i008: F019 with fault value 4 | All binector numbers<br>1 | Ind: 8<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|-----------------------------------|

| PNU                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Value range<br>[Unit]     | No. indices                | See<br>Change                     |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|-----------------------------------|
| <b>U101</b><br>(2101)<br>*<br>S00<br><br>(B115) | <b>Source for the activation of F024 and F020</b> <b>FB 3, FB 287</b><br>Selection of the binectors that activate fault messages F024 or F020 on log. "1"<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br>Up to SW 1.7: F024 (without fault value) if binector = 1 (FB 3)<br>SW 1.8 and later:<br>i001: F024 with fault value 1 (FB 3)<br>i002: F024 with fault value 2<br>i003: F024 with fault value 3<br>i004: F024 with fault value 4<br>i005: F020 with fault value 1 (FB 287)<br>i006: F020 with fault value 2<br>i007: F020 with fault value 3<br>i008: F020 with fault value 4 | All binector numbers<br>1 | Ind: 8<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U102</b><br>(2102)<br>*<br>S00<br><br>(B115) | <b>Source for the activation of F033 and F053</b> <b>FB 4, FB 288</b><br>Selection of the binectors that activate fault messages F033 or F053 on log. "1"<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br>Up to SW 1.7: F033 (without fault value) if binector = 1 (FB 4)<br>SW 1.8 and later:<br>i001: F033 with fault value 1 (FB 4)<br>i002: F033 with fault value 2<br>i003: F033 with fault value 3<br>i004: F033 with fault value 4<br>i005: F053 with fault value 1 (FB 288)<br>i006: F053 with fault value 2<br>i007: F053 with fault value 3<br>i008: F053 with fault value 4 | All binector numbers<br>1 | Ind: 8<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U103</b><br>(2103)<br>*<br>S00<br><br>(B115) | <b>Source for the activation of F034 and F054</b> <b>FB 5, FB 289</b><br>Selection of the binectors that activate fault messages F034 or F054 on log. "1"<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br>Up to SW 1.7: F034 (without Fault value) if binector = 1 (FB 5)<br>SW 1.8 and later:<br>i001: F034 with fault value 1 (FB 5)<br>i002: F034 with fault value 2<br>i003: F034 with fault value 3<br>i004: F034 with fault value 4<br>i005: F054 with fault value 1 (FB 289)<br>i006: F054 with fault value 2<br>i007: F054 with fault value 3<br>i008: F054 with fault value 4 | All binector numbers<br>1 | Ind: 8<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U104</b><br>(2104)<br>*<br>S00<br><br>(B115) | <b>Source for the activation of A023 and A019</b> <b>FB 6, FB 256</b><br>Selection of the binectors that activate alarm A023 or A019 on log. "1"<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br>Up to SW 1.7: A023 (FB 6)<br>SW 1.8 and later:<br>i001: A023 (FB 6)<br>i002: A019 (FB 256)                                                                                                                                                                                                                                                                                            | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

| PNU                                         | Description                                                                                                                                                                                                                                                                                        | Value range<br>[Unit]     | No. indices                | See<br>Change                     |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|-----------------------------------|
| <b>U105</b><br>(2105)<br>*<br>S00<br>(B115) | <b>Source for the activation of A024 and A020</b> <b>FB 7, FB 257</b><br>Selection of the binectors that activate alarm A024 or A020 on log. "1"<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br>Up to SW 1.7: A024 (FB 7)<br>SW 1.8 and later:<br>i001: A024 (FB 7)<br>i002: A020 (FB 257) | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U106</b><br>(2106)<br>*<br>S00<br>(B115) | <b>Source for the activation of A033 and A053</b> <b>FB 8, FB 258</b><br>Selection of the binectors that activate alarm A033 or A053 on log. "1"<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br>Up to SW 1.7: A033 (FB 8)<br>SW 1.8 and later:<br>i001: A033 (FB 8)<br>i002: A053 (FB 258) | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U107</b><br>(2107)<br>*<br>S00<br>(B115) | <b>Source for the activation of A034 and A054</b> <b>FB 9, FB 259</b><br>Selection of the binectors that activate alarm A034 or A054 on log. "1"<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br>Up to SW 1.7: A034 (FB 9)<br>SW 1.8 and later:<br>i001: A034 (FB 9)<br>i002: A054 (FB 259) | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

## 11.58 Connector/binector converters, binector/connector converters

Only active with optional technology software S00

|                                             |                                                                                                                                                                                                                                                                                                                               |                            |                               |                                  |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|----------------------------------|
| <b>U110</b><br>(2110)<br>*<br>S00<br>(B120) | <b>Source for connector/binector converter 1</b> <b>FB 10</b><br>Connector which must be converted to binectors B9052 (bit 0) to B9067 (bit 15)<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                         | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U111</b><br>(2111)<br>*<br>S00<br>(B120) | <b>Source for connector/binector converter 2</b> <b>FB 11</b><br>Connector which must be converted to binectors B9068 (bit 0) to B9083 (bit 15)<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                         | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U112</b><br>(2112)<br>*<br>S00<br>(B120) | <b>Source for connector/binector converter 3</b> <b>FB 12</b><br>Connector which must be converted to binectors B9084 (bit 0) to B9099 (bit 15)<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                         | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U113</b><br>(2113)<br>*<br>S00<br>(B121) | <b>Source for binector/connector converter 1</b> <b>FB 13</b><br>Binectors which must be converted to connector K9113<br>i001: 1 <sup>st</sup> binector (bit 0)<br>i002: 2 <sup>nd</sup> binector (bit 1)<br>...<br>i016: 16 <sup>th</sup> binector (bit 15)<br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1  | Ind: 16<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Offline |

| PNU                        | Description                                                                                                                                                                                                                                                                                                                   | Value range<br>[Unit]     | No. indices                 | See<br>Change                    |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------|----------------------------------|
| <b>U114</b><br>(2114)<br>* | <b>Source for binector/connector converter 2</b> <b>FB 14</b><br>Binectors which must be converted to connector K9114<br>i001: 1 <sup>st</sup> binector (bit 0)<br>i002: 2 <sup>nd</sup> binector (bit 1)<br>...<br>i016: 16 <sup>th</sup> binector (bit 15)<br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 16<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| S00<br>(B121)              |                                                                                                                                                                                                                                                                                                                               |                           |                             |                                  |
| <b>U115</b><br>(2115)<br>* | <b>Source for binector/connector converter 3</b> <b>FB 15</b><br>Binectors which must be converted to connector K9115<br>i001: 1 <sup>st</sup> binector (bit 0)<br>i002: 2 <sup>nd</sup> binector (bit 1)<br>...<br>i016: 16 <sup>th</sup> binector (bit 15)<br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 16<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| S00<br>(B121)              |                                                                                                                                                                                                                                                                                                                               |                           |                             |                                  |

## 11.59 Binector/connector converter for serial interfaces

|                            |                                                                                                                                                                                                                                                                                                                          |                           |                             |                                  |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------|----------------------------------|
| <b>U116</b><br>(2116)<br>* | <b>Source for binector/connector converter for GSST1</b><br>Binectors which must be converted to connector K2020<br>i001: 1 <sup>st</sup> binector (bit 0)<br>i002: 2 <sup>nd</sup> binector (bit 1)<br>...<br>i016: 16 <sup>th</sup> binector (bit 15)<br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 16<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| (G170)                     |                                                                                                                                                                                                                                                                                                                          |                           |                             |                                  |
| <b>U117</b><br>(2117)<br>* | <b>Source for binector/connector converter for GSST2</b><br>Binectors which must be converted to connector K6020<br>i001: 1 <sup>st</sup> binector (bit 0)<br>i002: 2 <sup>nd</sup> binector (bit 1)<br>...<br>i016: 16 <sup>th</sup> binector (bit 15)<br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 16<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| (G171)<br>(G173)           |                                                                                                                                                                                                                                                                                                                          |                           |                             |                                  |
| <b>U118</b><br>(2118)<br>* | <b>Source for binector/connector converter for GSST3</b><br>Binectors which must be converted to connector K9020<br>i001: 1 <sup>st</sup> binector (bit 0)<br>i002: 2 <sup>nd</sup> binector (bit 1)<br>...<br>i016: 16 <sup>th</sup> binector (bit 15)<br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 16<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| (G172)<br>(G174)           |                                                                                                                                                                                                                                                                                                                          |                           |                             |                                  |
| <b>U119</b><br>(2119)<br>* | <b>Parameters for the Trace function of DriveMonitor</b><br>This parameter is a setting for the exchange of process data between DriveMonitor and the SIMOREG converter. It must <u>not</u> be changed!                                                                                                                  |                           |                             |                                  |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.60 Mathematical functions

Only active with optional technology software S00

### Adder / subtractor

The 3 operands of a function block are selected by 3 indices each of a parameter.

U120 to U131:

The connectors selected via indices i001 and i002 are added, the connector selected via index i003 is subtracted.

U120 to U122 [SW 1.8 and later]:

The connectors selected via indices i004 and i005 are added, the connector selected via index i006 is subtracted.

The result is limited to -200.00 to +199.99% and applied to the connector stated.

|                                             |                                                                                                                                                                                                         |                              |                               |                            |                                   |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------|----------------------------|-----------------------------------|
| <b>U120</b><br>(2120)<br>*<br>S00<br>(B125) | <b>Operands for 1st adder / subtractor</b> (result = K9120)<br><b>Operands for 13th adder / subtractor</b> (result = K9132)<br>(SW 1.8 and later)<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 20</b><br><b>FB 32</b> | All connector<br>numbers<br>1 | Ind: 6<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U121</b><br>(2121)<br>*<br>S00<br>(B125) | <b>Operands for 2nd adder / subtractor</b> (result = K9121)<br><b>Operands for 14th adder / subtractor</b> (result = K9133)<br>[SW 1.8 and later]<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 21</b><br><b>FB 33</b> | All connector<br>numbers<br>1 | Ind: 6<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U122</b><br>(2122)<br>*<br>S00<br>(B125) | <b>Operands for 3rd adder / subtractor</b> (result = K9122)<br><b>Operands for 14th adder / subtractor</b> (result = K9134)<br>[SW 1.8 and later]<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 22</b><br><b>FB 34</b> | All connector<br>numbers<br>1 | Ind: 6<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U123</b><br>(2123)<br>*<br>S00<br>(B125) | <b>Operands for 4<sup>th</sup> adder / subtractor</b> (result = K9123)<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                            | <b>FB 23</b>                 | All connector<br>numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>U124</b><br>(2124)<br>*<br>S00<br>(B125) | <b>Operands for 5<sup>th</sup> adder / subtractor</b> (result = K9124)<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                            | <b>FB 24</b>                 | All connector<br>numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>U125</b><br>(2125)<br>*<br>S00<br>(B125) | <b>Operands for 6<sup>th</sup> adder / subtractor</b> (result = K9125)<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                            | <b>FB 25</b>                 | All connector<br>numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>U126</b><br>(2126)<br>*<br>S00<br>(B125) | <b>Operands for 7<sup>th</sup> adder / subtractor</b> (result = K9126)<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                            | <b>FB 26</b>                 | All connector<br>numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>U127</b><br>(2127)<br>*<br>S00<br>(B125) | <b>Operands for 8<sup>th</sup> adder / subtractor</b> (result = K9127)<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                            | <b>FB 27</b>                 | All connector<br>numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>U128</b><br>(2128)<br>*<br>S00<br>(B125) | <b>Operands for 9<sup>th</sup> adder / subtractor</b> (result = K9128)<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                            | <b>FB 28</b>                 | All connector<br>numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>U129</b><br>(2129)<br>*<br>S00<br>(B125) | <b>Operands for 10<sup>th</sup> adder / subtractor</b> (result = K9129)<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                           | <b>FB 29</b>                 | All connector<br>numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline  |

| PNU                                         | Description                                                                                                                                    | Value range [Unit]         | No. indices                | See Change                       |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------------|
| <b>U130</b><br>(2130)<br>*<br>S00<br>(B125) | <b>Operands for 11<sup>th</sup> adder / subtractor</b> (result = K9130) <b>FB 30</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U131</b><br>(2131)<br>*<br>S00<br>(B125) | <b>Operands for 12<sup>th</sup> adder / subtractor</b> (result = K9131) <b>FB 31</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**Adders / subtractors for double word connectors**

The 3 operands of a function block are selected in each case via the three indices of a parameter.

The result is switched to a double word connector and a connector.

The double word connector is limited to between -200.00 and +199.99%.

The connector is limited to between -0.003052 and +0.003052% (= value range of LOW word of a double word connector =  $\pm 200\%$  / 65536)

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                    |                            |                            |                                   |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------|----------------------------|-----------------------------------|
| <b>U132</b><br>(2132)<br>*<br>S00<br>(B151) | <b>Operands for 1<sup>st</sup> adder / subtractor</b><br><b>Operands for 2<sup>nd</sup> adder / subtractor</b><br><br>1 <sup>st</sup> adder / subtractor: result = KK9490 and K9491<br>2 <sup>nd</sup> adder / subtractor: result = KK9492 and K9493<br><br>i001: Addition value for 1 <sup>st</sup> adder/subtractor<br>i002: Addition value for 1 <sup>st</sup> adder/subtractor<br>i003: Subtraction value for 1 <sup>st</sup> adder/subtractor<br>i004: Addition value for 2 <sup>nd</sup> adder/subtractor<br>i005: Addition value for 2 <sup>nd</sup> adder/subtractor<br>i006: Subtraction value for 2 <sup>nd</sup> adder/subtractor<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 48</b><br><b>FB 49</b><br>[SW 1.9 and later] | All connector numbers<br>1 | Ind: 6<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------|----------------------------|-----------------------------------|

**Sign inverters**

The contents of the connector selected in the parameter are negated (two's complement). The result is applied to the specified connector.

|                                             |                                                                                                                                        |                            |                               |                                  |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|----------------------------------|
| <b>U135</b><br>(2135)<br>*<br>S00<br>(B125) | <b>Source for 1<sup>st</sup> sign inverter</b> (result = K9135) <b>FB 35</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U136</b><br>(2136)<br>*<br>S00<br>(B125) | <b>Source for 2<sup>nd</sup> sign inverter</b> (result = K9136) <b>FB 36</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U137</b><br>(2137)<br>*<br>S00<br>(B125) | <b>Source for 3<sup>rd</sup> sign inverter</b> (result = K9137) <b>FB 37</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U138</b><br>(2138)<br>*<br>S00<br>(B125) | <b>Source for 4<sup>th</sup> sign inverter</b> (result = K9138) <b>FB 38</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**Switchable sign inverters**

The contents of the connector entered in the parameter for selection of a source is switched through, depending on the state of the binector entered in the parameter for control bit selection, as an unchanged value (when control bit = 0) or as a negated value (two's complement, when control bit = 1). The result is applied to the specified connector.

|                                             |                                                                                                                                                        |                            |                               |                                  |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|----------------------------------|
| <b>U140</b><br>(2140)<br>*<br>S00<br>(B125) | <b>Source for 1<sup>st</sup> switchable sign inverter</b> <b>FB 40</b><br><br>Result = K9140<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|----------------------------------|

| PNU                                         | Description                                                                                                                                            | Value range [Unit]         | No. indices                   | See Change                       |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|----------------------------------|
| <b>U141</b><br>(2141)<br>*<br>S00<br>(B125) | <b>Control bit for 1<sup>st</sup> switchable sign inverter</b> <b>FB 40</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                    | All binector numbers<br>1  | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U142</b><br>(2142)<br>*<br>S00<br>(B125) | <b>Source for 2<sup>nd</sup> switchable sign inverter</b> <b>FB 41</b><br><br>Result = K9141<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U143</b><br>(2143)<br>*<br>S00<br>(B125) | <b>Control bit for 2<sup>nd</sup> switchable sign inverter</b> <b>FB 41</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.                    | All binector numbers<br>1  | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**Divider**

The two operands (x1, x2) for each divider are selected via 2 indices each of the parameter:

Index i001 = x1, index i002 = x2

Index i003 = x1, index i004 = x2 [SW 1.8 and later]

$$\text{Formula: } y = \frac{x1 * 100\%}{x2}$$

For division by 0 (x2=0) the following applies:

for x1 > 0: y = +199.99%

for x1 = 0: y = 0.00%

for x1 < 0: y = -200.00%

y is limited to -200.00 to +199.99% and applied to the connector stated.

|                                             |                                                                                                                                                                |                              |                            |                            |                                   |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------------------|----------------------------|-----------------------------------|
| <b>U145</b><br>(2145)<br>*<br>S00<br>(B131) | <b>Operands for 1st divider</b> (result = K9145)<br><b>Operands for 4th divider</b> (result = K9142)<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 45</b><br><b>FB 42</b> | All connector numbers<br>1 | Ind: 4<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U146</b><br>(2146)<br>*<br>S00<br>(B131) | <b>Operands for 2nd divider</b> (result = K9146)<br><b>Operands for 5th divider</b> (result = K9143)<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 46</b><br><b>FB 43</b> | All connector numbers<br>1 | Ind: 4<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U147</b><br>(2147)<br>*<br>S00<br>(B131) | <b>Operands for 3rd divider</b> (result = K9147)<br><b>Operands for 6th divider</b> (result = K9144)<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 47</b><br><b>FB 44</b> | All connector numbers<br>1 | Ind: 4<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

**Multiplier**

The two operands (x1, x2) for each multiplier are selected via 2 indices of the parameter each:

Index i001 = x1, Index i002 = x2

Index i003 = x1, Index i004 = x2 [SW 1.8 and later]

Index i005 = x1, Index i006 = x2 [SW 1.8 and later]

$$\text{Formula: } y = \frac{x1 * x2}{100\%}$$

y is limited to -200.00 to +199.99% and applied to the connector stated.

|                                             |                                                                                                                                                                                                                              |                                                |                            |                            |                                   |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------|----------------------------|-----------------------------------|
| <b>U150</b><br>(2150)<br>*<br>S00<br>(B130) | <b>Operands for 1st multiplier</b> (result = K9150)<br><b>Operands for 5th multiplier</b> (result = K9430)<br><b>Operands for 9th multiplier</b> (result = K9431)<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.  | <b>FB 50</b><br><b>FB 290</b><br><b>FB 291</b> | All connector numbers<br>1 | Ind: 6<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U151</b><br>(2151)<br>*<br>S00<br>(B130) | <b>Operands for 2nd multiplier</b> (result = K9151)<br><b>Operands for 6th multiplier</b> (result = K9432)<br><b>Operands for 10th multiplier</b> (result = K9433)<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 51</b><br><b>FB 292</b><br><b>FB 293</b> | All connector numbers<br>1 | Ind: 6<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |



| PNU                                         | Description                                                                                                                                                                                                                  | Value range [Unit]                             | No. indices                | See Change                                                          |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------|---------------------------------------------------------------------|
| <b>U152</b><br>(2152)<br>*<br>S00<br>(B130) | <b>Operands for 3rd multiplier</b> (result = K9152)<br><b>Operands for 7th multiplier</b> (result = K9434)<br><b>Operands for 11th multiplier</b> (result = K9435)<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 52</b><br><b>FB 294</b><br><b>FB 295</b> | All connector numbers<br>1 | Ind: 6<br>FS=0<br>Type: L2<br><br>P052 = 3<br>P051 = 40<br>off-line |
| <b>U153</b><br>(2153)<br>*<br>S00<br>(B130) | <b>Operands for 4th multiplier</b> (result = K9153)<br><b>Operands for 8th multiplier</b> (result = K9436)<br><b>Operands for 12th multiplier</b> (result = K9437)<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 53</b><br><b>FB 296</b><br><b>FB 297</b> | All connector numbers<br>1 | Ind: 6<br>FS=0<br>Type: L2<br><br>P052 = 3<br>P051 = 40<br>off-line |

**High-resolution multipliers/dividers**

The three operands are selected via the three indices of the parameter, i.e. index i001 = x1, index i002 = x2, index i003 = x3

$$\text{Equations: } x4(32\text{bit}) = x1 * x2, \quad y = \frac{x4}{x3} = \frac{x1 * x2}{x3}$$

Applicable for division by 0 (x2=0):

When x1 > 0: y = +199.99%

When x1 = 0: y = 0.00%

When x1 < 0: y = -200.00%

y is limited to -200.00 to +199.99% and applied to the specified connector.

|                                             |                                                                                                                                  |              |                            |                                                                    |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------|--------------------------------------------------------------------|
| <b>U155</b><br>(2155)<br>*<br>S00<br>(B131) | <b>Operands for 1<sup>st</sup> multiplier/divider</b> (result = K9155)<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 55</b> | All connector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2<br><br>P052 = 3<br>P051 = 40<br>Offline |
| <b>U156</b><br>(2156)<br>*<br>S00<br>(B131) | <b>Operands for 2<sup>nd</sup> multiplier/divider</b> (result = K9156)<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 56</b> | All connector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2<br><br>P052 = 3<br>P051 = 40<br>Offline |
| <b>U157</b><br>(2157)<br>*<br>S00<br>(B131) | <b>Operands for 3<sup>rd</sup> multiplier/divider</b> (result = K9157)<br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 57</b> | All connector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2<br><br>P052 = 3<br>P051 = 40<br>Offline |

**Absolute-value generators with filtering**

|                                             |                                                                                                                                                                                                                                                                                           |                            |                                                                       |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------------------------------------------------|
| <b>U160</b><br>(2160)<br>*<br>S00<br>(B135) | <b>Source for input quantity for 1<sup>st</sup> abs.-value generator with filter</b> <b>FB 60</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                               | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2<br><br>P052 = 3<br>P051 = 40<br>Offline |
| <b>U161</b><br>(2161)<br>*<br>S00<br>(B135) | <b>Signal injection mode for 1<sup>st</sup> abs.-value generator with filter</b> <b>FB 60</b><br><br>0 Injection of signal with correct sign<br>1 Injection of absolute value of signal<br>2 Injection of signal with sign, inverted<br>3 Injection of absolute value of signal, inverted | 0 to 3<br>1                | Ind: None<br>FS=0<br>Type: O2<br><br>P052 = 3<br>P051 = 40<br>Offline |
| <b>U162</b><br>(2162)<br>S00<br>(B135)      | <b>Filter time for 1<sup>st</sup> abs.-value generator with filter</b> <b>FB 60</b>                                                                                                                                                                                                       | 0 to 10000 [ms]<br>1       | Ind: None<br>FS=0<br>Type: O2<br><br>P052 = 3<br>P051 = 40<br>Offline |

|                                             |                                                                                                                                                                                                                                                                                           |                            |                                                                       |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------------------------------------------------|
| <b>U163</b><br>(2163)<br>*<br>S00<br>(B135) | <b>Source for input quantity for 2<sup>nd</sup> abs.-value generator with filter</b> <b>FB 61</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                               | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2<br><br>P052 = 3<br>P051 = 40<br>Offline |
| <b>U164</b><br>(2164)<br>*<br>S00<br>(B135) | <b>Signal injection mode for 2<sup>nd</sup> abs.-value generator with filter</b> <b>FB 61</b><br><br>0 Injection of signal with correct sign<br>1 Injection of absolute value of signal<br>2 Injection of signal with sign, inverted<br>3 Injection of absolute value of signal, inverted | 0 to 3<br>1                | Ind: None<br>FS=0<br>Type: O2<br><br>P052 = 3<br>P051 = 40<br>Offline |
| <b>U165</b><br>(2165)<br>S00<br>(B135)      | <b>Filter time for 2<sup>nd</sup> abs.-value generator with filter</b> <b>FB 61</b>                                                                                                                                                                                                       | 0 to 10000 [ms]<br>1       | Ind: None<br>FS=0<br>Type: O2<br><br>P052 = 3<br>P051 = 40<br>Offline |



| PNU                                         | Description                                                                                                                                                                                                                                                                        | Value range<br>[Unit]         | No. indices                   | See<br>Change                    |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|----------------------------------|
| <b>U166</b><br>(2166)<br>*<br>S00<br>(B135) | <b>Source for input quantity for 3<sup>rd</sup> abs.-value generator with filter FB 62</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                               | All connector<br>numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U167</b><br>(2167)<br>*<br>S00<br>(B135) | <b>Signal injection mode for 3<sup>rd</sup> abs.-value generator with filter FB 62</b><br><br>0 Injection of signal with correct sign<br>1 Injection of absolute value of signal<br>2 Injection of signal with sign, inverted<br>3 Injection of absolute value of signal, inverted | 0 to 3<br>1                   | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U168</b><br>(2168)<br>S00<br>(B135)      | <b>Filter time for 3<sup>rd</sup> abs.-value generator with filter FB 62</b>                                                                                                                                                                                                       | 0 to 10000<br>[ms]<br>1       | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U169</b><br>(2169)<br>*<br>S00<br>(B135) | <b>Source for input quantity for 4<sup>th</sup> abs.-value generator with filter FB 63</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                               | All connector<br>numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U170</b><br>(2170)<br>*<br>S00<br>(B135) | <b>Signal injection mode for 4<sup>th</sup> abs.-value generator with filter FB 63</b><br><br>0 Injection of signal with correct sign<br>1 Injection of absolute value of signal<br>2 Injection of signal with sign, inverted<br>3 Injection of absolute value of signal, inverted | 0 to 3<br>1                   | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U171</b><br>(2171)<br>S00<br>(B135)      | <b>Filter time for 4<sup>th</sup> abs.-value generator with filter FB 63</b>                                                                                                                                                                                                       | 0 to 10000<br>[ms]<br>1       | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.61 Processing of connectors

Only active with optional technology software S00

| <b>Averager</b> [SW 1.8 and later]          |                                                                                                                                                                                                                                                     | <b>FB 16, FB 17, FB 18, FB 19</b> |                            |                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------|-----------------------------------|
| <b>U172</b><br>(2172)<br>*<br>S00<br>(B139) | <b>Source for input signal</b> [SW 1.8 and later]<br><br>i001: 1st averager (FB 16)<br>i002: 2nd averager (FB 17)<br>i003: 3rd averager (FB 18)<br>i004: 4. averager (FB 19)<br><br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | All connector<br>numbers<br>1     | Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U173</b><br>(2173)<br>S00<br>(B139)      | <b>Number of sampling cycles</b> [SW 1.8 and later]<br><br>i001: 1st averager (FB 16)<br>i002: 2nd averager (FB 17)<br>i003: 3rd averager (FB 18)<br>i004: 4. averager (FB 19)                                                                      | 1 to 100<br>1                     | Ind: 4<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.62 Limiters, limit-value monitors

Only active with optional technology software S00

|                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                                                                                         |                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>Limiters</b><br>The input variable selected with index i001 or i004 of the 1 <sup>st</sup> parameter is limited to the limit values selected with indices i002 and i003 or i005 and i006 and applied to the specified connector. Violation of the limit values is signaled by means of two binectors. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                                                                                                         |                                  |
| <b>U175</b><br>(2175)<br>*<br>S00<br>(B134)<br>(B135)                                                                                                                                                                                                                                                    | <b>Source for input signal and limits for limiter 1</b> <b>FB 65</b><br>Output = connector K9167<br>i001: Input signal<br>i002: Upper limiting value (L+)<br>i003: Lower limiting value (L-)<br><br><b>Source for input signal and limits for limiter 4</b> <b>FB 212</b><br>[SW 2.0 and later]<br>Output = connector K9176<br>i004: Input signal<br>i005: Upper limiting value (L+)<br>i006: Lower limiting value (L-)<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1        | Ind: 6<br>FS=<br>i001: 0<br>i002: 9165<br>i003: 9166<br>i004: 0<br>i005: 9174<br>i006: 9175<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U176</b><br>(2176)<br>S00<br>(B134)<br>(B135)                                                                                                                                                                                                                                                         | <b>Limit value for limiter</b> <b>FB 65, FB212</b><br>i001: Applied to connector K9165 (FB 65)<br>i002: Applied to connector K9174 (FB 212) [SW 2.0 and later]                                                                                                                                                                                                                                                                                                                                 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 2<br>FS=100.00<br>Type: I2                                                                         | P052 = 3<br>P051 = 40<br>Offline |
| <b>U177</b><br>(2177)<br>*<br>S00<br>(B134)<br>(B135)                                                                                                                                                                                                                                                    | <b>Source for input signal and limits for limiter 2</b> <b>FB 66</b><br>Output = connector K9170<br>i001: Input signal<br>i002: Upper limiting value (L+)<br>i003: Lower limiting value (L-)<br><br><b>Source for input signal and limits for limiter 5</b> <b>FB 213</b><br>[SW 2.0 and later]<br>Output = connector K9179<br>i004: Input signal<br>i005: Upper limiting value (L+)<br>i006: Lower limiting value (L-)<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1        | Ind: 6<br>FS=<br>i001: 0<br>i002: 9168<br>i003: 9169<br>i004: 0<br>i005: 9177<br>i006: 9178<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U178</b><br>(2178)<br>S00<br>(B134)<br>(B135)                                                                                                                                                                                                                                                         | <b>Limit value for limiter</b> <b>FB 66, FB213</b><br>i001: Applied to connector K9168 (FB 66)<br>i002: Applied to connector K9177 (FB 213) [SW 2.0 and later]                                                                                                                                                                                                                                                                                                                                 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 2<br>FS=100.00<br>Type: I2                                                                         | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Value range<br>[Unit]             | No. indices                                                                                             | See<br>Change                    |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>U179</b><br>(2179)<br>*<br>S00<br>(B134)<br>(B135) | <b>Source for input signal and limits for limiter 3</b> <b>FB 67</b><br>Output = connector K9173<br>i001: Input signal<br>i002: Upper limiting value (L+)<br>i003: Lower limiting value (L-)<br><br><b>Source for input signal and limits for limiter 6</b> <b>FB 214</b><br>[SW 2.0 and later]<br>Output = connector K9262<br>i004: Input signal<br>i005: Upper limiting value (L+)<br>i006: Lower limiting value (L-)<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1        | Ind: 6<br>FS=<br>i001: 0<br>i002: 9171<br>i003: 9172<br>i004: 0<br>i005: 9260<br>i006: 9261<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U180</b><br>(2180)<br>S00<br>(B134)<br>(B135)      | <b>Limit value for limiter</b> <b>FB 67, FB214</b><br>i001: Applied to connector K9171 (FB 67)<br>i002: Applied to connector K9260 (FB 214) [SW 2.0 and later]                                                                                                                                                                                                                                                                                                                                 | -199.99 to 199.99<br>[%]<br>0.01% | Ind: 2<br>FS=100.00<br>Type: I2                                                                         | P052 = 3<br>P051 = 40<br>Offline |

#### Limit-value monitors for double word connectors

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                |                               |                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------------------|
| <b>U181</b><br>(2181)<br>*<br>S00<br>(B151) | <b>Source for input signal (A) and operating threshold (B) for 1<sup>st</sup> limit-value monitor for double word connectors</b> <b>FB 68</b><br><b>for 2<sup>nd</sup> limit-value monitor for double word connectors</b> <b>FB 69</b><br>[SW 1.9 and later]<br>i001: Input signal for 1 <sup>st</sup> limit-value monitor<br>i002: Operating threshold for 1 <sup>st</sup> limit-value monitor<br>i003: Input signal for 2 <sup>nd</sup> limit-value monitor<br>i004: Operating threshold for 2 <sup>nd</sup> limit-value monitor<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1     | Ind: 4<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>off-line |
| <b>U182</b><br>(2182)<br>S00<br>(B151)      | <b>Hysteresis for 1<sup>st</sup> limit-value monitor for double word connectors</b> <b>FB 68</b><br><b>Hysteresis for 2<sup>nd</sup> limit-value monitor for double word connectors</b> <b>FB 69</b><br>[SW 1.9 and later]<br>i001: Hysteresis for 1 <sup>st</sup> limit-value monitor<br>i002: Hysteresis for 2 <sup>nd</sup> limit-value monitor                                                                                                                                                                                                                                                        | 0.00 to 100.00<br>[%]<br>0.01% | Ind: 2<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |

#### Limit-value monitors with filtering

|                                             |                                                                                                                                                                                                                                                     |                                   |                                                    |                                  |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------|----------------------------------|
| <b>U185</b><br>(2185)<br>*<br>S00<br>(B136) | <b>Source for input signal (A) and operating point (B) for 1<sup>st</sup> limit-value monitor with filtering</b> <b>FB 70</b><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1        | Ind: 2<br>FS=<br>i001: 0<br>i002: 9181<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U186</b><br>(2186)<br>S00<br>(B136)      | <b>Settable operating point for limit-value monitor</b> <b>FB 70</b><br>Applied to connector K9181                                                                                                                                                  | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U187</b><br>(2187)<br>S00<br>(B136)      | <b>Filter time for 1<sup>st</sup> limit-value monitor with filtering</b> <b>FB 70</b>                                                                                                                                                               | 0 to 10000<br>[ms]<br>1           | Ind: None<br>FS=0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Offline |
| <b>U188</b><br>(2188)<br>S00<br>(B136)      | <b>Hysteresis for 1<sup>st</sup> limit-value monitor with filtering</b> <b>FB 70</b>                                                                                                                                                                | 0.00 to 100.00<br>[%]<br>0.01%    | Ind: None<br>FS=0.00<br>Type: O2                   | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                                                                                                                                                                |              | Value range<br>[Unit]             | No. indices                                        | See<br>Change                    |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------|----------------------------------------------------|----------------------------------|
| <b>U189</b><br>(2189)<br>*<br>S00<br>(B136) | <b>Source for input signal (A) and operating point (B) for 2<sup>nd</sup> limit-value monitor with filtering</b><br><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 71</b> | All connector numbers<br>1        | Ind: 2<br>FS=<br>i001: 0<br>i002: 9183<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U190</b><br>(2190)<br>S00<br>(B136)      | <b>Settable operating point for limit-value monitor</b><br>Applied to connector K9183                                                                                                                                                      | <b>FB 71</b> | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U191</b><br>(2191)<br>S00<br>(B136)      | <b>Filter time for 2<sup>nd</sup> limit-value monitor with filtering</b>                                                                                                                                                                   | <b>FB 71</b> | 0 to 10000<br>[ms]<br>1           | Ind: None<br>FS=0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Offline |
| <b>U192</b><br>(2192)<br>S00<br>(B136)      | <b>Hysteresis for 2<sup>nd</sup> limit-value monitor with filtering</b>                                                                                                                                                                    | <b>FB 71</b> | 0.00 to 100.00<br>[%]<br>0.01%    | Ind: None<br>FS=0.00<br>Type: O2                   | P052 = 3<br>P051 = 40<br>Offline |

|                                             |                                                                                                                                                                                                                                            |              |                                   |                                                    |                                  |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------|----------------------------------------------------|----------------------------------|
| <b>U193</b><br>(2193)<br>*<br>S00<br>(B136) | <b>Source for input signal (A) and operating point (B) for 3<sup>rd</sup> limit-value monitor with filtering</b><br><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 72</b> | All connector numbers<br>1        | Ind: 2<br>FS=<br>i001: 0<br>i002: 9185<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U194</b><br>(2194)<br>S00<br>(B136)      | <b>Settable operating point for limit-value monitor</b><br>Applied to connector K9185                                                                                                                                                      | <b>FB 72</b> | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U195</b><br>(2195)<br>S00<br>(B136)      | <b>Filter time for 3<sup>rd</sup> limit-value monitor with filtering</b>                                                                                                                                                                   | <b>FB 72</b> | 0 to 10000<br>[ms]<br>1           | Ind: None<br>FS=0<br>Type: O2                      | P052 = 3<br>P051 = 40<br>Offline |
| <b>U196</b><br>(2196)<br>S00<br>(B136)      | <b>Hysteresis for 3<sup>rd</sup> limit-value monitor with filtering</b>                                                                                                                                                                    | <b>FB 72</b> | 0.00 to 100.00<br>[%]<br>0.01%    | Ind: None<br>FS=0.00<br>Type: O2                   | P052 = 3<br>P051 = 40<br>Offline |

| Limit-value monitors without filtering      |                                                                                                                                                                                                                                               |              |                                   |                                                    |                                  |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------|----------------------------------------------------|----------------------------------|
| <b>U197</b><br>(2197)<br>*<br>S00<br>(B137) | <b>Source for input signal (A) and operating point (B) for 1<sup>st</sup> limit-value monitor without filtering</b><br><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 73</b> | All connector numbers<br>1        | Ind: 2<br>FS=<br>i001: 0<br>i002: 9186<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U198</b><br>(2198)<br>S00<br>(B137)      | <b>Settable operating point for limit-value monitor</b><br>Applied to connector K9186                                                                                                                                                         | <b>FB 73</b> | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U199</b><br>(2199)<br>S00<br>(B137)      | <b>Hysteresis for 1<sup>st</sup> limit-value monitor without filtering</b>                                                                                                                                                                    | <b>FB 73</b> | 0.00 to 100.00<br>[%]<br>0.01%    | Ind: None<br>FS=0.00<br>Type: O2                   | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                                                                                                                                                                                | Value range [Unit]                | No. indices                                        | See Change                       |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------|----------------------------------|
| <b>U200</b><br>(2200)<br>*<br>S00<br>(B137) | <b>Source for input signal (A) and operating point (B) for 2<sup>nd</sup> limit-value monitor without filtering</b> <b>FB 74</b><br><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1        | Ind: 2<br>FS=<br>i001: 0<br>i002: 9187<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U201</b><br>(2201)<br>S00<br>(B137)      | <b>Settable operating point for limit-value monitor</b> <b>FB 74</b><br>Applied to connector K9187                                                                                                                                                         | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U202</b><br>(2202)<br>S00<br>(B137)      | <b>Hysteresis for 2<sup>nd</sup> limit-value monitor without filtering</b> <b>FB 74</b>                                                                                                                                                                    | 0.00 to 100.00<br>[%]<br>0.01%    | Ind: None<br>FS=0.00<br>Type: O2                   | P052 = 3<br>P051 = 40<br>Offline |

|                                             |                                                                                                                                                                                                                                                            |                                   |                                                    |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------|----------------------------------|
| <b>U203</b><br>(2203)<br>*<br>S00<br>(B137) | <b>Source for input signal (A) and operating point (B) for 3<sup>rd</sup> limit-value monitor without filtering</b> <b>FB 75</b><br><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1        | Ind: 2<br>FS=<br>i001: 0<br>i002: 9188<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U204</b><br>(2204)<br>S00<br>(B137)      | <b>Settable operating point for limit-value monitor</b> <b>FB 75</b><br>Applied to connector K9188                                                                                                                                                         | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U205</b><br>(2205)<br>S00<br>(B137)      | <b>Hysteresis for 3<sup>rd</sup> limit-value monitor without filtering</b> <b>FB 75</b>                                                                                                                                                                    | 0.00 to 100.00<br>[%]<br>0.01%    | Ind: None<br>FS=0.00<br>Type: O2                   | P052 = 3<br>P051 = 40<br>Offline |

|                                             |                                                                                                                                                                                                                                                            |                                   |                                                    |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------|----------------------------------|
| <b>U206</b><br>(2206)<br>*<br>S00<br>(B137) | <b>Source for input signal (A) and operating point (B) for 4<sup>th</sup> limit-value monitor without filtering</b> <b>FB 76</b><br><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1        | Ind: 2<br>FS=<br>i001: 0<br>i002: 9189<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U207</b><br>(2207)<br>S00<br>(B137)      | <b>Settable operating point for limit-value monitor</b> <b>FB 76</b><br>Applied to connector K9189                                                                                                                                                         | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U208</b><br>(2208)<br>S00<br>(B137)      | <b>Hysteresis for 4<sup>th</sup> limit-value monitor without filtering</b> <b>FB 76</b>                                                                                                                                                                    | 0.00 to 100.00<br>[%]<br>0.01%    | Ind: None<br>FS=0.00<br>Type: O2                   | P052 = 3<br>P051 = 40<br>Offline |

|                                             |                                                                                                                                                                                                                                                            |                                   |                                                    |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------|----------------------------------|
| <b>U210</b><br>(2210)<br>*<br>S00<br>(B138) | <b>Source for input signal (A) and operating point (B) for 5<sup>th</sup> limit-value monitor without filtering</b> <b>FB 77</b><br><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1        | Ind: 2<br>FS=<br>i001: 0<br>i002: 9190<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U211</b><br>(2211)<br>S00<br>(B138)      | <b>Settable operating point for limit-value monitor</b> <b>FB 77</b><br>Applied to connector K9190                                                                                                                                                         | -200.00 to 199.99<br>[%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2                   | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                                                                                                                                                                                | Value range [Unit]             | No. indices                                        | See Change                       |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------|----------------------------------|
| <b>U212</b><br>(2212)<br>S00<br>(B138)      | <b>Hysteresis for 5<sup>th</sup> limit-value monitor without filtering</b> <b>FB 77</b><br><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                          | 0.00 to 100.00 [%]<br>0.01%    | Ind: None<br>FS=0.00<br>Type: O2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U213</b><br>(2213)<br>*<br>S00<br>(B138) | <b>Source for input signal (A) and operating point (B) for 6<sup>th</sup> limit-value monitor without filtering</b> <b>FB 78</b><br><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1     | Ind: 2<br>FS=<br>i001: 0<br>i002: 9191<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U214</b><br>(2214)<br>S00<br>(B138)      | <b>Settable operating point for limit-value monitor</b> <b>FB 78</b><br>Applied to connector K9191                                                                                                                                                         | -200.00 to 199.99 [%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U215</b><br>(2215)<br>S00<br>(B138)      | <b>Hysteresis for 6<sup>th</sup> limit-value monitor without filtering</b> <b>FB 78</b>                                                                                                                                                                    | 0.00 to 100.00 [%]<br>0.01%    | Ind: None<br>FS=0.00<br>Type: O2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U216</b><br>(2216)<br>*<br>S00<br>(B138) | <b>Source for input signal (A) and operating point (B) for 7<sup>th</sup> limit-value monitor without filtering</b> <b>FB 79</b><br><br>i001: Input signal<br>i002: Operating point<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1     | Ind: 2<br>FS=<br>i001: 0<br>i002: 9192<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U217</b><br>(2217)<br>S00<br>(B138)      | <b>Settable operating point for limit-value monitor</b> <b>FB 79</b><br>Applied to connector K9192                                                                                                                                                         | -200.00 to 199.99 [%]<br>0.01% | Ind: None<br>FS=0.00<br>Type: I2                   | P052 = 3<br>P051 = 40<br>Offline |
| <b>U218</b><br>(2218)<br>S00<br>(B138)      | <b>Hysteresis for 7<sup>th</sup> limit-value monitor without filtering</b> <b>FB 79</b>                                                                                                                                                                    | 0.00 to 100.00 [%]<br>0.01%    | Ind: None<br>FS=0.00<br>Type: O2                   | P052 = 3<br>P051 = 40<br>Offline |

## 11.63 Processing of connectors

Only active with optional technology software S00

| Maximum selection                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | FB 80, FB 174, FB 175, FB 176 |                             |                                   |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|-----------------------------------|
| The largest of the input values selected by 3 indices each of the parameter (x1, x2, x3) is applied to the output. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                               |                             |                                   |
| <b>U220</b><br>(2220)<br>*<br>S00<br><br>(B140)                                                                    | <b>Source for maximum selection</b><br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001: x1 Maximum selection 1 (FB 80, Output = K9193)<br>i002: x2 Maximum selection 1<br>i003: x3 Maximum selection 1<br><br>SW 1.8 and later:<br>i004: x1 Maximum selection 2 (FB 174, Output = K9460)<br>i005: x2 Maximum selection 2<br>i006: x3 Maximum selection 2<br>i007: x1 Maximum selection 3 (FB 175, Output = K9461)<br>i008: x2 Maximum selection 3<br>i009: x3 Maximum selection 3<br><br>i010: x1 Maximum selection 4 (FB 176, Output = K9462)<br>i011: x2 Maximum selection 4<br>i012: x3 Maximum selection 4 | All connector numbers<br>1    | Ind: 12<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

| PNU                                                                                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Value range<br>[Unit]         | No. indices                 | See<br>Change                     |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|-----------------------------------|
| Minimum selection                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | FB 81, FB 177, FB 178, FB 179 |                             |                                   |
| The smallest of the input values selected by 3 indices each of the parameter (x1, x2, x3) is applied to the output. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                               |                             |                                   |
| U221<br>(2221)<br>*<br>S00<br><br>(B140)                                                                            | <b>Source for minimum selection</b><br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001: x1 Minimum selection 1 (FB 81, Output = K9194)<br>i002: x2 Minimum selection 1<br>i003: x3 Minimum selection 1<br><br>SW 1.8 and later:<br>i004: x1 Minimum selection 2 (FB 177, Output = K9463)<br>i005: x2 Minimum selection 2<br>i006: x3 Minimum selection 2<br>i007: x1 Minimum selection 3 (FB 178, Output = K9464)<br>i008: x2 Minimum selection 3<br>i009: x3 Minimum selection 3<br>i010: x1 Minimum selection 4 (FB 179, Output = K9465)<br>i011: x2 Minimum selection 4<br>i012: x3 Minimum selection 4 | All connector<br>numbers<br>1 | Ind: 12<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

**Tracking/storage elements**

The tracking/storage elements are storage elements for the parameterized input quantity. The outputs are linked to connectors.

Transfer of the input quantity is controlled via the RESET, TRACK and STORE functions:

RESET: When the controlling binector reaches log. "1", the output is set to 0.00% (y=0)

TRACK: When the controlling binector reaches log. "1", the output is set to the input value and then tracks it continuously (y=x). If the TRACK signal switches from "1" to "0", the last value applied to the y output is "frozen"

STORE: With a "0" to "1" transition of the controlling binector signal, the output is permanently set to the current input value (y=x). This value then remains stored

Priority 1. RESET, 2. TRACK, 3. STORE

**Tracking/storage element 1**

|                                             |                                                                                                                                                                                                                                                                                           |              |                            |                               |                                  |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------|-------------------------------|----------------------------------|
| <b>U222</b><br>(2222)<br>*<br>S00<br>(B145) | <b>Source for input quantity (x)</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                            | <b>FB 82</b> | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U223</b><br>(2223)<br>*<br>S00<br>(B145) | <b>Source for control signals RESET, TRACK and STORE</b><br><br>i001: TRACK<br>i002: STORE<br>i003: RESET<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                            | <b>FB 82</b> | All binector numbers<br>1  | Ind: 3<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U224</b><br>(2224)<br>*<br>S00<br>(B145) | <b>Control word for Power On Mode</b><br><br>0 Volatile storage:<br>Zero appears at output when voltage recovers<br><br>1 Non-volatile storage:<br>When the voltage is disconnected or fails, the current output value is stored and then output when the voltage recovers/is reconnected | <b>FB 82</b> | 0 to 1<br>1                | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

**Tracking/storage element 2**

|                                             |                                                                                                |              |                            |                               |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------------------|--------------|----------------------------|-------------------------------|----------------------------------|
| <b>U225</b><br>(2225)<br>*<br>S00<br>(B145) | <b>Source for input quantity (x)</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 83</b> | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
|---------------------------------------------|------------------------------------------------------------------------------------------------|--------------|----------------------------|-------------------------------|----------------------------------|

| PNU                                         | Description                                                                                                                                                                                                                                                                                            | Value range [Unit]        | No. indices                   | See Change                       |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------|----------------------------------|
| <b>U226</b><br>(2226)<br>*<br>S00<br>(B145) | <b>Source for control signals RESET, TRACK and STORE</b> <b>FB 83</b><br><br>i001: TRACK<br>i002: STORE<br>i003: RESET<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                            | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U227</b><br>(2227)<br>*<br>S00<br>(B145) | <b>Control word for Power On Mode</b> <b>FB 83</b><br><br>0 Volatile storage:<br>Zero appears at output when voltage recovers<br><br>1 Non-volatile storage:<br>When the voltage is disconnected or fails, the current output value is stored and then output when the voltage recovers/is reconnected | 0 to 1<br>1               | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

**Connector memories**

The connector memories are memory elements for the input quantities selected via the parameters. The outputs are linked to connectors.

While the SET input is in the log. "1" state, output quantity y tracks input quantity x continuously. If the SET input changes state from log. "1" to log. "0", the current value of x is stored and output continuously at y.

Output (y) = 0 is set on POWER ON.

**Connector memory 1**

|                                             |                                                                                                             |                            |                               |                                  |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|----------------------------------|
| <b>U228</b><br>(2228)<br>*<br>S00<br>(B145) | <b>Source for input quantity (x)</b> <b>FB 84</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U229</b><br>(2229)<br>*<br>S00<br>(B145) | <b>Source for control signal SET</b> <b>FB 84</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.   | All binector numbers<br>1  | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**Connector memory 2**

|                                             |                                                                                                             |                            |                               |                                  |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|----------------------------------|
| <b>U230</b><br>(2230)<br>*<br>S00<br>(B145) | <b>Source for input quantity (x)</b> <b>FB 85</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U231</b><br>(2231)<br>*<br>S00<br>(B145) | <b>Source for control signal SET</b> <b>FB 85</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.   | All binector numbers<br>1  | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**Connector changeover switches**

Depending on the state of the control signal, one of the two input quantities is applied to the output (connector):

Control signal = 0: The input quantity selected in index i001 is applied to the output

Control signal = 1: The input quantity selected in index i002 is applied to the output

**Connector changeover switch 1 (output = K9210)**

|                                             |                                                                                                           |                            |                               |                                  |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|----------------------------------|
| <b>U240</b><br>(2240)<br>*<br>S00<br>(B150) | <b>Source for input quantities</b> <b>FB 90</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U241</b><br>(2241)<br>*<br>S00<br>(B150) | <b>Source for control signal</b> <b>FB 90</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.     | All binector numbers<br>1  | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |



| PNU                                                   | Description                                                                                  |              | Value range<br>[Unit]         | No. indices                   | See<br>Change                    |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------|-------------------------------|-------------------------------|----------------------------------|
| <b>Connector changeover switch 2</b> (output = K9211) |                                                                                              |              |                               |                               |                                  |
| <b>U242</b><br>(2242)<br>*<br>S00<br>(B150)           | <b>Source for input quantities</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 91</b> | All connector<br>numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U243</b><br>(2243)<br>*<br>S00<br>(B150)           | <b>Source for control signal</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.     | <b>FB 91</b> | All binector numbers<br>1     | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

|                                                       |                                                                                              |              |                               |                               |                                  |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------|-------------------------------|-------------------------------|----------------------------------|
| <b>Connector changeover switch 3</b> (output = K9212) |                                                                                              |              |                               |                               |                                  |
| <b>U244</b><br>(2244)<br>*<br>S00<br>(B150)           | <b>Source for input quantities</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 92</b> | All connector<br>numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U245</b><br>(2245)<br>*<br>S00<br>(B150)           | <b>Source for control signal</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.     | <b>FB 92</b> | All binector numbers<br>1     | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

|                                                       |                                                                                              |              |                               |                               |                                  |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------|-------------------------------|-------------------------------|----------------------------------|
| <b>Connector changeover switch 4</b> (output = K9213) |                                                                                              |              |                               |                               |                                  |
| <b>U246</b><br>(2246)<br>*<br>S00<br>(B150)           | <b>Source for input quantities</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 93</b> | All connector<br>numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U247</b><br>(2247)<br>*<br>S00<br>(B150)           | <b>Source for control signal</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.     | <b>FB 93</b> | All binector numbers<br>1     | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

|                                                       |                                                                                              |              |                               |                               |                                  |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------|-------------------------------|-------------------------------|----------------------------------|
| <b>Connector changeover switch 5</b> (output = K9214) |                                                                                              |              |                               |                               |                                  |
| <b>U248</b><br>(2248)<br>*<br>S00<br>(B150)           | <b>Source for input quantities</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 94</b> | All connector<br>numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U249</b><br>(2249)<br>*<br>S00<br>(B150)           | <b>Source for control signal</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.     | <b>FB 94</b> | All binector numbers<br>1     | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

|                                               |                                                                                                                                                                                                                                                                                        |                                                                   |                               |                            |                                  |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------|----------------------------|----------------------------------|
| <b>Connector changeover switches 6 and 11</b> |                                                                                                                                                                                                                                                                                        |                                                                   |                               |                            |                                  |
| <b>U250</b><br>(2250)<br>*<br>S00<br>(B150)   | <b>Source for input quantities</b><br><br>Output 6 = Connector K9215<br>i001: 1st input signal<br>i002: 2nd input signal<br><br>Output 11 = Connector K9265<br>i003: 1st input signal<br>i004: 2nd input signal<br><br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 95 and FB 196</b><br><br><br><br><br><br>[SW 2.0 and later] | All connector<br>numbers<br>1 | Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                                                                                                  | Value range [Unit]                                | No. indices                                                 | See Change                       |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------|----------------------------------|
| <b>U251</b><br>(2251)<br>*<br>S00<br>(B150) | <b>Source for control signal</b><br><br>i001: Switchover for output 6<br>i002: Switchover for output 11<br><br>Settings:<br>0 = Binector B0000<br>1 = Binector B0001<br>etc. | <b>FB 95 and FB 196</b><br><br>[SW 2.0 and later] | All binector numbers<br>1<br><br>Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

|                                               |                                                                                                                                                                                                                                                                                        |                                                   |                                                              |                                  |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------|----------------------------------|
| <b>Connector changeover switches 7 and 12</b> |                                                                                                                                                                                                                                                                                        |                                                   |                                                              |                                  |
| <b>U252</b><br>(2252)<br>*<br>S00<br>(B150)   | <b>Source for input quantities</b><br><br>Output 7 = Connector K9216<br>i001: 1st input signal<br>i002: 2nd input signal<br><br>Output 12 = Connector K9266<br>i003: 1st input signal<br>i004: 2nd input signal<br><br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 96 and FB 197</b><br><br>[SW 2.0 and later] | All connector numbers<br>1<br><br>Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U253</b><br>(2253)<br>*<br>S00<br>(B150)   | <b>Source for control signal</b><br><br>i001: Switchover for output 7<br>i002: Switchover for output 12<br><br>Settings:<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.                                                                                                           | <b>FB 96 and FB 197</b><br><br>[SW 2.0 and later] | All binector numbers<br>1<br><br>Ind: 2<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |

|                                               |                                                                                                                                                                                                                                                                                        |                                                   |                                                              |                                  |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------|----------------------------------|
| <b>Connector changeover switches 8 and 13</b> |                                                                                                                                                                                                                                                                                        |                                                   |                                                              |                                  |
| <b>U254</b><br>(2254)<br>*<br>S00<br>(B150)   | <b>Source for input quantities</b><br><br>Output 8 = Connector K9217<br>i001: 1st input signal<br>i002: 2nd input signal<br><br>Output 13 = Connector K9267<br>i003: 1st input signal<br>i004: 2nd input signal<br><br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 97 and FB 198</b><br><br>[SW 2.0 and later] | All connector numbers<br>1<br><br>Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U255</b><br>(2255)<br>*<br>S00<br>(B150)   | <b>Source for control signal</b><br><br>i001: Switchover for output 8<br>i002: Switchover for output 13<br><br>Settings:<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.                                                                                                           | <b>FB 97 and FB 198</b><br><br>[SW 2.0 and later] | All binector numbers<br>1<br><br>Ind: 2<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |

|                                               |                                                                                                                                                                                                                                                                                        |                                                   |                                                              |                                  |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------|----------------------------------|
| <b>Connector changeover switches 9 and 14</b> |                                                                                                                                                                                                                                                                                        |                                                   |                                                              |                                  |
| <b>U256</b><br>(2256)<br>*<br>S00<br>(B150)   | <b>Source for input quantities</b><br><br>Output 9 = Connector K9218<br>i001: 1st input signal<br>i002: 2nd input signal<br><br>Output 14 = Connector K9268<br>i003: 1st input signal<br>i004: 2nd input signal<br><br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 98 and FB 199</b><br><br>[SW 2.0 and later] | All connector numbers<br>1<br><br>Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                                                                                                                                        | Value range<br>[Unit]     | No. indices                | See<br>Change                    |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U257</b><br>(2257)<br>*<br>S00<br>(B150) | <b>Source for control signal</b> <b>FB 98 and FB 199</b><br>i001: Switchover for output 9<br>i002: Switchover for output 14<br>[SW 2.0 and later]<br>Settings:<br>0 = Binector B0000<br>1 = Binector B0001<br>etc. | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

#### Connector changeover switches 10 and 15

|                                             |                                                                                                                                                                                                                                                                                                                           |                            |                            |                                  |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------------|
| <b>U258</b><br>(2258)<br>*<br>S00<br>(B150) | <b>Source for input quantities</b> <b>FB 99 and FB 229</b><br>Output 10 = Connector K9219<br>i001: 1st input signal<br>i002: 2nd input signal<br>Output 15 = Connector K9269<br>i003: 1st input signal<br>i004: 2nd input signal<br>[SW 2.0 and later]<br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | All connector numbers<br>1 | Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U259</b><br>(2259)<br>*<br>S00<br>(B150) | <b>Source for control signal</b> <b>FB 99 and FB 229</b><br>i001: Switchover for output 10<br>i002: Switchover for output 15<br>[SW 2.0 and later]<br>Settings:<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.                                                                                                       | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.64 Integrators, DT1 elements, characteristics, dead zones, setpoint branching

Only active with optional technology software S00

| Integrator 1 (output = K9220)               |                                                                                                                                                                                                                                                                                                                                                                                    |                            |                                |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------|----------------------------------|
| <b>U260</b><br>(2260)<br>*<br>S00<br>(B155) | <b>Source for input quantity</b> <b>FB 100</b><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                               | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>U261</b><br>(2261)<br>S00<br>(B155)      | <b>Integral-action time</b> <b>FB 100</b>                                                                                                                                                                                                                                                                                                                                          | 10 to 65000<br>[ms]<br>1   | Ind: None<br>FS=10<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U262</b><br>(2262)<br>*<br>S00<br>(B155) | <b>Source for control signals</b> <b>FB 100</b><br>i001 Source for "Stop integrator" signal<br>(integrator is stopped when binector reaches log. "1" state)<br>i002 Source for "Set integrator" signal<br>(when binector reaches log. "1" state, the integrator is set to the<br>value entered in parameter U263)<br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>U263</b><br>(2263)<br>*<br>S00<br>(B155) | <b>Source for setting value</b> <b>FB 100</b><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                                                                                                                                                                                                                                                                                                   | Value range [Unit]                              | No. indices                    | See Change                       |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------|----------------------------------|
| <b>Integrator 2</b> (output = K9221)        |                                                                                                                                                                                                                                                                                                                                                                               |                                                 |                                |                                  |
| <b>U264</b><br>(2264)<br>*<br>S00<br>(B155) | <b>Source for input quantity</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                    | <b>FB 101</b><br><br>All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>U265</b><br>(2265)<br>S00<br>(B155)      | <b>Integral-action time</b>                                                                                                                                                                                                                                                                                                                                                   | <b>FB 101</b><br><br>10 to 65000<br>[ms]<br>1   | Ind: None<br>FS=10<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U266</b><br>(2266)<br>*<br>S00<br>(B155) | <b>Source for control signals</b><br><br>i001 Source for "Stop integrator" signal<br>(integrator is stopped when binector reaches log. "1" state)<br><br>i002 Source for "Set integrator" signal<br>(when binector reaches log. "1" state, the integrator is set to the value entered in parameter U267)<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | <b>FB 101</b><br><br>All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>U267</b><br>(2267)<br>*<br>S00<br>(B155) | <b>Source for setting value</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                     | <b>FB 101</b><br><br>All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |

|                                             |                                                                                                                                                                                                                                                                                                                                                                               |                                                 |                                |                                  |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------|----------------------------------|
| <b>Integrator 3</b> (output = K9222)        |                                                                                                                                                                                                                                                                                                                                                                               |                                                 |                                |                                  |
| <b>U268</b><br>(2268)<br>*<br>S00<br>(B155) | <b>Source for input quantity</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                    | <b>FB 102</b><br><br>All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>U269</b><br>(2269)<br>S00<br>(B155)      | <b>Integral-action time</b>                                                                                                                                                                                                                                                                                                                                                   | <b>FB 102</b><br><br>10 to 65000<br>[ms]<br>1   | Ind: None<br>FS=10<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U270</b><br>(2270)<br>*<br>S00<br>(B155) | <b>Source for control signals</b><br><br>i001 Source for "Stop integrator" signal<br>(integrator is stopped when binector reaches log. "1" state)<br><br>i002 Source for "Set integrator" signal<br>(when binector reaches log. "1" state, the integrator is set to the value entered in parameter U271)<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | <b>FB 102</b><br><br>All binector numbers<br>1  | Ind: 2<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>U271</b><br>(2271)<br>*<br>S00<br>(B155) | <b>Source for setting value</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                     | <b>FB 102</b><br><br>All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>Offline |

|                                                        |                                                                                            |                                                 |                               |                                  |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------|----------------------------------|
| <b>DT1 element 1</b> (output = K9223, inverted: K9224) |                                                                                            |                                                 |                               |                                  |
| <b>U272</b><br>(2272)<br>*<br>S00<br>(B155)            | <b>Source for input quantity</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 103</b><br><br>All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U273</b><br>(2273)<br>S00<br>(B155)                 | <b>Derivative-action time</b>                                                              | <b>FB 103</b><br><br>0 to 1000<br>[ms]<br>1     | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U274</b><br>(2274)<br>S00<br>(B155)                 | <b>Filter time</b>                                                                         | <b>FB 103</b><br><br>0 to 1000<br>[ms]<br>1     | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

**DT1 element 2** (output = K9225, inverted: K9226)

|                                             |                                                                                            |               |                               |                               |                                  |
|---------------------------------------------|--------------------------------------------------------------------------------------------|---------------|-------------------------------|-------------------------------|----------------------------------|
| <b>U275</b><br>(2275)<br>*<br>S00<br>(B155) | <b>Source for input quantity</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 104</b> | All connector<br>numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U276</b><br>(2276)<br>S00<br>(B155)      | <b>Derivative-action time</b>                                                              | <b>FB 104</b> | 0 to 1000<br>[ms]<br>1        | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U277</b><br>(2277)<br>S00<br>(B155)      | <b>Filter time</b>                                                                         | <b>FB 104</b> | 0 to 1000<br>[ms]<br>1        | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |

**DT1 element 3** (output = K9227, inverted: K9228)

|                                             |                                                                                            |               |                               |                               |                                  |
|---------------------------------------------|--------------------------------------------------------------------------------------------|---------------|-------------------------------|-------------------------------|----------------------------------|
| <b>U278</b><br>(2278)<br>*<br>S00<br>(B155) | <b>Source for input quantity</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 105</b> | All connector<br>numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U279</b><br>(2279)<br>S00<br>(B155)      | <b>Derivative-action time</b>                                                              | <b>FB 105</b> | 0 to 1000<br>[ms]<br>1        | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U280</b><br>(2280)<br>S00<br>(B155)      | <b>Filter time</b>                                                                         | <b>FB 105</b> | 0 to 1000<br>[ms]<br>1        | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |

**Characteristic blocks**

The curve of the characteristics can be defined by 10 points each:

Index i001 to i010 of the parameters for the x values (U282, U285, U288): x values for FB 106, FB 107, FB 108  
Index i001 to i010 of the parameters for the y values (U283, U286, U289): associated y values

SW 1.8 and later:

Index i011 to i020 of the parameters for the x values (U282, U285, U288): x values for FB 280, FB 282, FB 284  
Index i011 to i020 of the parameters for the y values (U283, U286, U289): associated y values

Index i021 to i030 of the parameters for the x values (U282, U285, U288): x values for FB 281, FB 283, FB 285  
Index i021 to i030 of the parameters for the y values (U283, U286, U289): associated y values

for x = -200.00% up to x value acc. to index i001 (or i011 or i021) of the parameter for the x values gilt:  
y = value acc. to index i001 (or i011 or i021) of the parameter for the y values

for x = x value acc. to index i010 (or i020 or i030) of the parameter for the x values to x = 200.00% gilt:  
y = value acc. to index i010 (or i020 or i030) of the parameter for the y values

The distance between two adjacent x or y values must not be more than 199.99% otherwise deviations from the required shape of the characteristic can arise.

**Characteristic block 1** (output = K9229)

**Characteristic block 4** (output = K9410) [SW 1.8 and later]

**Characteristic block 5** (output = K9411) [SW 1.8 and later]

**FB 106**

**FB 280**

**FB 281**

|                                             |                                                                                                                                                                                                                                                                                              |  |                               |                            |                                   |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------|----------------------------|-----------------------------------|
| <b>U281</b><br>(2281)<br>*<br>S00<br>(B160) | <b>Source for input quantity</b><br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>Up to SW 1.7:<br>Selected connector = input quantity for FB106<br><br>SW 1.8 and later:<br>i001 Input quantity for FB106<br>i002 Input quantity for FB280<br>i003 Input quantity for FB281 |  | All connector<br>numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------|----------------------------|-----------------------------------|

| PNU                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Value range<br>[Unit]            | No. indices                   | See<br>Change                    |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------|----------------------------------|
| <b>U282</b><br>(2282)<br>S00<br>(B160) | <b>x values</b><br><br>i001 1st characteristic point for FB106<br>i002 2nd characteristic point for FB106<br>...<br>i010 10th characteristic point for FB106<br><br>SW 1.8 and later:<br>i011 1st characteristic point for FB280<br>i012 2nd characteristic point for FB280<br>...<br>i020 10th characteristic point for FB280<br><br>i021 1st characteristic point for FB281<br>i022 2nd characteristic point for FB281<br>...<br>i030 10th characteristic point for FB281 | -200.00 to 199.99<br>[%]<br>0.01 | Ind:30<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>on-line |
| <b>U283</b><br>(2283)<br>S00<br>(B160) | <b>y values</b><br><br>i001 1st characteristic point for FB106<br>i002 2nd characteristic point for FB106<br>...<br>i010 10th characteristic point for FB106<br><br>SW 1.8 and later:<br>i011 1st characteristic point for FB280<br>i012 2nd characteristic point for FB280<br>...<br>i020 10th characteristic point for FB280<br><br>i021 1st characteristic point for FB281<br>i022 2nd characteristic point for FB281<br>...<br>i030 10th characteristic point for FB281 | -200.00 to 199.99<br>[%]<br>0.01 | Ind:30<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>on-line |

|                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                |                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------|-----------------------------------|
| <b>Characteristic block 2</b> (output = K9230)<br><b>Characteristic block 6</b> (output = K9412) [SW 1.8 and later]<br><b>Characteristic block 7</b> (output = K9413) [SW 1.8 and later] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>FB 107</b><br><b>FB 282</b><br><b>FB 283</b> |                                |                                   |
| <b>U284</b><br>(2284)<br>*<br>S00<br>(B160)                                                                                                                                              | <b>Source for input quantity</b><br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>up to SW 1.7:<br>Selected connector = input quantity for FB107<br><br>SW 1.8 and later:<br>i001 input quantity for FB107<br>i002 input quantity for FB282<br>i003 input quantity for FB283                                                                                                                                                                                | All connector<br>numbers<br>1                   | Ind: 3<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>off-line |
| <b>U285</b><br>(2285)<br>S00<br>(B160)                                                                                                                                                   | <b>x values</b><br><br>i001 1st characteristic point for FB107<br>i002 2nd characteristic point for FB107<br>...<br>i010 10th characteristic point for FB107<br><br>SW 1.8 and later:<br>i011 1st characteristic point for FB282<br>i012 2nd characteristic point for FB282<br>...<br>i020 10th characteristic point for FB282<br><br>i021 1st characteristic point for FB283<br>i022 2nd characteristic point for FB283<br>...<br>i030 10th characteristic point for FB283 | -200.00 to 199.99<br>[%]<br>0.01                | Ind: 30<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>on-line  |

| PNU                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Value range<br>[Unit]            | No. indices                    | See<br>Change                    |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------|----------------------------------|
| <b>U286</b><br>(2286)<br>S00<br>(B160) | <b>y values</b><br><br>i001 1st characteristic point for FB107<br>i002 2nd characteristic point for FB107<br>...<br>i010 10th characteristic point for FB107<br><br>SW 1.8 and later:<br>i011 1st characteristic point for FB282<br>i012 2nd characteristic point for FB282<br>...<br>i020 10th characteristic point for FB282<br><br>i021 1st characteristic point for FB283<br>i022 2nd characteristic point for FB283<br>...<br>i030 10th characteristic point for FB283 | -200.00 to 199.99<br>[%]<br>0.01 | Ind: 30<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>on-line |

|                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                |                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------|-----------------------------------|
| <b>Characteristic block 3</b> (Output = K9231)<br><b>Characteristic block 8</b> (Output = K9414) [SW 1.8 and later]<br><b>Characteristic block 9</b> (Output = K9415) [SW 1.8 and later] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>FB 108</b><br><b>FB 284</b><br><b>FB 285</b> |                                |                                   |
| <b>U287</b><br>(2287)<br>*<br>S00<br>(B160)                                                                                                                                              | <b>Source for input quantity</b><br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>up to SW 1.7:<br>Selected connector = input quantity for FB108<br><br>SW 1.8 and later:<br>i001 Input quantity for FB108<br>i002 Input quantity for FB284<br>i003 Input quantity for FB285                                                                                                                                                                                | All connector<br>numbers<br>1                   | Ind: 3<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>off-line |
| <b>U288</b><br>(2288)<br>S00<br>(B160)                                                                                                                                                   | <b>x values</b><br><br>i001 1st characteristic point for FB108<br>i002 2nd characteristic point for FB108<br>...<br>i010 10th characteristic point for FB108<br><br>SW 1.8 and later:<br>i011 1st characteristic point for FB284<br>i012 2nd characteristic point for FB284<br>...<br>i020 10th characteristic point for FB284<br><br>i021 1st characteristic point for FB285<br>i022 2nd characteristic point for FB285<br>...<br>i030 10th characteristic point for FB285 | -200.00 to 199.99<br>[%]<br>0.01                | Ind: 30<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U289</b><br>(2289)<br>S00<br>(B160)                                                                                                                                                   | <b>y values</b><br><br>i001 1st characteristic point for FB108<br>i002 2nd characteristic point for FB108<br>...<br>i010 10th characteristic point for FB108<br><br>SW 1.8 and later:<br>i011 1st characteristic point for FB284<br>i012 2nd characteristic point for FB284<br>...<br>i020 10th characteristic point for FB284<br><br>i021 1st characteristic point for FB285<br>i022 2nd characteristic point for FB285<br>...<br>i030 10th characteristic point for FB285 | -200.00 to 199.99<br>[%]<br>0.01                | Ind: 30<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>on-line  |

| PNU                                                                                                                                | Description                                                                                | Value range<br>[Unit]                              | No. indices                      | See<br>Change                    |
|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------|----------------------------------|
| <b>Dead zones</b>                                                                                                                  |                                                                                            |                                                    |                                  |                                  |
| The component of the input quantity (x) whose absolute value exceeds the threshold for the dead zone is applied to the output (y). |                                                                                            |                                                    |                                  |                                  |
| <b>Dead zone 1</b> (output = K9232)                                                                                                |                                                                                            |                                                    |                                  |                                  |
| <b>U290</b><br>(2290)<br>*<br>S00<br>(B161)                                                                                        | <b>Source for input quantity</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 109</b><br><br>All connector<br>numbers<br>1 | Ind: None<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U291</b><br>(2291)<br>S00<br>(B161)                                                                                             | <b>Dead zone</b>                                                                           | <b>FB 109</b><br><br>0.00 to 100.00<br>[%]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |

|                                             |                                                                                            |                                                    |                                  |                                  |
|---------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------|----------------------------------|
| <b>Dead zone 2</b> (output = K9233)         |                                                                                            |                                                    |                                  |                                  |
| <b>U292</b><br>(2292)<br>*<br>S00<br>(B161) | <b>Source for input quantity</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 110</b><br><br>All connector<br>numbers<br>1 | Ind: None<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U293</b><br>(2293)<br>S00<br>(B161)      | <b>Dead zone</b>                                                                           | <b>FB 110</b><br><br>0.00 to 100.00<br>[%]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |

|                                             |                                                                                            |                                                    |                                  |                                  |
|---------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------|----------------------------------|
| <b>Dead zone 3</b> (output = K9234)         |                                                                                            |                                                    |                                  |                                  |
| <b>U294</b><br>(2294)<br>*<br>S00<br>(B161) | <b>Source for input quantity</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 111</b><br><br>All connector<br>numbers<br>1 | Ind: None<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U295</b><br>(2295)<br>S00<br>(B161)      | <b>Dead zone</b>                                                                           | <b>FB 111</b><br><br>0.00 to 100.00<br>[%]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |

|                                                                                                                                                                                        |                                                                                            |                                                    |                                    |                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------|------------------------------------|----------------------------------|
| <b>Setpoint branching</b> (output = K9234)                                                                                                                                             |                                                                                            |                                                    |                                    |                                  |
| The input quantity is weighted with 2 parameters:<br>Parameter U297 determines the output value with an input = 0%<br>Parameter U298 determines the output value with an input = +100% |                                                                                            |                                                    |                                    |                                  |
| -U297 and -U298 apply in the case of negative input values.<br>The hysteresis set in parameter U299 is applied for transitions from negative to positive input values and vice versa   |                                                                                            |                                                    |                                    |                                  |
| <b>U296</b><br>(2296)<br>*<br>S00<br>(B161)                                                                                                                                            | <b>Source for input quantity</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 112</b><br><br>All connector<br>numbers<br>1 | Ind: None<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>Offline |
| <b>U297</b><br>(2297)<br>S00<br>(B161)                                                                                                                                                 | <b>Minimum speed</b>                                                                       | <b>FB 112</b><br><br>0.00 to 199.99<br>[%]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>U298</b><br>(2298)<br>S00<br>(B161)                                                                                                                                                 | <b>Maximum speed</b>                                                                       | <b>FB 112</b><br><br>0.00 to 199.99<br>[%]<br>0.01 | Ind: None<br>FS=100.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U299</b><br>(2299)<br>S00<br>(B161)                                                                                                                                                 | <b>Hysteresis</b>                                                                          | <b>FB 112</b><br><br>0.00 to 100.00<br>[%]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |



| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.65 Simple ramp-function generator

Only active with optional technology software S00

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                           |               |                               |                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------|----------------------------------------------------------------------------------------------------|
| <p>Please note:</p> <ul style="list-style-type: none"> <li>The output (y) = 0 is set in response to "Set simple ramp-function generator to zero" and POWER ON</li> <li>The output (y) is frozen at the current value in response to "Stop simple ramp-function generator"</li> <li>The ramp-up and ramp-down times are set to zero in response to "Bypass simple ramp-function generator"</li> </ul> <p>Ramp-up integrator:</p> <p>The simple ramp-function generator contains a flip-flop whose output is set to log. "0" (ramp generator initial run) after POWER ON or when the ramp-function generator has been enabled. When the ramp-function generator output reaches a value corresponding to the input quantity (y=x) for the first time, the flip-flop output switches to log. "1" and remains in this state until the next enabling command. This output is linked to binector B9191. By parameterizing U301, index i001=919, it is possible to apply this binector to the "Bypass simple ramp-function generator" function and thus to implement a ramp-up integrator function.</p> |                                                                                                                                                                                                                                                                                                                                                           |               |                               |                                                                                                    |
| <b>U300</b><br>(2300)<br>*<br>S00<br>(B165)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Source for input quantity</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                | <b>FB 113</b> | All connector numbers<br>1    | Ind: None<br>FS=0<br>Type: L2<br><br>P052 = 3<br>P051 = 40<br>Offline                              |
| <b>U301</b><br>(2301)<br>*<br>S00<br>(B165)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Source for control signals</b><br><br>i001 Source for "Bypass simple ramp-function generator" signal<br>i002 Source for "Stop simple ramp-function generator" signal<br>i003 Source for "Reset / enable simple ramp-function generator" signal<br>(0 = reset to zero, 1 = enable)<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | <b>FB 113</b> | All binector numbers<br>1     | Ind: 3<br>FS=<br>i001: 0<br>i002: 0<br>i003: 1<br>Type: L2<br><br>P052 = 3<br>P051 = 40<br>Offline |
| <b>U302</b><br>(2302)<br>S00<br>(B165)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Ramp-up time</b>                                                                                                                                                                                                                                                                                                                                       | <b>FB 113</b> | 0.00 to 300.00<br>[s]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2<br><br>P052 = 3<br>P051 = 40<br>Online                            |
| <b>U303</b><br>(2303)<br>S00<br>(B165)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Ramp-down time</b>                                                                                                                                                                                                                                                                                                                                     | <b>FB 113</b> | 0.00 to 300.00<br>[s]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2<br><br>P052 = 3<br>P051 = 40<br>Online                            |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.66 Multiplexer

Only active with optional technology software S00

FB86 = 1st multiplexer (output = K9450)

FB87 = 2nd multiplexer (output = K9451)

FB88 = 3rd multiplexer (output = K9452)

Function:

An input quantity is connected through to the output depending on the control bits:

| B3 | B2 | B1 | Output y |
|----|----|----|----------|
| 0  | 0  | 0  | X0       |
| 0  | 0  | 1  | X1       |
| 0  | 1  | 0  | X2       |
| 0  | 1  | 1  | X3       |
| 1  | 0  | 0  | X4       |
| 1  | 0  | 1  | X5       |
| 1  | 1  | 0  | X6       |
| 1  | 1  | 1  | X7       |

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                               |                            |                            |                                   |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|-----------------------------------|
| <b>U310</b><br>(2310)<br>*<br>S00<br><br>(B195) | <b>Source for control bits for the multiplexer</b> [SW 1.8 and later]<br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br><br>i001: Control bit B1 for 1st multiplexer<br>i002: Control bit B2<br>i003: Control bit B3<br><br>i004: Control bit B1 for 2nd multiplexer<br>i005: Control bit B2<br>i006: Control bit B3<br><br>i007: Control bit B1 for 3rd multiplexer<br>i008: Control bit B2<br>i009: Control bit B3 | All binector numbers<br>1  | Ind: 9<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U311</b><br>(2311)<br>*<br>S00<br><br>(B195) | <b>Source for input quantities for 1st multiplexer</b> [SW 1.8 and later]<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001 Input quantity X0<br>i002 Input quantity X1<br>i003 Input quantity X2<br>i004 Input quantity X3<br>i005 Input quantity X4<br>i006 Input quantity X5<br>i007 Input quantity X6<br>i008 Input quantity X7                                                                       | All connector numbers<br>1 | Ind: 8<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U312</b><br>(2312)<br>*<br>S00<br><br>(B195) | <b>Source for input quantities for 2nd multiplexer</b> [SW 1.8 and later]<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001 Input quantity X0<br>i002 Input quantity X1<br>i003 Input quantity X2<br>i004 Input quantity X3<br>i005 Input quantity X4<br>i006 Input quantity X5<br>i007 Input quantity X6<br>i008 Input quantity X7                                                                       | All connector numbers<br>1 | Ind: 8<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

| PNU                                             | Description                                                                                                                                                                                                                                                                                                                                             | Value range<br>[Unit]         | No. indices                | See<br>Change                     |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------|-----------------------------------|
| <b>U313</b><br>(2313)<br>*<br>S00<br><br>(B195) | <b>Source for input quantities for 3rd multiplexer</b> [SW 1.8 and later]<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001 Input quantity X0<br>i002 Input quantity X1<br>i003 Input quantity X2<br>i004 Input quantity X3<br>i005 Input quantity X4<br>i006 Input quantity X5<br>i007 Input quantity X6<br>i008 Input quantity X7 | All connector<br>numbers<br>1 | Ind: 8<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

## 11.67 Counters

Only active with optional technology software S00

| Software counter <b>FB 89</b>               |                                                                                                                                                                                                                                                                                                          |                               |                                                                                   |                                   |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------|-----------------------------------|
| <b>n314</b><br>(2314)<br>S00<br>(B196)      | <b>Display of output of software counter</b> <b>FB 89</b><br>[SW 1.9 and later]                                                                                                                                                                                                                          | 0 to 65535                    | Ind: None<br>Type: O2                                                             | P052 = 3                          |
| <b>U315</b><br>(2315)<br>*<br>S00<br>(B196) | <b>Fixed values for setting/limiting inputs of software counter</b> <b>FB 89</b><br>[SW 1.9 and later]<br><br>i001: Minimum value<br>i002: Maximum value<br>i003: Setting value<br>i004: Start value                                                                                                     | 0 to 65535<br>1               | Ind: 4<br>FS=<br>i001: 0<br>i002: 65535<br>i003: 0<br>i004: 0<br>Type: O2         | P052 = 3<br>P051 = 40<br>off-line |
| <b>U316</b><br>(2316)<br>*<br>S00<br>(B196) | <b>Source for setting/limiting inputs of software counter</b> <b>FB 89</b><br>[SW 1.9 and later]<br><br>i001: Minimum value<br>i002: Maximum value<br>i003: Setting value<br>i004: Start value<br><br>Settings:<br>0 = connector K0000<br>1 = connector K0001<br>etc.                                    | All connector<br>numbers<br>1 | Ind: 4<br>FS=<br>i001: 9441<br>i002: 9442<br>i003: 9443<br>i004: 9444<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U317</b><br>(2317)<br>*<br>S00<br>(B196) | <b>Source for control signals of software counter</b> <b>FB 89</b><br>[SW 1.9 and later]<br><br>i001: Positive edge: Count up<br>i002: Positive edge: Count down<br>i003: Stop counter<br>i004: Set counter<br>i005: Enable counter<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1     | Ind: 5<br>FS=<br>i001: 0<br>i002: 0<br>i003: 0<br>i004: 0<br>i005: 1<br>Type: L2  | P052 = 3<br>P051 = 40<br>off-line |

## 11.68 Logic functions

Only active with optional technology software S00

| Decoders/demultiplexers, binary to 1 of 8   |                                                                                                                                                                                                                                                                         |                           |                            |                                  |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U318</b><br>(2318)<br>*<br>S00<br>(B200) | <b>Source for input signals for decoder/demultiplexer 1</b> <b>FB 118</b><br><br>i001 Source for input signal, bit 0<br>i002 Source for input signal, bit 1<br>i003 Source for input signal, bit 2<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                                                                                                                                                                                             | Value range [Unit]        | No. indices                | See Change                       |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U319</b><br>(2319)<br>*<br>S00<br>(B200) | <b>Source for input signals for decoder/demultiplexer 2</b> <b>FB 119</b><br><br>i001 Source for input signal, bit 0<br>i002 Source for input signal, bit 1<br>i003 Source for input signal, bit 2<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**AND elements with 3 inputs each**

The input signals selected via the 3 indices of the parameter are ANDed and the result of the logic operation applied to the specified binector.

|                                             |                                                                                                                                                                                                                                         |                           |                            |                                  |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U320</b><br>(2320)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 1</b> (output = B9350) <b>FB 120</b><br><br>i001 Source for input 1<br>i002 Source for input 2<br>i003 Source for input 3<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U321</b><br>(2321)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 2</b> (output = B9351) <b>FB 121</b><br>As for U320                                                                                                                                            | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U322</b><br>(2322)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 3</b> (output = B9352) <b>FB 122</b><br>As for U320                                                                                                                                            | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U323</b><br>(2323)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 4</b> (output = B9353) <b>FB 123</b><br>As for U320                                                                                                                                            | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U324</b><br>(2324)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 5</b> (output = B9354) <b>FB 124</b><br>As for U320                                                                                                                                            | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U325</b><br>(2325)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 6</b> (output = B9355) <b>FB 125</b><br>As for U320                                                                                                                                            | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U326</b><br>(2326)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 7</b> (output = B9356) <b>FB 126</b><br>As for U320                                                                                                                                            | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U327</b><br>(2327)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 8</b> (output = B9357) <b>FB 127</b><br>As for U320                                                                                                                                            | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U328</b><br>(2328)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 9</b> (output = B9358) <b>FB 128</b><br>As for U320                                                                                                                                            | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U329</b><br>(2329)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 10</b> (output = B9359) <b>FB 129</b><br>As for U320                                                                                                                                           | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                   | Value range<br>[Unit]     | No. indices                | See<br>Change                    |
|---------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U330</b><br>(2330)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 11</b> (output = B9360) <b>FB 130</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U331</b><br>(2331)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 12</b> (output = B9361) <b>FB 131</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U332</b><br>(2332)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 13</b> (output = B9362) <b>FB 132</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U333</b><br>(2333)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 14</b> (output = B9363) <b>FB 133</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U334</b><br>(2334)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 15</b> (output = B9364) <b>FB 134</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U335</b><br>(2335)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 16</b> (output = B9365) <b>FB 135</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U336</b><br>(2336)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 17</b> (output = B9366) <b>FB 136</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U337</b><br>(2337)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 18</b> (output = B9367) <b>FB 137</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U338</b><br>(2338)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 19</b> (output = B9368) <b>FB 138</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U339</b><br>(2339)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 20</b> (output = B9369) <b>FB 139</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U340</b><br>(2340)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 21</b> (output = B9370) <b>FB 140</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U341</b><br>(2341)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 22</b> (output = B9371) <b>FB 141</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U342</b><br>(2342)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 23</b> (output = B9372) <b>FB 142</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U343</b><br>(2343)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 24</b> (output = B9373) <b>FB 143</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                   | Value range [Unit]        | No. indices                | See Change                       |
|---------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U344</b><br>(2344)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 25</b> (output = B9374) <b>FB 144</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U345</b><br>(2345)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 26</b> (output = B9375) <b>FB 145</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U346</b><br>(2346)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 27</b> (output = B9376) <b>FB 146</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U347</b><br>(2347)<br>*<br>S00<br>(B205) | <b>Source for input signals, AND element 28</b> (output = B9377) <b>FB 147</b><br>As for U320 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**OR elements with 3 inputs each**

The input signals selected via the 3 indices of the parameter are ORed and the result of the logic operation applied to the specified binector.

|                                             |                                                                                                                                                                                                                                    |                           |                            |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U350</b><br>(2350)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 1</b> (output = B9380) <b>FB 150</b><br>i001 Source for input 1<br>i002 Source for input 2<br>i003 Source for input 3<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U351</b><br>(2351)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 2</b> (output = B9381) <b>FB 151</b><br>As for U350                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U352</b><br>(2352)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 3</b> (output = B9382) <b>FB 152</b><br>As for U350                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U353</b><br>(2353)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 4</b> (output = B9383) <b>FB 153</b><br>As for U350                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U354</b><br>(2354)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 5</b> (output = B9384) <b>FB 154</b><br>As for U350                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U355</b><br>(2355)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 6</b> (output = B9385) <b>FB 155</b><br>As for U350                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U356</b><br>(2356)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 7</b> (output = B9386) <b>FB 156</b><br>As for U350                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U357</b><br>(2357)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 8</b> (output = B9387) <b>FB 157</b><br>As for U350                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                  | Value range [Unit]        | No. indices                | See Change                       |
|---------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U358</b><br>(2358)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 9</b> (output = B9388) <b>FB 158</b><br>As for U350  | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U359</b><br>(2359)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 10</b> (output = B9389) <b>FB 159</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U360</b><br>(2360)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 11</b> (output = B9390) <b>FB 160</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U361</b><br>(2361)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 12</b> (output = B9391) <b>FB 161</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U362</b><br>(2362)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 13</b> (output = B9392) <b>FB 162</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U363</b><br>(2363)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 14</b> (output = B9393) <b>FB 163</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U364</b><br>(2364)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 15</b> (output = B9394) <b>FB 164</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U365</b><br>(2365)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 16</b> (output = B9395) <b>FB 165</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U366</b><br>(2366)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 17</b> (output = B9396) <b>FB 166</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U367</b><br>(2367)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 18</b> (output = B9397) <b>FB 167</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U368</b><br>(2368)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 19</b> (output = B9398) <b>FB 168</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U369</b><br>(2369)<br>*<br>S00<br>(B206) | <b>Source for input signals, OR element 20</b> (output = B9399) <b>FB 169</b><br>As for U350 | All binector numbers<br>1 | Ind: 3<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**EXCLUSIVE OR elements with 2 inputs each**

The input signals selected via the 2 indices of the parameter are combined in an EXCLUSIVE OR (XOR) operation and the result applied to the specified binector.

|                                             |                                                                                                                                                                                                      |                           |                            |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U370</b><br>(2370)<br>*<br>S00<br>(B206) | <b>Source for input signals, XOR element 1</b> (output = B9195) <b>FB 170</b><br>i001 Source for input 1<br>i002 Source for input 2<br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|

| PNU                                         | Description                                                                                  | Value range [Unit]        | No. indices                | See Change                       |
|---------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U371</b><br>(2371)<br>*<br>S00<br>(B206) | <b>Source for input signals, XOR element 2</b> (output = B9196) <b>FB 171</b><br>As for U370 | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U372</b><br>(2372)<br>*<br>S00<br>(B206) | <b>Source for input signals, XOR element 3</b> (output = B9197) <b>FB 172</b><br>As for U370 | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U373</b><br>(2373)<br>*<br>S00<br>(B206) | <b>Source for input signals, XOR element 4</b> (output = B9198) <b>FB 173</b><br>As for U370 | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**Inverters**

The input signal is inverted and the result applied to the specified binector.

|                                             |                                                                                                                               |                           |                               |                                  |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------|----------------------------------|
| <b>U380</b><br>(2380)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 1</b> (output = B9450) <b>FB 180</b><br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U381</b><br>(2381)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 2</b> (output = B9451) <b>FB 181</b><br>As for U380                                      | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U382</b><br>(2382)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 3</b> (output = B9452) <b>FB 182</b><br>As for U380                                      | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U383</b><br>(2383)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 4</b> (output = B9453) <b>FB 183</b><br>As for U380                                      | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U384</b><br>(2384)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 5</b> (output = B9454) <b>FB 184</b><br>As for U380                                      | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U385</b><br>(2385)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 6</b> (output = B9455) <b>FB 185</b><br>As for U380                                      | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U386</b><br>(2386)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 7</b> (output = B9456) <b>FB 186</b><br>As for U380                                      | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U387</b><br>(2387)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 8</b> (output = B9457) <b>FB 187</b><br>As for U380                                      | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U388</b><br>(2388)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 9</b> (output = B9458) <b>FB 188</b><br>As for U380                                      | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U389</b><br>(2389)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 10</b> (output = B9459) <b>FB 189</b><br>As for U380                                     | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U390</b><br>(2390)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 11</b> (output = B9460) <b>FB 190</b><br>As for U380                                     | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |



| PNU                                         | Description                                                                               | Value range [Unit]        | No. indices                   | See Change                       |
|---------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------|-------------------------------|----------------------------------|
| <b>U391</b><br>(2391)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 12</b> (output = B9461) <b>FB 191</b><br>As for U380 | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U392</b><br>(2392)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 13</b> (output = B9462) <b>FB 192</b><br>As for U380 | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U393</b><br>(2393)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 14</b> (output = B9463) <b>FB 193</b><br>As for U380 | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U394</b><br>(2394)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 15</b> (output = B9464) <b>FB 194</b><br>As for U380 | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U395</b><br>(2395)<br>*<br>S00<br>(B207) | <b>Source for input signal, inverter 16</b> (output = B9465) <b>FB 195</b><br>As for U380 | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**NAND elements with 3 inputs each**

The input signals selected via the 3 indices of the parameter are combined in an NAND operation and the result applied to the specified binector.

|                                             |                                                                                                                                                                                                                                      |                           |                            |                                  |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U400</b><br>(2400)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 1</b> (output = B9470) <b>FB 200</b><br>i001 Source for input 1<br>i002 Source for input 2<br>i003 Source for input 3<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U401</b><br>(2401)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 2</b> (output = B9471) <b>FB 201</b><br>As for U400                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U402</b><br>(2402)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 3</b> (output = B9472) <b>FB 202</b><br>As for U400                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U403</b><br>(2403)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 4</b> (output = B9473) <b>FB 203</b><br>As for U400                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U404</b><br>(2404)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 5</b> (output = B9474) <b>FB 204</b><br>As for U400                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U405</b><br>(2405)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 6</b> (output = B9475) <b>FB 205</b><br>As for U400                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U406</b><br>(2406)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 7</b> (output = B9476) <b>FB 206</b><br>As for U400                                                                                                                                        | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                    | Value range [Unit]        | No. indices                | See Change                       |
|---------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| <b>U407</b><br>(2407)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 8</b> (output = B9477) <b>FB 207</b><br>As for U400  | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U408</b><br>(2408)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 9</b> (output = B9478) <b>FB 208</b><br>As for U400  | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U409</b><br>(2409)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 10</b> (output = B9479) <b>FB 209</b><br>As for U400 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U410</b><br>(2410)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 11</b> (output = B9480) <b>FB 210</b><br>As for U400 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U411</b><br>(2411)<br>*<br>S00<br>(B207) | <b>Source for input signals, NAND element 12</b> (output = B9481) <b>FB 211</b><br>As for U400 | All binector numbers<br>1 | Ind: 3<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

## 11.69 Storage elements, timers and binary signal selector switches

Only active with optional technology software S00

| <b>RS flipflops</b>                                                                                                                       |                                                                                                                                                                                                                              |                           |                            |                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|----------------------------------|
| RS flipflops with SET (Q=1) and RESET (Q=0) (priority: 1 <sup>st</sup> RESET, 2 <sup>nd</sup> SET). RESET setting is enabled on POWER ON. |                                                                                                                                                                                                                              |                           |                            |                                  |
| <b>U415</b><br>(2415)<br>*<br>S00<br>(B210)                                                                                               | <b>Source for SET and RESET for RS flipflop 1</b> <b>FB 215</b><br>(Outputs: Q = B9550, /Q = B9551)<br><br>i001 Source for SET<br>i002 Source for RESET<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U416</b><br>(2416)<br>*<br>S00<br>(B210)                                                                                               | <b>Source for SET and RESET for RS flipflop 2</b> <b>FB 216</b><br>(outputs: Q = B9552, /Q = B9553)<br><br>As for U415                                                                                                       | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U417</b><br>(2417)<br>*<br>S00<br>(B210)                                                                                               | <b>Source for SET and RESET for RS flipflop 3</b> <b>FB 217</b><br>(outputs: Q = B9554, /Q = B9555)<br><br>As for U415                                                                                                       | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U418</b><br>(2418)<br>*<br>S00<br>(B210)                                                                                               | <b>Source for SET and RESET for RS flipflop 4</b> <b>FB 218</b><br>(outputs: Q = B9556, /Q = B9557)<br><br>As for U415                                                                                                       | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U419</b><br>(2419)<br>*<br>S00<br>(B210)                                                                                               | <b>Source for SET and RESET for RS flipflop 5</b> <b>FB 219</b><br>(outputs: Q = B9558, /Q = B9559)<br><br>As for U415                                                                                                       | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U420</b><br>(2420)<br>*<br>S00<br>(B210)                                                                                               | <b>Source for SET and RESET for RS flipflop 6</b> <b>FB 220</b><br>(outputs: Q = B9560, /Q = B9561)<br><br>As for U415                                                                                                       | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U421</b><br>(2421)<br>*<br>S00<br>(B210)                                                                                               | <b>Source for SET and RESET for RS flipflop 7</b> <b>FB 221</b><br>(outputs: Q = B9562, /Q = B9563)<br><br>As for U415                                                                                                       | All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                         | Description                                                                                               | Value range [Unit]                             | No. indices                | See Change                       |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------|----------------------------------|
| <b>U422</b><br>(2422)<br>*<br>S00<br>(B210) | <b>Source for SET and RESET for RS flipflop 8</b><br>(outputs: Q = B9564, /Q = B9565)<br><br>As for U415  | <b>FB 222</b><br><br>All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U423</b><br>(2423)<br>*<br>S00<br>(B210) | <b>Source for SET and RESET for RS flipflop 9</b><br>(outputs: Q = B9566, /Q = B9567)<br><br>As for U415  | <b>FB 223</b><br><br>All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U424</b><br>(2424)<br>*<br>S00<br>(B210) | <b>Source for SET and RESET for RS flipflop 10</b><br>(outputs: Q = B9568, /Q = B9569)<br><br>As for U415 | <b>FB 224</b><br><br>All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U425</b><br>(2425)<br>*<br>S00<br>(B210) | <b>Source for SET and RESET for RS flipflop 11</b><br>(outputs: Q = B9570, /Q = B9571)<br><br>As for U415 | <b>FB 225</b><br><br>All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U426</b><br>(2426)<br>*<br>S00<br>(B210) | <b>Source for SET and RESET for RS flipflop 12</b><br>(outputs: Q = B9572, /Q = B9573)<br><br>As for U415 | <b>FB 226</b><br><br>All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U427</b><br>(2427)<br>*<br>S00<br>(B210) | <b>Source for SET and RESET for RS flipflop 13</b><br>(outputs: Q = B9574, /Q = B9575)<br><br>As for U415 | <b>FB 227</b><br><br>All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U428</b><br>(2428)<br>*<br>S00<br>(B210) | <b>Source for SET and RESET for RS flipflop 14</b><br>(outputs: Q = B9576, /Q = B9577)<br><br>As for U415 | <b>FB 228</b><br><br>All binector numbers<br>1 | Ind: 2<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**D flipflops**

D flipflops with RESET (Q=0), SET (Q=1) and STORE (Q=D on transition from 0 to 1) (priority: 1<sup>st</sup> RESET, 2<sup>nd</sup> SET, 3<sup>rd</sup> STORE).  
RESET setting is enabled on POWER ON.

|                                             |                                                                                                                                                                                                                                                                       |                                                |                            |                                  |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------|----------------------------------|
| <b>U430</b><br>(2430)<br>*<br>S00<br>(B211) | <b>Source for SET, D, STORE and RESET for D flipflop 1</b><br>(outputs: Q = B9490, /Q = B9491)<br><br>i001 Source for SET<br>i002 Source for D<br>i003 Source for STORE<br>i004 Source for RESET<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | <b>FB 230</b><br><br>All binector numbers<br>1 | Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U431</b><br>(2431)<br>*<br>S00<br>(B211) | <b>Source for SET, D, STORE and RESET for D flipflop 2</b><br>(outputs: Q = B9492, /Q = B9493)<br><br>As for U430                                                                                                                                                     | <b>FB 231</b><br><br>All binector numbers<br>1 | Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U432</b><br>(2432)<br>*<br>S00<br>(B211) | <b>Source for SET, D, STORE and RESET for D flipflop 3</b><br>(outputs: Q = B9494, /Q = B9495)<br><br>As for U430                                                                                                                                                     | <b>FB 232</b><br><br>All binector numbers<br>1 | Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U433</b><br>(2433)<br>*<br>S00<br>(B211) | <b>Source for SET, D, STORE and RESET for D flipflop 4</b><br>(outputs: Q = B9496, /Q = B9497)<br><br>As for U430                                                                                                                                                     | <b>FB 233</b><br><br>All binector numbers<br>1 | Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                                                 | Description                                                                                                                                                                                                                                                                                                         | Value range<br>[Unit]           | No. indices                       | See<br>Change                     |
|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------|-----------------------------------|
| <b>Timer 1</b> (0.000 to 60.000s) (output = B9580, inverted: B9581) |                                                                                                                                                                                                                                                                                                                     |                                 |                                   |                                   |
| <b>U440</b><br>(2440)<br>*<br>S00<br>(B215)                         | <b>Source for input signal and reset signal for timer element 1</b> <b>FB 240</b><br><br>i001 Source for input signal<br>i002 Source for reset signal for the pulse generator (if U442=3)<br>(in state "1", the pulse generator is set to "0")<br><br>Settings:<br>0 = Binector B0000<br>1 = Binector B0001<br>etc. | All binector numbers<br>1       | Ind: 2<br>FS=0<br>Type: L2        | P052 = 3<br>P051 = 40<br>off-line |
| <b>U441</b><br>(2441)<br>S00<br>(B215)                              | <b>Time for timer 1</b> <b>FB 240</b>                                                                                                                                                                                                                                                                               | 0.000 to 60.000<br>[s]<br>0.001 | Ind: None<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>U442</b><br>(2442)<br>*<br>S00<br>(B215)                         | <b>Mode for timer 1</b> <b>FB 240</b><br><br>0 ON delay<br>1 OFF delay<br>2 ON / OFF delay<br>3 Pulse generator with positive edge triggering                                                                                                                                                                       | 0 to 3<br>1                     | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline  |

|                                                                     |                                                                                                      |                                 |                                   |                                  |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------|----------------------------------|
| <b>Timer 2</b> (0.000 to 60.000s) (output = B9582, inverted: B9583) |                                                                                                      |                                 |                                   |                                  |
| <b>U443</b><br>(2443)<br>*<br>S00<br>(B215)                         | <b>Source for input signal and reset signal for timer element 2</b> <b>FB 241</b><br><br>As for U440 | All binector numbers<br>1       | Ind: 2<br>FS=0<br>Type: L2        | P052 = 3<br>P051 = 40<br>Offline |
| <b>U444</b><br>(2444)<br>S00<br>(B215)                              | <b>Time for timer 2</b> <b>FB 241</b>                                                                | 0.000 to 60.000<br>[s]<br>0.001 | Ind: None<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U445</b><br>(2445)<br>*<br>S00<br>(B215)                         | <b>Mode for timer 2</b> <b>FB 241</b><br><br>As for U442                                             | 0 to 3<br>1                     | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |

|                                                                     |                                                                                                      |                                 |                                   |                                  |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------|----------------------------------|
| <b>Timer 3</b> (0.000 to 60.000s) (output = B9584, inverted: B9585) |                                                                                                      |                                 |                                   |                                  |
| <b>U446</b><br>(2446)<br>*<br>S00<br>(B215)                         | <b>Source for input signal and reset signal for timer element 3</b> <b>FB 242</b><br><br>As for U440 | All binector numbers<br>1       | Ind: 2<br>FS=0<br>Type: L2        | P052 = 3<br>P051 = 40<br>Offline |
| <b>U447</b><br>(2447)<br>S00<br>(B215)                              | <b>Time for timer 3</b> <b>FB 242</b>                                                                | 0.000 to 60.000<br>[s]<br>0.001 | Ind: None<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U448</b><br>(2448)<br>*<br>S00<br>(B215)                         | <b>Mode for timer 3</b> <b>FB 242</b><br><br>As for U442                                             | 0 to 3<br>1                     | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |

|                                                                     |                                                                                                      |                                 |                                   |                                  |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------|----------------------------------|
| <b>Timer 4</b> (0.000 to 60.000s) (output = B9586, inverted: B9587) |                                                                                                      |                                 |                                   |                                  |
| <b>U449</b><br>(2449)<br>*<br>S00<br>(B215)                         | <b>Source for input signal and reset signal for timer element 4</b> <b>FB 243</b><br><br>As for U440 | All binector numbers<br>1       | Ind: 2<br>FS=0<br>Type: L2        | P052 = 3<br>P051 = 40<br>Offline |
| <b>U450</b><br>(2450)<br>S00<br>(B215)                              | <b>Time for timer 4</b> <b>FB 243</b>                                                                | 0.000 to 60.000<br>[s]<br>0.001 | Ind: None<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U451</b><br>(2451)<br>*<br>S00<br>(B215)                         | <b>Mode for timer 4</b> <b>FB 243</b><br><br>As for U442                                             | 0 to 3<br>1                     | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

**Timer 5** (0.000 to 60.000s) (output = B9588, inverted: B9589)

|                                             |                                                                                    |                                                  |                                   |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------|----------------------------------|
| <b>U452</b><br>(2452)<br>*<br>S00<br>(B215) | <b>Source for input signal and reset signal for timer element 5</b><br>As for U440 | <b>FB 244</b><br>All binector numbers<br>1       | Ind: 2<br>FS=0<br>Type: L2        | P052 = 3<br>P051 = 40<br>Offline |
| <b>U453</b><br>(2453)<br>S00<br>(B215)      | <b>Time for timer 5</b>                                                            | <b>FB 244</b><br>0.000 to 60.000<br>[s]<br>0.001 | Ind: None<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U454</b><br>(2454)<br>*<br>S00<br>(B215) | <b>Mode for timer 5</b><br>As for U442                                             | <b>FB 244</b><br>0 to 3<br>1                     | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |

**Timer 6** (0.000 to 60.000s) (output = B9590, inverted: B9591)

|                                             |                                                                                    |                                                  |                                   |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------|----------------------------------|
| <b>U455</b><br>(2455)<br>*<br>S00<br>(B215) | <b>Source for input signal and reset signal for timer element 6</b><br>As for U440 | <b>FB 245</b><br>All binector numbers<br>1       | Ind: 2<br>FS=0<br>Type: L2        | P052 = 3<br>P051 = 40<br>Offline |
| <b>U456</b><br>(2456)<br>S00<br>(B215)      | <b>Time for timer 6</b>                                                            | <b>FB 245</b><br>0.000 to 60.000<br>[s]<br>0.001 | Ind: None<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U457</b><br>(2457)<br>*<br>S00<br>(B215) | <b>Mode for timer 6</b><br>As for U442                                             | <b>FB 245</b><br>0 to 3<br>1                     | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |

**Timer 7** (0.00 to 600.00s) (output = B9592, inverted: B9593)

|                                             |                                                                                    |                                                |                                  |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------|----------------------------------|
| <b>U458</b><br>(2458)<br>*<br>S00<br>(B216) | <b>Source for input signal and reset signal for timer element 7</b><br>As for U440 | <b>FB 246</b><br>All binector numbers<br>1     | Ind: 2<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>U459</b><br>(2459)<br>S00<br>(B216)      | <b>Time for timer 7</b>                                                            | <b>FB 246</b><br>0.00 to 600.00<br>[s]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U460</b><br>(2460)<br>*<br>S00<br>(B216) | <b>Mode for timer 7</b><br>As for U442                                             | <b>FB 246</b><br>0 to 3<br>1                   | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |

**Timer 8** (0.00 to 600.00s) (output = B9594, inverted: B9595)

|                                             |                                                                                    |                                                |                                  |                                  |
|---------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------|----------------------------------|
| <b>U461</b><br>(2461)<br>*<br>S00<br>(B216) | <b>Source for input signal and reset signal for timer element 8</b><br>As for U440 | <b>FB 247</b><br>All binector numbers<br>1     | Ind: 2<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>U462</b><br>(2462)<br>S00<br>(B216)      | <b>Time for timer 8</b>                                                            | <b>FB 247</b><br>0.00 to 600.00<br>[s]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U463</b><br>(2463)<br>*<br>S00<br>(B216) | <b>Mode for timer 8</b><br>As for U442                                             | <b>FB 247</b><br>0 to 3<br>1                   | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                                                                                                                                                                                                                    | Description                                                                                                                                                                                                                                                                                                                        | Value range<br>[Unit]         | No. indices                      | See<br>Change                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------|----------------------------------|
| <b>Timer 9</b> (0.00 to 600.00s) (output = B9596, inverted: B9597)                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                    |                               |                                  |                                  |
| <b>U464</b><br>(2464)<br>*<br>S00<br>(B216)                                                                                                                                                                                            | <b>Source for input signal and reset signal for timer element 9</b> <b>FB 248</b><br>As for U440                                                                                                                                                                                                                                   | All binector numbers<br>1     | Ind: 2<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>U465</b><br>(2465)<br>S00<br>(B216)                                                                                                                                                                                                 | <b>Time for timer 9</b> <b>FB 248</b>                                                                                                                                                                                                                                                                                              | 0.00 to 600.00<br>[s]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U466</b><br>(2466)<br>*<br>S00<br>(B216)                                                                                                                                                                                            | <b>Mode for timer 9</b> <b>FB 248</b><br>As for U442                                                                                                                                                                                                                                                                               | 0 to 3<br>1                   | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>Timer 10</b> (0.00 to 600.00s) (output = B9598, inverted: B9599)                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                    |                               |                                  |                                  |
| <b>U467</b><br>(2467)<br>*<br>S00<br>(B216)                                                                                                                                                                                            | <b>Source for input signal and reset signal for timer element 10</b> <b>FB 249</b><br>As for U440                                                                                                                                                                                                                                  | All binector numbers<br>1     | Ind: 2<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>U468</b><br>(2468)<br>S00<br>(B216)                                                                                                                                                                                                 | <b>Time for timer 10</b> <b>FB 249</b>                                                                                                                                                                                                                                                                                             | 0.00 to 600.00<br>[s]<br>0.01 | Ind: None<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U469</b><br>(2469)<br>*<br>S00<br>(B216)                                                                                                                                                                                            | <b>Mode for timer 10</b> <b>FB 249</b><br>As for U442                                                                                                                                                                                                                                                                              | 0 to 3<br>1                   | Ind: None<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>Binary signal selector switches</b>                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                    |                               |                                  |                                  |
| The control signal (binector) is selected via index i001 of the parameter.<br>Control signal = 0: Binector as set in index i002 is applied to the output<br>Control signal = 1: Binector as set in index i003 is applied to the output |                                                                                                                                                                                                                                                                                                                                    |                               |                                  |                                  |
| <b>U470</b><br>(2470)<br>*<br>S00<br>(B216)                                                                                                                                                                                            | <b>Source for input signals for binary signal selector switch 1</b> <b>FB 250</b><br>(output = B9482)<br><br>i001 Source for control signal<br>i002 Source for output signal when control signal = 0<br>i003 Source for output signal when control signal = 1<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc. | All binector numbers<br>1     | Ind: 3<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>U471</b><br>(2471)<br>*<br>S00<br>(B216)                                                                                                                                                                                            | <b>Source for input signals for binary signal selector switch 2</b> <b>FB 251</b><br>(output = B9483)<br>As for U470                                                                                                                                                                                                               | All binector numbers<br>1     | Ind: 3<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>U472</b><br>(2472)<br>*<br>S00<br>(B216)                                                                                                                                                                                            | <b>Source for input signals for binary signal selector switch 3</b> <b>FB 252</b><br>(output = B9484)<br>As for U470                                                                                                                                                                                                               | All binector numbers<br>1     | Ind: 3<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>U473</b><br>(2473)<br>*<br>S00<br>(B216)                                                                                                                                                                                            | <b>Source for input signals for binary signal selector switch 4</b> <b>FB 253</b><br>(output = B9485)<br>As for U470                                                                                                                                                                                                               | All binector numbers<br>1     | Ind: 3<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |
| <b>U474</b><br>(2474)<br>*<br>S00<br>(B216)                                                                                                                                                                                            | <b>Source for input signals for binary signal selector switch 5</b> <b>FB 254</b><br>(output = B9486)<br>As for U470                                                                                                                                                                                                               | All binector numbers<br>1     | Ind: 3<br>FS=0<br>Type: L2       | P052 = 3<br>P051 = 40<br>Offline |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.70 Technology controller

Only active with optional technology software S00

| Technology controller: Actual value                |                                                                                                                                                 |               |                                 |                                |                                  |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------------|--------------------------------|----------------------------------|
| <b>U480</b><br>(2480)<br>*<br>S00<br>FDS<br>(B170) | <b>Source for actual value</b><br>Selection of connectors to be added as the actual value<br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 114</b> | All connector numbers<br>1      | Ind: 4<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>U481</b><br>(2481)<br>S00<br>FDS<br>(B170)      | <b>Filter time for actual value</b>                                                                                                             | <b>FB 114</b> | 0.00 to 600.00<br>[s]<br>0.01   | Ind: 4<br>FS=0.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>U482</b><br>(2482)<br>S00<br>FDS<br>(B170)      | <b>Derivative-action time for actual value (D component)</b><br>0.000 = D component deactivated<br>See also U483                                | <b>FB 114</b> | 0.000 to 30.000<br>[s]<br>0.001 | Ind: 4<br>FS=0.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U483</b><br>(2483)<br>*<br>S00<br>FDS<br>(B170) | <b>Factor for derivative-action time</b><br>0 Derivative-action time = U482 * 1<br>1 Derivative-action time = U482 * 1000                       | <b>FB 114</b> | 0 to 1<br>1                     | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |

| Technology controller: Setpoint                    |                                                                                                                                                           |               |                                  |                               |                                  |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------|-------------------------------|----------------------------------|
| <b>U484</b><br>(2484)<br>*<br>S00<br>FDS<br>(B170) | <b>Source for setpoint</b><br>Selection of connectors to be added as the setpoint<br>0 = connector K0000<br>1 = connector K0001<br>etc.                   | <b>FB 114</b> | All connector numbers<br>1       | Ind: 4<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U485</b><br>(2485)<br>S00<br>FDS<br>(B170)      | <b>Injectable additional setpoint</b><br>This parameter setting is added to the setpoint when the binector selected in U486 changes to the log. "1" state | <b>FB 114</b> | -200.00 to 199.99<br>[%]<br>0.01 | Ind: 4<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U486</b><br>(2486)<br>*<br>S00<br>FDS<br>(B170) | <b>Source for control bit for injection of additional setpoint</b><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                    | <b>FB 114</b> | All binector numbers<br>1        | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U487</b><br>(2487)<br>S00<br>FDS<br>(B170)      | <b>Filter time for setpoint</b>                                                                                                                           | <b>FB 114</b> | 0.00 to 600.00<br>[s]<br>0.01    | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |

| Technology controller: Controller parameters       |                                                                                                              |               |                               |                               |                                  |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------|---------------|-------------------------------|-------------------------------|----------------------------------|
| <b>U488</b><br>(2488)<br>S00<br>FDS<br>(B170)      | <b>P gain</b>                                                                                                | <b>FB 114</b> | 0.10 to 200.00<br>0.01        | Ind: 4<br>FS=3.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U489</b><br>(2489)<br>*<br>S00<br>FDS<br>(B170) | <b>Source for input quantity (x) for Kp adaptation</b><br>0 = connector K0000<br>1 = connector K0001<br>etc. | <b>FB 114</b> | All connector numbers<br>1    | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U490</b><br>(2490)<br>S00<br>FDS<br>(B170)      | <b>Characteristic for Kp adaptation: Threshold 1 (x1)</b>                                                    | <b>FB 114</b> | 0.00 to 200.00<br>[%]<br>0.01 | Ind: 4<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |

| PNU                                                | Description                                                                                                                  | Value range [Unit]              | No. indices                     | See Change                       |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------|----------------------------------|
| <b>U491</b><br>(2491)<br>S00<br>FDS<br>(B170)      | <b>Characteristic for Kp adaptation: Threshold 2 (x2)</b> <b>FB 114</b>                                                      | 0.00 to 200.00<br>[%]<br>0.01   | Ind: 4<br>FS=100.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U492</b><br>(2492)<br>S00<br>FDS<br>(B170)      | <b>Characteristic for Kp adaptation: Minimum value (y1)</b> <b>FB 114</b><br>Minimum value of Kp factor (y) when $x \leq x1$ | 0.10 to 30.00<br>0.01           | Ind: 4<br>FS=1.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>U493</b><br>(2493)<br>S00<br>FDS<br>(B170)      | <b>Characteristic for Kp adaptation: Maximum value (y2)</b> <b>FB 114</b><br>Maximum value of Kp factor (y) when $x \geq x2$ | 0.10 to 30.00<br>0.01           | Ind: 4<br>FS=1.00<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>U494</b><br>(2494)<br>S00<br>FDS<br>(B170)      | <b>Reset time</b> <b>FB 114</b><br>See also U495                                                                             | 0.010 to 60.000<br>[s]<br>0.001 | Ind: 4<br>FS=3.000<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>U495</b><br>(2495)<br>*<br>S00<br>FDS<br>(B170) | <b>Factor for reset time</b> <b>FB 114</b><br>0 Reset time = U494 * 1<br>1 Reset time = U494 * 1000                          | 0 to 1<br>1                     | Ind: 4<br>FS=0<br>Type: O2      | P052 = 3<br>P051 = 40<br>Offline |

**Technology controller: Speed droop**

A parameterizable feedback loop can be connected in parallel to the I and P components of the technology controller (acts on summation point of setpoint and actual value). This loop can be activated and deactivated by settings in parameter U496 (loop can also be deactivated by setting U497 = 0).

|                                               |                                                                                                                                                                                    |                                |                                  |                                  |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------|----------------------------------|
| <b>U496</b><br>(2496)<br>*<br>S00<br>(B170)   | <b>Source for control bit for speed droop injection</b> <b>FB 114</b><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                          | All binector numbers<br>1      | Ind: None<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U497</b><br>(2497)<br>S00<br>FDS<br>(B170) | <b>Speed droop</b> <b>FB 114</b><br>Example:<br>A 10% speed droop setting causes a 10% reduction in the setpoint at a 100% controller output ("softening" of closed-loop control). | 0.0 to 60.0<br>[%]<br>0.1      | Ind: 4<br>FS=0.0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online  |
| <b>U498</b><br>(2498)<br>S00<br>FDS<br>(B170) | <b>Positive limit for speed droop</b> <b>FB 114</b>                                                                                                                                | 0.00 to 199.99<br>[%]<br>0.01  | Ind: 4<br>FS=100.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>U499</b><br>(2499)<br>S00<br>FDS<br>(B170) | <b>Negative limit for speed droop</b> <b>FB 114</b>                                                                                                                                | -200.00 to 0.00<br>[%]<br>0.01 | Ind: 4<br>FS=-100.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |

**Technology controller: Control bits**

|                                                    |                                                                                                                                                                                               |                           |                               |                                  |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------|----------------------------------|
| <b>U500</b><br>(2500)<br>*<br>S00<br>(B170)        | <b>Source for technology controller enabling command</b> <b>FB 114</b><br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                    | All binector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U502</b><br>(2502)<br>*<br>S00<br>FDS<br>(B170) | <b>PI/PID controller switchover</b> <b>FB 114</b><br>0 PI controller (D component is applied only in actual-value channel)<br>1 PID controller (D component is applied for control deviation) | 0 to 1<br>1               | Ind: 4<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U503</b><br>(2503)<br>*<br>S00<br>FDS<br>(B170) | <b>Set P component to zero</b> <b>FB 114</b><br>0 Set controller P component to zero (i.e. to obtain pure I controller)<br>1 Controller P component is active                                 | 0 to 1<br>1               | Ind: 4<br>FS=1<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |



| PNU                                                | Description                                                                                                                                                       | Value range [Unit] | No. indices                | See Change                       |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------|----------------------------------|
| <b>U504</b><br>(2504)<br>*<br>S00<br>FDS<br>(B170) | <b>Set I component to zero</b> <b>FB 114</b><br><br>0 Set controller I component to zero (i.e. to obtain pure P controller)<br>1 Controller I component is active | 0 to 1<br>1        | Ind: 4<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |

**Technology controller: Set I component**

When the state of the binector selected in U506 switches from log. "0" to "1", the I component of the technology controller is set to the value parameterized in U505.

With this function it is possible, for example, to use the same signal (binector) to control controller enabling commands and setting of the I component.

|                                             |                                                                                                                         |                            |                               |                                  |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|----------------------------------|
| <b>U505</b><br>(2505)<br>*<br>S00<br>(B170) | <b>Source for setting value for I component</b> <b>FB 114</b><br><br>0 = connector K0000<br>1 = connector K0001<br>etc. | All connector numbers<br>1 | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U506</b><br>(2506)<br>*<br>S00<br>(B170) | <b>Source for control bit "Set I component"</b> <b>FB 114</b><br><br>0 = binector B0000<br>1 = binector B0001<br>etc.   | All binector numbers<br>1  | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |

**Technology controller: Output, limitation**

|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |                                  |                                  |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------------|----------------------------------|
| <b>U507</b><br>(2507)<br>*<br>S00<br>(B170)   | <b>Source for variable positive limit</b> <b>FB 114</b><br><br>After multiplication with U508, the contents of the selected connector act as a positive limit for the technology controller output.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.<br><br><u>Note:</u><br>If the selected connector contains a negative value, a negative maximum value is applied to the output of this limiter stage.                                                                                                                                                                                                                                                   | All connector numbers<br>1 | Ind: None<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U508</b><br>(2508)<br>S00<br>FDS<br>(B170) | <b>Positive limit for output of technology controller</b> <b>FB 114</b><br><br>See also U507                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.0 to 199.9<br>[%]<br>0.1 | Ind: 4<br>FS=100.0<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>U509</b><br>(2509)<br>*<br>S00<br>(B170)   | <b>Source for variable negative limit</b> <b>FB 114</b><br><br>After multiplication with U510, the contents of the selected connector act as a negative limit for the technology controller output.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.<br><br><u>Note:</u><br>If the selected connector contains a positive value, a positive minimum value is applied to the output of this limiter stage.<br><br><u>Note:</u><br>Connector K9252 contains the positive limiting value with inverted sign generated by U507 and U508. By setting U509=9252 and U510=100.00, therefore, it is possible to set the negative and positive limits symmetrically. | All connector numbers<br>1 | Ind: None<br>FS=9252<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U510</b><br>(2510)<br>S00<br>FDS<br>(B170) | <b>Negative limit for output of technology controller</b> <b>FB 114</b><br><br>See also U509                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.0 to 199.9<br>[%]<br>0.1 | Ind: 4<br>FS=100.0<br>Type: O2   | P052 = 3<br>P051 = 40<br>Online  |
| <b>U511</b><br>(2511)<br>*<br>S00<br>(B170)   | <b>Source for variable weighting factor for output</b> <b>FB 114</b><br><br>After multiplication with U512, the contents of the selected connector act as a weighting factor for the technology controller output.<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                         | All connector numbers<br>1 | Ind: None<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |

| PNU                                           | Description                                         | Value range [Unit]                             | No. indices                    | See Change                      |
|-----------------------------------------------|-----------------------------------------------------|------------------------------------------------|--------------------------------|---------------------------------|
| <b>U512</b><br>(2512)<br>S00<br>FDS<br>(B170) | <b>Weighting factor for output</b><br>See also U511 | <b>FB 114</b><br>-100.0 to 100.0<br>[%]<br>0.1 | Ind: 4<br>FS=100.0<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |

## 11.71 Velocity/speed calculators

Only active with optional technology software S00

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                  |               |                               |                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------|--------------------------------------------------------------------|
| <b>Speed/velocity calculator</b><br><br>Function: $v_{act} = \frac{D * \pi * n_{rated}}{i} * \frac{n_{act}}{100\%}$<br><br><div> <div>v_act</div> <div>Actual velocity</div> <div>(n021, U521, K9256)</div> </div> <div> <div>D</div> <div>Diameter</div> <div>(U517, U518)</div> </div> <div> <div>n Rated</div> <div>Rated speed</div> <div>(U520)</div> </div> <div> <div>i</div> <div>Gear ratio</div> <div>(U519)</div> </div> <div> <div>n_act</div> <div>Actual speed</div> <div>(U515)</div> </div> |                                                                                                                                                                                  |               |                               |                                                                    |
| <b>U515</b><br>(2515)<br>*<br>S00<br>(B190)                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Source for actual speed</b><br>0 = connector K0000<br>1 = connector K0001<br>etc.                                                                                             | <b>FB 115</b> | All connector numbers<br>1    | Ind: None<br>FS=0<br>Type: L2<br>P052 = 3<br>P051 = 40<br>Offline  |
| <b>Velocity/speed calculator</b><br><br>Function: $n_{set} = \frac{v_{set} * i}{D * \pi * n_{rated}} * 100\%$<br><br><div> <div>n_set</div> <div>Setpoint speed</div> <div>(n023, K9257)</div> </div> <div> <div>D</div> <div>Diameter</div> <div>(U517, U518, U523)</div> </div> <div> <div>n Rated</div> <div>Rated speed</div> <div>(U520)</div> </div> <div> <div>i</div> <div>Gear ratio</div> <div>(U519)</div> </div> <div> <div>v_set</div> <div>Setpoint velocity</div> <div>(U516)</div> </div>   |                                                                                                                                                                                  |               |                               |                                                                    |
| <b>U516</b><br>(2516)<br>*<br>S00<br>(B190)                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Source for set velocity</b><br>A value of 16384 in the selected connector is equivalent to the set velocity set in U522<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 115</b> | All connector numbers<br>1    | Ind: None<br>FS=0<br>Type: L2<br>P052 = 3<br>P051 = 40<br>off-line |
| <b>U517</b><br>(2517)<br>*<br>S00<br>(B190)                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Source for diameter</b><br>A value of 16384 in the selected connector is equivalent to the diameter set in U523<br>0 = Connector K0000<br>1 = Connector K0001<br>etc.         | <b>FB 115</b> | All connector numbers<br>1    | Ind: None<br>FS=0<br>Type: L2<br>P052 = 3<br>P051 = 40<br>off-line |
| <b>U518</b><br>(2518)<br>S00<br>FDS<br>(B190)                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Minimum diameter</b><br>Lower limit for diameter set in U517                                                                                                                  | <b>FB 115</b> | 10.0 to 6553.5<br>[mm]<br>0.1 | Ind: 4<br>FS=6500.0<br>Type: O2<br>P052 = 3<br>P051 = 40<br>Online |
| <b>U519</b><br>(2519)<br>S00<br>FDS<br>(B190)                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Gear ratio (i)</b>                                                                                                                                                            | <b>FB 115</b> | 1.00 to 300.00<br>0.01        | Ind: 4<br>FS=1.00<br>Type: O2<br>P052 = 3<br>P051 = 40<br>Online   |
| <b>U520</b><br>(2520)<br>S00<br>FDS<br>(B190)                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Rated speed (n Rated)</b>                                                                                                                                                     | <b>FB 115</b> | 100 to 4000<br>[rev/m]<br>1   | Ind: 4<br>FS=1450<br>Type: O2<br>P052 = 3<br>P051 = 40<br>Online   |

| PNU                                    | Description                                                                                                              | Value range<br>[Unit]           | No. indices                       | See<br>Change                    |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------|----------------------------------|
| <b>U521</b><br>(2521)<br>S00<br>(B190) | <b>Normalization for actual velocity</b> [SW 1.8 and later]<br>16384 in K9256 correspond to the actual velocity set here | 0.01 to 327.67<br>[m/s]<br>0.01 | Ind: None<br>FS=16.38<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| <b>U522</b><br>(2522)<br>S00<br>(B190) | <b>Normalization for set velocity</b> [SW 1.8 and later]<br>See parameter U516                                           | 0.01 to 327.67<br>[m/s]<br>0.01 | Ind: None<br>FS=16.38<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| <b>U523</b><br>(2523)<br>S00<br>(B190) | <b>Normalization for diameter</b> [SW 1.8 and later]<br>See parameter U517                                               | 10 to 60000<br>[mm]<br>1        | Ind: None<br>FS=1638<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line |

## 11.72 Variable moment of inertia

Only active with optional technology software S00

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                               |                                   |                                   |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------|-----------------------------------|-----------------------------------|
| Calculation of the variable moment of inertia             |                                                                                                                                                                                                                                                                                                                                                                                                     | FB 115             |                               |                                   |                                   |
| Function: $J_V = \frac{D^4 - D_{Hülse}^4}{D_{max}^4} * K$ |                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                               |                                   |                                   |
| J <sub>V</sub>                                            | Variable moment of inertia                                                                                                                                                                                                                                                                                                                                                                          |                    |                               |                                   |                                   |
| D                                                         | Diameter                                                                                                                                                                                                                                                                                                                                                                                            |                    |                               |                                   |                                   |
| D <sub>Hülse</sub>                                        | Diameter of the sleeve                                                                                                                                                                                                                                                                                                                                                                              |                    |                               |                                   |                                   |
| D <sub>max</sub>                                          | Maximum diameter                                                                                                                                                                                                                                                                                                                                                                                    |                    |                               |                                   |                                   |
| K                                                         | Constant                                                                                                                                                                                                                                                                                                                                                                                            |                    |                               |                                   |                                   |
| <b>U525</b><br>(2525)<br>*<br>S00<br><br>(B191)           | <b>Source for input quantities</b><br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001    Diameter<br>(16384 are equivalent to set diameter U526)<br>i002    Diameter of the sleeve<br>(16384 are equivalent to set diameter U527 )<br>i003    Maximum diameter<br>(16384 are equivalent to set diameter U528 )<br>i004    Constant<br>(16384 are equivalent to set factor U529 ) | [SW 1.8 and later] | All connector<br>numbers<br>1 | Ind: 4<br>FS=1<br>Type: L2        | P052 = 3<br>P051 = 40<br>off-line |
| <b>U526</b><br>(2526)<br>S00<br>(B191)                    | <b>Normalization for diameter</b><br><br>See parameter U525                                                                                                                                                                                                                                                                                                                                         | [SW 1.8 and later] | 10 to 60000<br>[mm]<br>1      | Ind: None<br>FS=10000<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U527</b><br>(2527)<br>S00<br>(B191)                    | <b>Normalization for diameter of the sleeve</b><br><br>See parameter U525                                                                                                                                                                                                                                                                                                                           | [SW 1.8 and later] | 10 to 60000<br>[mm]<br>1      | Ind: None<br>FS=10000<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U528</b><br>(2528)<br>S00<br>(B191)                    | <b>Normalization for maximum diameter</b><br><br>See parameter U525                                                                                                                                                                                                                                                                                                                                 | [SW 1.8 and later] | 10 to 60000<br>[mm]<br>1      | Ind: None<br>FS=10000<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U529</b><br>(2529)<br>S00<br>(B191)                    | <b>Normalization for constant K</b><br><br>See parameter U525                                                                                                                                                                                                                                                                                                                                       | [SW 1.8 and later] | 0.01 to 100.00<br>0.01        | Ind: None<br>FS=1.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line  |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.73 PI controller

Only active with optional technology software S00

|                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                   |                               |                             |                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|-----------------------------------|
| PI controller 1 = FB260<br>PI controller 2 = FB261<br>PI controller 3 = FB262<br>PI controller 4 = FB263<br>PI controller 5 = FB264<br>PI controller 6 = FB265<br>PI controller 7 = FB266<br>PI controller 8 = FB267<br>PI controller 9 = FB268<br>PI controller 10 = FB269 |                                                                                                                                                                                                                                                   |                               |                             |                                   |
| <b>U530</b><br>(2530)<br>*<br>S00<br><br>(B180...<br>B189)                                                                                                                                                                                                                  | <b>Source for input quantity</b> [SW 1.8 and later]<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001: input quantity PI controller 1<br>i002: input quantity PI controller 2<br>...<br>i010: input quantity PI controller 10 | All connector<br>numbers<br>1 | Ind: 10<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

### Enable and setting of the PI controllers

|                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                             |                                   |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------|-----------------------------------|
| <b>U531</b><br>(2531)<br>*<br>S00<br><br>(B180...<br>B189) | <b>Source for control signals (enable PI controller)</b> [SW 1.8 and later]<br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br><br>i001: 0 = Disable controller PI controller 1<br>i002: 0 = Disable controller PI controller 2<br>...<br>i010: 0 = Disable controller PI controller 10<br><br>i011: 1 = Freeze I component PI controller 1<br>i012: 1 = Freeze I component PI controller 2<br>...<br>i020: 1 = Freeze I component PI controller 10<br><br>i021: 1 = Freeze output PI controller 1<br>i022: 1 = Freeze output PI controller 2<br>...<br>i030: 1 = Freeze output PI controller 10<br><br>i031: 1 = Freeze I component in pos.direction PI controller 1<br>i032: 1 = Freeze I component in pos.direction PI controller 2<br>...<br>i040: 1 = Freeze I component in pos.direction PI controller 10<br><br>i041: 1 = Freeze I component in neg.direction PI controller 1<br>i042: 1 = Freeze I component in neg.direction PI controller 2<br>...<br>i050: 1 = Stop I component in neg.direction PI controller 10 | All binector numbers<br>1 | Ind: 50<br>WE=0<br>Typ: L2  | P052 = 3<br>P051 = 40<br>off-line |
| <b>U532</b><br>(2532)<br>*<br>S00<br><br>(B180...<br>B189) | <b>Source for control signals (set PI controller)</b> [SW 1.8 and later]<br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br><br>i001: 0 = Set I component PI controller 1<br>i002: 0 = Set I component PI controller 2<br>...<br>i010: 0 = Set I component PI controller 10<br><br>i011: 0 = Set output PI controller 1<br>i012: 0 = Set output PI controller 2<br>...<br>i020: 0 = Set output PI controller 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | All binector numbers<br>1 | Ind: 20<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

| PNU                                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Value range<br>[Unit]         | No. indices                 | See<br>Change                     |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|-----------------------------------|
| <b>U533</b><br>(2533)<br>*<br>S00<br><br>(B180...<br>B189) | <b>Source for Setting values</b> [SW 1.8 and later]<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001: Setting value for I component PI controller 1<br>i002: Setting value for I component PI controller 2<br>...<br>i010: Setting value for I component PI controller 10<br><br>i011: Setting value for Output PI controller 1<br>i012: Setting value for Output PI controller 2<br>...<br>i020: Setting value for Output PI controller 10 | All connector<br>numbers<br>1 | Ind: 20<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

**Filtering of the input signals**

|                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               |                             |                                   |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|-----------------------------------|
| <b>U534</b><br>(2534)<br>*<br>S00<br><br>(B180...<br>B189) | <b>Source for variable filtering time for the input signal</b> [SW 1.8 and later]<br><br>The content of the selected connector acts as filtering time for the PI controller after multiplication with U535.<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001: variable filtering time PI controller 1<br>i002: variable filtering time PI controller 2<br>...<br>i010: variable filtering time PI controller 10 | All connector<br>numbers<br>1 | Ind: 10<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U535</b><br>(2535)<br>S00<br>(B180...<br>B189)          | <b>Filtering time for the input signal</b> [SW 1.8 and later]<br><br>i001: filtering time PI controller 1<br>i002: filtering time PI controller 2<br>...<br>i010: filtering time PI controller 10                                                                                                                                                                                                                                    | 0 to 10000<br>[ms]<br>1       | Ind: 10<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |

**Controller parameters**

|                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                               |                               |                                |                                   |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------|-----------------------------------|
| <b>U536</b><br>(2536)<br>*<br>S00<br><br>(B180...<br>B189) | <b>Source for variable P gain</b> [SW 1.8 and later]<br><br>The content of the selected connector acts as the P gain for the PI controller after multiplication with U537.<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001: variable P gain PI controller 1<br>i002: variable P gain PI controller 2<br>...<br>i010: variable P gain PI controller 10                                                   | All connector<br>numbers<br>1 | Ind: 10<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>off-line |
| <b>U537</b><br>(2537)<br>S00<br>(B180...<br>B189)          | <b>PI controller P gain</b> [SW 1.8 and later]<br><br>i001: P gain PI controller 1<br>i002: P gain PI controller 2<br>...<br>i010: P gain PI controller 10                                                                                                                                                                                                                                                                    | 0.10 to 200.00<br>0.01        | Ind: 10<br>FS=3.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U538</b><br>(2538)<br>*<br>S00<br><br>(B180...<br>B189) | <b>Source for variable Integration time</b> [SW 1.8 and later]<br><br>The content of the selected connector acts as the integration time for the PI controller after multiplication with U539.<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001: variable Integration time PI controller 1<br>i002: variable Integration time PI controller 2<br>...<br>i010: variable Integration time PI controller 10 | All connector<br>numbers<br>1 | Ind: 10<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>off-line |

| PNU                   | Description                                              | Value range<br>[Unit]  | No. indices                     | See<br>Change                    |
|-----------------------|----------------------------------------------------------|------------------------|---------------------------------|----------------------------------|
| <b>U539</b><br>(2539) | <b>PI controller integration time</b> [SW 1.8 and later] | 0.010 to 10.000<br>[s] | Ind: 10<br>FS=3.000<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| S00                   | i001: Integration time PI controller 1                   | 0.001                  |                                 |                                  |
| (B180...<br>B189)     | i002: Integration time PI controller 2                   |                        |                                 |                                  |
|                       | ...<br>i010: Integration time PI controller 10           |                        |                                 |                                  |

| Control bits          |                                                          |        |                             |                                   |
|-----------------------|----------------------------------------------------------|--------|-----------------------------|-----------------------------------|
| <b>U540</b><br>(2540) | <b>Freeze P component</b> [SW 1.8 and later]             | 0 to 1 | Ind: 10<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |
| *                     | 0 Controller P component frozen (i.e. pure I controller) | 1      |                             |                                   |
| S00                   | 1 Controller P component active                          |        |                             |                                   |
| (B180...<br>B189)     | i001: PI controller 1                                    |        |                             |                                   |
|                       | i002: PI controller 2                                    |        |                             |                                   |
|                       | ...<br>i010: PI controller 10                            |        |                             |                                   |
| <b>U541</b><br>(2541) | <b>Freeze I component</b> [SW 1.8 and later]             | 0 to 1 | Ind: 10<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |
| *                     | 0 Controller I component frozen (i.e. pure P controller) | 1      |                             |                                   |
| S00                   | 1 Controller I component active                          |        |                             |                                   |
| (B180...<br>B189)     | i001: PI controller 1                                    |        |                             |                                   |
|                       | i002: PI controller 2                                    |        |                             |                                   |
|                       | ...<br>i010: PI controller 10                            |        |                             |                                   |

| Output, Limitation    |                                                                                                                                                                                                                                                                                                             |                          |                                                                                                                                          |                                   |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>U542</b><br>(2542) | <b>Source for variable positive limit</b> [SW 1.8 and later]                                                                                                                                                                                                                                                | All connector<br>numbers | Ind: 10<br>FS=1<br>Type: L2                                                                                                              | P052 = 3<br>P051 = 40<br>off-line |
| *                     | The content of the selected connector acts as the positive limit for the output of the PI controller after multiplication with U543.                                                                                                                                                                        | 1                        |                                                                                                                                          |                                   |
| S00                   | 0 = Connector K0000<br>1 = Connector K0001<br>etc.                                                                                                                                                                                                                                                          |                          |                                                                                                                                          |                                   |
| (B180...<br>B189)     | i001: PI controller 1<br>i002: PI controller 2<br>...<br>i010: PI controller 10                                                                                                                                                                                                                             |                          |                                                                                                                                          |                                   |
|                       | <b>Note:</b><br>If the content of the selected connector has a negative value, this causes a negative maximum value at the output of this limiter stage.                                                                                                                                                    |                          |                                                                                                                                          |                                   |
| <b>U543</b><br>(2543) | <b>Positive limit for the output of the PI controller</b> [SW 1.8 and later]                                                                                                                                                                                                                                | 0.0 to 199.9<br>[%]      | Ind: 10<br>FS=100.0<br>Type: O2                                                                                                          | P052 = 3<br>P051 = 40<br>on-line  |
| S00                   | See also U542                                                                                                                                                                                                                                                                                               | 0.1                      |                                                                                                                                          |                                   |
| (B180...<br>B189)     |                                                                                                                                                                                                                                                                                                             |                          |                                                                                                                                          |                                   |
| <b>U544</b><br>(2544) | <b>Source for variable negative Limit</b> [SW 1.8 and later]                                                                                                                                                                                                                                                | All connector<br>numbers | Ind: 10<br>FS=                                                                                                                           | P052 = 3<br>P051 = 40<br>off-line |
| *                     | The content of the selected connector acts as the negative limit for the output of the technology controller after multiplication with U510.                                                                                                                                                                | 1                        | i001: 9306<br>i002: 9316<br>i003: 9326<br>i004: 9336<br>i005: 9346<br>i006: 9356<br>i007: 9366<br>i008: 9376<br>i009: 9386<br>i010: 9396 |                                   |
| S00                   | 0 = Connector K0000<br>1 = Connector K0001<br>etc.                                                                                                                                                                                                                                                          |                          |                                                                                                                                          |                                   |
| (B180...<br>B189)     | i001: PI controller 1<br>i002: PI controller 2<br>...<br>i010: PI controller 10                                                                                                                                                                                                                             |                          |                                                                                                                                          |                                   |
|                       | <b>Note:</b><br>If the content of the selected connector has a positive value, this causes a positive minimum value at the output of this limiter stage.                                                                                                                                                    |                          |                                                                                                                                          |                                   |
|                       | <b>Note:</b><br>Connectors K9306 to K9396 contain for PI controllers 1 to 10 the positive limitation values formed by U542 and U543 with an inverted sign. In this way it is possible to set the negative limitation symmetrically to the positive limitation by setting U544= 9306 to 9396 and U545=100.0. |                          | Type: L2                                                                                                                                 |                                   |

| PNU                                               | Description                                                                                       | Value range<br>[Unit]      | No. indices                    | See<br>Change                    |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------|--------------------------------|----------------------------------|
| <b>U545</b><br>(2545)<br>S00<br>(B180...<br>B189) | <b>Negative limit for the output of the PI controller</b> [SW 1.8 and later]<br><br>See also U544 | 0.0 to 199.9<br>[%]<br>0.1 | Ind: 4<br>FS=100.0<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |

## 11.74 Closed-loop control elements

Only active with optional technology software S00

| Derivative / delay elements SW 1.8 and later                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  | FB 270 to FB 279           |                               |                                   |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|----------------------------|-------------------------------|-----------------------------------|
| <b>U550</b><br>(2550)<br>*<br>S00<br><br>(B156)<br>(B157)<br>(B158) | <b>Source for input quantity</b> [SW 1.8 and later]<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001: Input quantity derivative/delay element 1 (FB 270)<br>i002: Input quantity derivative/delay element 2 (FB 271)<br>i003: Input quantity derivative/delay element 3 (FB 272)<br>i004: Input quantity derivative/delay element 4 (FB 273)<br>i005: Input quantity derivative/delay element 5 (FB 274)<br>i006: Input quantity derivative/delay element 6 (FB 275)<br>i007: Input quantity derivative/delay element 7 (FB 276)<br>i008: Input quantity derivative/delay element 8 (FB 277)<br>i009: Input quantity derivative/delay element 9 (FB 278)<br>i010: Input quantity derivative/delay element 10 (FB 279) |  |  | All connector numbers<br>1 | Ind: 10<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>off-line |
| <b>U551</b><br>(2551)<br>*<br>S00<br><br>(B156)<br>(B157)<br>(B158) | <b>Source for multiplier for derivative-action time</b> [SW 1.8 and later]<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001: Multiplier derivative/delay element 1 (FB 270)<br>i002: Multiplier derivative/delay element 2 (FB 271)<br>i003: Multiplier derivative/delay element 3 (FB 272)<br>i004: Multiplier derivative/delay element 4 (FB 273)<br>i005: Multiplier derivative/delay element 5 (FB 274)<br>i006: Multiplier derivative/delay element 6 (FB 275)<br>i007: Multiplier derivative/delay element 7 (FB 276)<br>i008: Multiplier derivative/delay element 8 (FB 277)<br>i009: Multiplier derivative/delay element 9 (FB 278)<br>i010: Multiplier derivative/delay element 10 (FB 279)                  |  |  | All connector numbers<br>1 | Ind: 10<br>FS=1<br>Type: L2   | P052 = 3<br>P051 = 40<br>off-line |
| <b>U552</b><br>(2552)<br>S00<br><br>(B156)<br>(B157)<br>(B158)      | <b>Derivative-action time</b> [SW 1.8 and later]<br><br>i001: Der.-act.time deriv./delay element 1 (FB 270)<br>i002: Der.-act.time deriv./delay element 2 (FB 271)<br>i003: Der.-act.time deriv./delay element 3 (FB 272)<br>i004: Der.-act.time deriv./delay element 4 (FB 273)<br>i005: Der.-act.time deriv./delay element 5 (FB 274)<br>i006: Der.-act.time deriv./delay element 7 (FB 276)<br>i008: Der.-act.time deriv./delay element 8 (FB 277)<br>i009: Der.-act.time deriv./delay element 9 (FB 278)<br>i010: Der.-act.time deriv./delay element 10 (FB 279)                                                                                                                                                                       |  |  | 0 to 10000<br>[ms]<br>1    | Ind: 10<br>FS=100<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U553</b><br>(2553)<br>*<br>S00<br><br>(B156)<br>(B157)<br>(B158) | <b>Source for multiplier for filtering time</b> [SW 1.8 and later]<br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.<br><br>i001: Multiplier derivative/delay element 1 (FB 270)<br>i002: Multiplier derivative/delay element 2 (FB 271)<br>i003: Multiplier derivative/delay element 3 (FB 272)<br>i004: Multiplier derivative/delay element 4 (FB 273)<br>i005: Multiplier derivative/delay element 5 (FB 274)<br>i006: Multiplier derivative/delay element 6 (FB 275)<br>i007: Multiplier derivative/delay element 7 (FB 276)<br>i008: Multiplier derivative/delay element 8 (FB 277)<br>i009: Multiplier derivative/delay element 9 (FB 278)<br>i010: Multiplier derivative/delay element 10 (FB 279)                          |  |  | All connector numbers<br>1 | Ind: 10<br>FS=1<br>Type: L2   | P052 = 3<br>P051 = 40<br>off-line |

| PNU                   | Description                                               | Value range<br>[Unit] | No. indices                   | See<br>Change                    |
|-----------------------|-----------------------------------------------------------|-----------------------|-------------------------------|----------------------------------|
| <b>U554</b><br>(2554) | <b>Filtering time</b> [SW 1.8 and later]                  | 0 to 10000<br>[ms]    | Ind: 10<br>FS=100<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
| S00                   | i001: Filtering time derivative/delay element 1 (FB 270)  | 1                     |                               |                                  |
|                       | i002: Filtering time derivative/delay element 2 (FB 271)  |                       |                               |                                  |
|                       | i003: Filtering time derivative/delay element 3 (FB 272)  |                       |                               |                                  |
| (B156)                | i004: Filtering time derivative/delay element 4 (FB 273)  |                       |                               |                                  |
| (B157)                | i005: Filtering time derivative/delay element 5 (FB 274)  |                       |                               |                                  |
| (B158)                | i006: Filtering time derivative/delay element 6 (FB 275)  |                       |                               |                                  |
|                       | i007: Filtering time derivative/delay element 7 (FB 276)  |                       |                               |                                  |
|                       | i008: Filtering time derivative/delay element 8 (FB 277)  |                       |                               |                                  |
|                       | i009: Filtering time derivative/delay element 9 (FB 278)  |                       |                               |                                  |
|                       | i010: Filtering time derivative/delay element 10 (FB 279) |                       |                               |                                  |

## 11.75 Commutation monitoring

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |                               |                                 |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------|---------------------------------|
| <b>n560 to U576</b><br>(2560 to 2576) | <b>Reserved for later use</b> [SW 2.1 and later]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |                               |                                 |
| <b>U580</b><br>(2580)                 | <b>Control word for commutation monitoring</b> [SW 2.1 and later]<br>This parameter allows individual decision criteria associated with the commutation monitoring to be deactivated for test purposes.<br><br>1 Monitoring of the blocking voltage time area (decision criterion 1) is evaluated<br><br>2 Monitoring of the current waveform (decision criterion 2) is evaluated<br><br>4 Monitoring of the current maximum values (decision criterion 3) is evaluated<br><br>If more than one decision criterion is to be evaluated, the sum of the relevant digits must be entered as the parameter setting.                                                                                                                                                                                                                                                                                                                 | 0 to 7<br>1     | Ind: none<br>FS=7<br>Type: O2 | P052 = 3<br>P051 = 40<br>online |
| <b>U581</b><br>(2581)                 | <b>Diagnostic memory for commutation monitoring</b> [SW 2.1 and later]<br>This memory is updated every time fault message F030 is activated. The data stored in this parameter provide the SIEMENS specialist with more detailed information about the causes of fault message F030.<br><br>i001-i016 Data of last commutation failure<br>i017-i032 Data of second last commutation failure<br>i033-i048 Date of third last commutation failure<br>i049-i064 Data of fourth last commutation failure<br>i065 Total number of commutation failures detected by blocking voltage time area monitoring (criterion 1)<br>i066 Total number of commutation failures detected by current waveform monitoring (criterion 2)<br>i067 Total number of overcurrents detected by monitoring of current maximum values (criterion 3)<br>i068 Total number of commutation failures or overcurrents already signaled by a paralleled SIMOREG. | 0 to 65535<br>1 | Ind: 68<br>FS=0<br>Type: O2   | P052 = 3<br>P051 = 40<br>online |
| <b>U582</b><br>(2582)                 | <b>Reaction of commutation monitor</b> [SW 2.1 and later]<br>This parameter allows the reaction of the commutation monitor to be programmed.<br><br>1 Detection of a commutation failure or overcurrent results in immediate pulse blocking and generation of warning A030. The pulses are enabled again after approximately 20ms and warning A030 is reset.<br><br>2 Detection of a commutation failure or overcurrent results in immediate pulse blocking and generation of fault message F030.                                                                                                                                                                                                                                                                                                                                                                                                                               | 1 to 2<br>1     | Ind: none<br>FS=2<br>Type: O2 | P052 = 3<br>P051 = 40<br>online |
| <b>U583</b><br>(2583)                 | <b>Reserved for later use</b> [SW 2.1 and later]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |                               |                                 |



| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.76 Setpoint reduction

|                                             |                                                                                                                                                                                                                                                                                        |                                |                                |                                   |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------|-----------------------------------|
| <b>U607</b><br>(2607)<br>*<br>BDS<br>(G135) | <b>Source for activation of the setpoint reduction</b><br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br><br>0 Setpoint reduction active<br>The Setpoint (before the ramp-function generator) is multiplied<br>by the factor set in parameter U608<br>1 No setpoint reduction | All binector numbers<br>1      | Ind: 2<br>FS=1<br>Type: L2     | P052 = 3<br>P051 = 40<br>off-line |
| <b>U608</b><br>(2608)<br>FDS<br>(G135)      | <b>Multiplier for speed setpoint on activation of the setpoint reduction</b>                                                                                                                                                                                                           | 0.00 to 100.00<br>[%]<br>0.01% | Ind: 4<br>FS=15.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |

## 11.77 Definition of the function of inputs and outputs

|                                 |                                                                                                                                                                                                                                                   |             |                               |                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|---------------------------------|
| <b>U616</b><br>(2616)<br>(G117) | <b>Control word for input "E stop" (term. 105 to 108)</b> [SW 2.0 and later]<br><br>0 = E stop has same effect as OFF2<br>1 = E stop immediately cancels the firing pulse chain (without waiting<br>for I = 0 and without outputting $\alpha_w$ ) | 0 to 1<br>1 | Ind: none<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>online |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|---------------------------------|

## 11.78 Definition of the function of the relay output at terminals 109 / 110

|                                             |                                                                                                                                                                     |                           |                              |                                   |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------|-----------------------------------|
| <b>U619</b><br>(2619)<br>*<br>BDS<br>(G117) | <b>Source for the relay output "line contactor ON" (terminals 109 / 110)</b><br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br><br>124 = Main contactor ON | All binector numbers<br>1 | Ind: 2<br>FS=124<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------|-----------------------------------|

## 11.79 Starting pulse – Speed controller

(See also Chapter 8 Function Diagram Sheet G150)

|                                             |                                                                                                                              |                                   |                                 |                                   |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|-----------------------------------|
| <b>U651</b><br>(2651)<br>FDS<br>(G150)      | <b>Starting pulse</b> (integrator setting value for the speed controller)                                                    | -100.00 to 100.00<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2   | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U652</b><br>(2652)<br>FDS<br>(G150)      | <b>Multiplier for starting pulse with neg. setpoint</b><br>if the starting pulse acc. to U651 is also used for pos. setpoint | 0.00 to 200.00<br>[%]<br>0.01%    | Ind: 4<br>FS=50.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U653</b><br>(2653)<br>FDS<br>(G150)      | <b>Starting pulse with neg. setpoint</b>                                                                                     | -100.00 to 100.00<br>[%]<br>0.01% | Ind: 4<br>FS=0.00<br>Type: I2   | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U655</b><br>(2655)<br>*<br>(G150)        | <b>Source for Starting pulse</b><br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.                                   | All connector<br>numbers<br>1     | Ind: None<br>FS=451<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U656</b><br>(2656)<br>*<br>(G150)        | <b>Source for starting pulse with neg. setpoint</b><br><br>0 = Connector K0000<br>1 = Connector K0001<br>etc.                | All connector<br>numbers<br>1     | Ind: None<br>FS=452<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |
| <b>U657</b><br>(2657)<br>*<br>BDS<br>(G150) | <b>Source for switchover starting pulse for pos./neg. setp.</b><br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.      | All binector numbers<br>1         | Ind: 2<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>off-line |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.80 Evaluation of a 4-step master switch for cranes

(See also Chapter 8 Function Diagram Sheet G125)

|                                      |                                                                                                          |                                |                                    |                                   |
|--------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------|-----------------------------------|
| <b>U660</b><br>(2660)<br>*<br>(G125) | <b>Source for travel command 1</b><br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.               | All binector numbers<br>1      | Ind: None<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>off-line |
| <b>U661</b><br>(2661)<br>*<br>(G125) | <b>Source for travel command 2</b><br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.               | All binector numbers<br>1      | Ind: None<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>off-line |
| <b>U662</b><br>(2662)<br>*<br>(G125) | <b>Source for switchover to setpoint step S2</b><br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc. | All binector numbers<br>1      | Ind: None<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>off-line |
| <b>U663</b><br>(2663)<br>*<br>(G125) | <b>Source for switchover to setpoint step S3</b><br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc. | All binector numbers<br>1      | Ind: None<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>off-line |
| <b>U664</b><br>(2664)<br>*<br>(G125) | <b>Source for switchover to setpoint step S4</b><br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc. | All binector numbers<br>1      | Ind: None<br>FS=0<br>Type: L2      | P052 = 3<br>P051 = 40<br>off-line |
| <b>U665</b><br>(2665)<br>(G125)      | <b>Setpoint for setpoint step S1</b>                                                                     | 0.00 to 110.00<br>[%]<br>0.01% | Ind: None<br>FS=10.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U666</b><br>(2666)<br>(G125)      | <b>Setpoint for setpoint step S2</b>                                                                     | 0.00 to 110.00<br>[%]<br>0.01% | Ind: None<br>FS=25.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U667</b><br>(2667)<br>(G125)      | <b>Setpoint for setpoint step S3</b>                                                                     | 0.00 to 110.00<br>[%]<br>0.01% | Ind: None<br>FS=40.00<br>Type: O2  | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U668</b><br>(2668)<br>(G125)      | <b>Setpoint for setpoint step S4</b>                                                                     | 0.00 to 110.00<br>[%]<br>0.01% | Ind: None<br>FS=100.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |

## 11.81 Position/positional deviation acquisition

Only active with optional technology software S00

|                                             |                                                                                                                                                                                                                                                                            |                                                                      |                                                  |                                  |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------|----------------------------------|
| <b>U670</b><br>(2670)<br>*<br>S00<br>(B152) | <b>Source for actual position values</b><br><br>Selection of connector whose values are to be used as actual position values.<br><br>i001: Actual position value 1<br>i002: Actual position value 2<br><br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc. | <b>FB 54</b><br>[SW 2.0 and later]<br><br>All connector numbers<br>1 | Ind: 2<br>FS=<br>i001: 46<br>i002: 0<br>Type: L2 | P052 = 2<br>P051 = 40<br>offline |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------|----------------------------------|

| PNU                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Value range<br>[Unit]      | No. indices                                                         | See<br>Change                     |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------------------------------------|-----------------------------------|
| <b>U671</b><br>(2671)<br>*<br>S00<br>(B152) | <b>Source for setting/resetting signal for position acquisition FB 54</b><br>[SW 2.0 and later]<br><br>Selection of binector whose value is to be used as the setting or resetting signals.<br>i001: Reset actual position value 1<br>i002: Set actual position value 1<br><br>i003: Reset actual position value 2<br>i004: Set actual position value 2<br><br>i005: Reset positional deviation<br>i006: Set positional deviation<br><br>Settings:<br>0 = Binector B0000<br>1 = Binector B0001<br>etc. | All binector numbers<br>1  | Ind: 6<br>FS=0<br>Type: L2                                          | P052 = 2<br>P051 = 40<br>offline  |
| <b>U672</b><br>(2672)<br>*<br>S00<br>(B152) | <b>Source for setting values FB 54</b><br>[SW 2.0 and later]<br><br>Selection of connectors whose values are to be used as setting values<br>i001: Setting value for position 1<br>i002: Setting value for position 2<br>i003: Setting value for positional deviation<br><br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc.                                                                                                                                                           | All connector numbers<br>1 | Ind: 3<br>FS=<br>i001: 9471<br>i002: 9472<br>i003: 9473<br>Type: L2 | P052 = 2<br>P051 = 40<br>offline  |
| <b>U673</b><br>(2673)<br>*<br>S00<br>(B152) | <b>Numerator of transformation ratio for actual position value 2 FB 54</b><br>[SW 2.0 and later]<br><br>U673 must be less than or equal to U674, otherwise F058 is output with fault value 14                                                                                                                                                                                                                                                                                                          | -32766 to 32766<br>1       | Ind: none<br>FS=10000<br>Type: I2                                   | P052 = 2<br>P051 = 40<br>off-line |
| <b>U674</b><br>(2674)<br>*<br>S00<br>(B152) | <b>Denominator of transformation ratio for actual position value 2 FB 54</b><br>[SW 2.0 and later]                                                                                                                                                                                                                                                                                                                                                                                                     | 1 to 32767<br>1            | Ind: none<br>FS=10000<br>Type: O2                                   | P052 = 2<br>P051 = 40<br>offline  |
| <b>U675</b><br>(2675)<br>*<br>S00<br>(B152) | <b>Source for connecting the positional deviation offset FB 54</b><br>[SW 2.0 and later]<br><br>Selection of the binector whose value connects the offset of the positional deviation<br><br>Settings:<br>0 = Binector B0000<br>1 = Binector B0001<br>etc.                                                                                                                                                                                                                                             | All binector numbers<br>1  | Ind: none<br>FS=0<br>Type: L2                                       | P052 = 2<br>P051 = 40<br>offline  |
| <b>U676</b><br>(2676)<br>*<br>S00<br>(B152) | <b>Source for positional deviation offset FB 54</b><br>[SW 2.0 and later]<br><br>Selection of the connector whose value is to be used as the offset of the positional deviation<br><br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc.                                                                                                                                                                                                                                                 | All connector numbers<br>1 | Ind: none<br>FS=9474<br>Type: L2                                    | P052 = 2<br>P051 = 40<br>offline  |
| <b>U677</b><br>(2677)<br>*<br>S00<br>(B152) | <b>Fixed values for position acquisition FB 54</b><br>[SW 2.0 and later]<br><br>i001: LOW word of double-word connector KK9471<br>i002: HIGH word of double-word connector KK9471<br>i003: LOW word of double-word connector KK9472<br>i004: HIGH word of double-word connector KK9472<br>i005: LOW word of double-word connector KK9473<br>i006: HIGH word of double-word connector KK9473<br>i007: LOW word of double-word connector KK9474<br>i008: HIGH word of double-word connector KK9474       | -32768 to 32767<br>1       | Ind: 8<br>FS=0<br>Type: I2                                          | P052 = 2<br>P051 = 40<br>offline  |

| PNU                        | Description                                                                                                                                                                 | Value range<br>[Unit] | No. indices                   | See<br>Change                   |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------|---------------------------------|
| <b>U678</b><br>(2678)<br>* | <b>Memory for actual position values: Initial value at POWER ON FB 54</b><br>[SW 2.1 and later]                                                                             | 0 to 1<br>1           | Ind: none<br>FS=0<br>Type: O2 | P052 = 2<br>P051 = 40<br>online |
| S00<br>(B152)              | 0 Initial value = 0<br>1 Initial value is set such that on POWER ON KK9481 or KK9482 assumes whatever its setting value was before the electronics supply was disconnected. |                       |                               |                                 |

## 11.82 Root extractor

Only active with optional technology software S00

|                                        |                                                                                                                                                                                                                                                                                     |                               |                                  |                                  |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------|----------------------------------|
| <b>U680</b><br>(2680)<br>*             | <b>Source for the input of the root extractor</b><br>[SW 2.0 and later]<br><b>FB 58</b><br>Selection of the connector whose value is to be used for the root extractor input.<br>Settings:<br>0 = Connector K0000<br>1 = Connector K0001<br>etc.                                    | All connector numbers<br>1    | Ind: none<br>FS=9483<br>Type: L2 | P052 = 2<br>P051 = 40<br>offline |
| S00<br>(B153)                          |                                                                                                                                                                                                                                                                                     |                               |                                  |                                  |
| <b>U681</b><br>(2681)<br>S00<br>(B153) | <b>Operating point for limit monitoring indicator of the root extractor</b><br>[SW 2.0 and later]<br><b>FB 58</b><br>applied to connector KK9483                                                                                                                                    | 1 to 65535<br>1               | Ind: none<br>FS=1<br>Type: O2    | P052 = 2<br>P051 = 40<br>online  |
| <b>U682</b><br>(2682)<br>S00<br>(B153) | <b>Hysteresis for limit monitoring indicator of the root extractor</b><br>[SW 2.0 and later]<br><b>FB 58</b>                                                                                                                                                                        | 1 to 65535<br>1               | Ind: none<br>FS=1<br>Type: O2    | P052 = 2<br>P051 = 40<br>online  |
| <b>U683</b><br>(2683)<br>S00<br>(B153) | <b>x value for root function and gradient</b><br>[SW 2.0 and later]<br><b>FB 58</b><br>Definition of input values<br>i001: Distance between input value of root function and fictitious passage through zero for y value U684.001<br>i002: x value of gradient for y value U684.002 | 1 to 65535<br>1               | Ind: 2<br>FS=1000<br>Type: O2    | P052 = 2<br>P051 = 40<br>online  |
| <b>U684</b><br>(2684)<br>S00<br>(B153) | <b>y value for root function and gradient</b><br>[SW 2.0 and later]<br><b>FB 58</b><br>Definition of output values<br>i001: y value of root function for distance U683.001<br>i002: y value of gradient for x value U683.002                                                        | 0.01 to 199.99<br>[%]<br>0.01 | Ind: 2<br>FS=100.00<br>Type: O2  | P052 = 2<br>P051 = 40<br>online  |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

### 11.83 Configuration of SCB1 with SCI

|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                               |                                 |  |              |               |    |                  |                     |    |                |                  |    |  |                  |             |                           |                                 |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------|---------------------------------|--|--------------|---------------|----|------------------|---------------------|----|----------------|------------------|----|--|------------------|-------------|---------------------------|---------------------------------|
| <b>U690</b><br>(2690)<br><br>(Z150)<br>(Z151) | <b>Configuration of analog inputs of SCI1</b> [SW 1.9 and later]<br><br>Definition of type of input signals<br><br><table><tr><td>Parameter value</td><td>Terminals</td><td>Terminals</td></tr><tr><td></td><td>X428/3, 6, 9</td><td>X428/5, 8, 11</td></tr><tr><td>0:</td><td>-10 V ... + 10 V</td><td>- 20 mA ... + 20 mA</td></tr><tr><td>1:</td><td>0 V ... + 10 V</td><td>0 mA ... + 20 mA</td></tr><tr><td>2:</td><td></td><td>4 mA ... + 20 mA</td></tr></table><br>Notes:<br>- Only one signal can be processed per input. Voltage or current signals can be evaluated.<br>- Voltage and current signals must be connected to different terminals.<br>- Only unipolar signals are permitted with settings 1 and 2, i.e. the internal process quantities are also unipolar.<br>- When setting 2 is selected, an input current of < 2 mA causes shutdown on faults (open-circuit monitoring)<br>- The offset compensation for the analog inputs is set in parameter U692.<br><br>i001: Slave 1, analog input 1<br>i002: Slave 1, analog input 2<br>i003: Slave 1, analog input 3<br>i004: Slave 2, analog input 1<br>i005: Slave 2, analog input 2<br>i006: Slave 2, analog input 3 | Parameter value                   | Terminals                     | Terminals                       |  | X428/3, 6, 9 | X428/5, 8, 11 | 0: | -10 V ... + 10 V | - 20 mA ... + 20 mA | 1: | 0 V ... + 10 V | 0 mA ... + 20 mA | 2: |  | 4 mA ... + 20 mA | 0 to 2<br>1 | Ind:6<br>FS= 0<br>Type O2 | P052 = 3<br>P051 =40<br>on-line |
| Parameter value                               | Terminals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Terminals                         |                               |                                 |  |              |               |    |                  |                     |    |                |                  |    |  |                  |             |                           |                                 |
|                                               | X428/3, 6, 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | X428/5, 8, 11                     |                               |                                 |  |              |               |    |                  |                     |    |                |                  |    |  |                  |             |                           |                                 |
| 0:                                            | -10 V ... + 10 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | - 20 mA ... + 20 mA               |                               |                                 |  |              |               |    |                  |                     |    |                |                  |    |  |                  |             |                           |                                 |
| 1:                                            | 0 V ... + 10 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0 mA ... + 20 mA                  |                               |                                 |  |              |               |    |                  |                     |    |                |                  |    |  |                  |             |                           |                                 |
| 2:                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 4 mA ... + 20 mA                  |                               |                                 |  |              |               |    |                  |                     |    |                |                  |    |  |                  |             |                           |                                 |
| <b>U691</b><br>(2691)<br><br>(Z150)<br>(Z151) | <b>Smoothing time constant for analog inputs of SCI1</b> [SW 1.9 and later]<br><br>Formula: T = 2ms * 2 to the power of U691<br>i001: Slave 1, analog input 1<br>i002: Slave 1, analog input 2<br>i003: Slave 1, analog input 3<br>i004: Slave 2, analog input 1<br>i005: Slave 2, analog input 2<br>i006: Slave 2, analog input 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0 to 15<br>1                      | Ind:6<br>FS= 2<br>Type O2     | P052 = 3<br>P051 =40<br>on-line |  |              |               |    |                  |                     |    |                |                  |    |  |                  |             |                           |                                 |
| <b>U692</b><br>(2692)<br><br>(Z150)<br>(Z151) | <b>Offset compensation for analog inputs of SCI1</b> [SW 1.9 and later]<br><br>Setting instructions, see Operating Instructions for SCI1<br>i001: Slave 1, analog input 1<br>i002: Slave 1, analog input 2<br>i003: Slave 1, analog input 3<br>i004: Slave 2, analog input 1<br>i005: Slave 2, analog input 2<br>i006: Slave 2, analog input 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -20.00 to 20.00<br>[V]<br>0.01V   | Ind:6<br>FS= 0<br>Type I2     | P052 = 3<br>P051 =40<br>on-line |  |              |               |    |                  |                     |    |                |                  |    |  |                  |             |                           |                                 |
| <b>U693</b><br>(2693)<br><br>(Z155)<br>(Z156) | <b>Actual value output via analog outputs of SCI1</b> [SW 1.9 and later]<br><br>Selection of connectors whose values are to be output (for details, see Operating Instructions for SCI1)<br>i001: Slave 1, analog output 1<br>i002: Slave 1, analog output 2<br>i003: Slave 1, analog output 3<br>i004: Slave 2, analog output 1<br>i005: Slave 2, analog output 2<br>i006: Slave 2, analog output 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | All connector<br>numbers<br>1     | Ind:6<br>FS= 0<br>Type L2     | P052 = 3<br>P051 =40<br>on-line |  |              |               |    |                  |                     |    |                |                  |    |  |                  |             |                           |                                 |
| <b>U694</b><br>(2694)<br><br>(Z155)<br>(Z156) | <b>Gain for analog outputs of SCI1</b> [SW 1.9 and later]<br><br>Setting instructions, see Operating Instructions for SCI1<br>i001: Slave 1, analog output 1<br>i002: Slave 1, analog output 2<br>i003: Slave 1, analog output 3<br>i004: Slave 2, analog output 1<br>i005: Slave 2, analog output 2<br>i006: Slave 2, analog output 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -320.00 to 320.00<br>[V]<br>0.01V | Ind:6<br>FS= 10.00<br>Type I2 | P052 = 3<br>P051 =40<br>on-line |  |              |               |    |                  |                     |    |                |                  |    |  |                  |             |                           |                                 |

| PNU                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Value range<br>[Unit]             | No. indices                   | See<br>Change                   |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------|---------------------------------|
| <b>U695</b><br>(2695)<br><br>(Z155)<br>(Z156) | <b>Offset compensation for analog outputs of SCI1</b> [SW 1.9 and later]<br><br>Setting instructions, see Operating Instructions for SCI1<br>i001: Slave 1, analog output 1<br>i002: Slave 1, analog output 2<br>i003: Slave 1, analog output 3<br>i004: Slave 2, analog output 1<br>i005: Slave 2, analog output 2<br>i006: Slave 2, analog output 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -100.00 to 100.00<br>[V]<br>0.01V | Ind:6<br>FS= 0<br>Type I2     | P052 = 3<br>P051 =40<br>on-line |
| <b>U696</b><br>(2696)                         | <b>Telegram failure time for SCB1</b> [SW 1.9 and later]<br><br>If no process data are exchanged with the supplementary board within the set telegram failure period, error message F079 is activated.<br>The monitoring cycle is 20 ms and it is therefore only meaningful to set failure times that are multiples of 20ms.<br><br>Settings for telegram failure time:<br>0 No time monitoring<br>1...65000 Time which may elapse between 2 data exchanges before error message F079 can be output<br><br>Note:<br>The telegram monitoring function is active:<br><ul style="list-style-type: none"> <li>from the first error-free exchange of process data after connection of the electronics power supply</li> <li>from the first error-free exchange of process data after the telegram monitor has responded (as a result of telegram monitoring timeout)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 65000<br>[ms]<br>1ms         | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 =40<br>on-line |
| <b>n697</b><br>(2697)                         | <b>Diagnostic information of SCB1</b> [SW 1.9 and later]<br><br>Visualization parameter for displaying diagnostic info relating to SCB1.<br>The displayed values overflow at "255" (e.g. the number of telegrams begins at "0" again after "255").<br>i001: Number of error-free telegrams<br>i002: Number of errored telegrams<br>i003: Number of voltage failures on slaves<br>i004: Number of interruptions in fiber-optic connection<br>i005: Number of missing response telegrams<br>i006: Number of search telegrams for slave location<br>i007: ETX error<br>i008: Number of configuration telegrams<br>i009: Highest terminal numbers needed according to PZD connection (parameterization of connectors or binectors)<br>i010: Analog inputs/outputs required according to PZD connection of setpoint channel and actual value output via SCI (parameterization of appropriate connectors)<br>i011: Reserved<br>i012: Reserved<br>i013: SCB1 alarm word<br>i014: Setting defining whether slave no. 1 is needed and type if applicable<br>0: No slave required<br>1: SCI1<br>2: SCI2<br>i015: Setting defining whether slave no. 2 is needed and type if applicable<br>0: No slave required<br>1: SCI1<br>2: SCI2<br>i016: SCI board: Initialization error<br>i017: SCB1 generation: Year<br>i018: SCB1 generation: Day and month<br>i019: SCI slave1: Software version<br>i020: SCI slave1: Year of generation<br>i021: SCI slave1: Day and month of generation<br>i022: SCI slave2: Software version<br>i023: SCI slave2: Year of generation<br>i024: SCI slave2: Day and month of generation |                                   | Ind:24<br>Type O2             | P052 = 3<br>P051 =40<br>on-line |

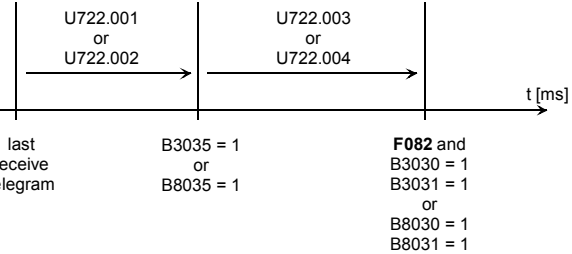
| PNU                                                                                                                                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Value range<br>[Unit]     | No. indices                | See<br>Change                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|---------------------------------|
| <b>U698</b><br>(2698)<br><br>(Z135)<br>(Z136)<br>(Z145)<br>(Z146)                                                                                 | <b>Binector selection for binary outputs of SCI</b> [SW 1.9 and later]<br>Selection of binectors whose states are output via the binary outputs of the SCIs<br><br>i001: Binector selection for SCI slave1, binary output 1<br>i002: Binector selection for SCI slave1, binary output 2<br>i003: Binector selection for SCI slave1, binary output 3<br>i004: Binector selection for SCI slave1, binary output 4<br>i005: Binector selection for SCI slave1, binary output 5<br>i006: Binector selection for SCI slave1, binary output 6<br>i007: Binector selection for SCI slave1, binary output 7<br>i008: Binector selection for SCI slave1, binary output 8<br>i009: Binector selection for SCI slave1, binary output 9<br>i010: Binector selection for SCI slave1, binary output 10<br>i011: Binector selection for SCI slave1, binary output 11<br>i012: Binector selection for SCI slave1, binary output 12<br>i013: Binector selection for SCI slave2, binary output 1<br>i014: Binector selection for SCI slave2, binary output 2<br>i015: Binector selection for SCI slave2, binary output 3<br>i016: Binector selection for SCI slave2, binary output 4<br>i017: Binector selection for SCI slave2, binary output 5<br>i018: Binector selection for SCI slave2, binary output 6<br>i019: Binector selection for SCI slave2, binary output 7<br>i020: Binector selection for SCI slave2, binary output 8<br>i021: Binector selection for SCI slave2, binary output 9<br>i022: Binector selection for SCI slave2, binary output 10<br>i023: Binector selection for SCI slave2, binary output 11<br>i024: Binector selection for SCI slave2, binary output 12 | All binector numbers<br>1 | Ind:24<br>FS= 0<br>Type L2 | P052 = 3<br>P051 =40<br>on-line |
| <b>n699</b><br>(2699)<br><br>(Z130)<br>(Z131)<br>(Z135)<br>(Z136)<br>(Z140)<br>(Z141)<br>(Z145)<br>(Z146)<br>(Z150)<br>(Z151)<br>(Z155)<br>(Z156) | <b>Display of SCB1/SCI process data</b> [SW 1.9 and later]<br>All values in hexadecimal representation<br><br>i001: SCI slave1, binary inputs<br>i002: SCI slave1, analog input1<br>i003: SCI slave1, analog input2<br>i004: SCI slave1, analog input3<br>i005: SCI slave2, binary inputs<br>i006: SCI slave2, analog input1<br>i007: SCI slave2, analog input2<br>i008: SCI slave2, analog input3<br>i009: SCI slave1, binary outputs<br>i010: SCI slave1, analog output1<br>i011: SCI slave1, analog output2<br>i012: SCI slave1, analog output3<br>i013: SCI slave2, binary outputs<br>i014: SCI slave2, binary outputs<br>i015: SCI slave2, analog output2<br>i016: SCI slave2, analog output3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                           | Ind:16<br>Type L2          | P052 = 3<br>P051 =40<br>on-line |

## 11.84 Configuration of supplementary boards in board locations 2 and 3

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |                            |                                  |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|----------------------------------|
| <b>U710</b><br>(2710)<br>* | <b>Initialize link to supplementary boards</b><br><br>i001 Initialization of 1 <sup>st</sup> communications board (in slot with lower ID letter)<br><br>i002 Initialization of 2 <sup>nd</sup> communications board (in slot with higher ID letter)<br><br>Settings:<br>0 The link to supplementary boards is re-initialized. After the configuration parameters for supplementary boards have been changed, U710 must be set to 0 so that the new settings can take effect.<br>The parameter is then set automatically to 1.<br>Note: Data transmission is interrupted while initialization is in progress.<br>1 Deactivated | 0 to 1<br>1 | Ind: 2<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|----------------------------------|

| PNU                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Value range<br>[Unit] | No. indices                 | See<br>Change      |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------|--------------------|
| <b>U711</b><br>(2711)<br>*<br><br>(Z110)<br>(Z111) | <b>Communications board parameter 1 (CB parameter 1)</b><br>See documentation for installed COM BOARD.<br><br>This parameter is relevant only if a communications board is installed. The validity of the setting is monitored by the CB. If the CB rejects the setting, fault message F080 is displayed with fault value 5<br>Index 1 is used to parameterize the 1 <sup>st</sup> CB (including CB behind TB) and index 2 to parameterize the 2 <sup>nd</sup> CB. | 0 to 65535<br>1       | Ind: 2<br>FS=0<br>Type: O2  | P052 = 3<br>Online |
| <b>U712</b><br>(2712)<br>*<br><br>(Z110)<br>(Z111) | <b>Communications board parameter 2 (CB parameter 2)</b><br>See U711                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 65535<br>1       | Ind: 2<br>FS=0<br>Type: O2  | P052 = 3<br>Online |
| <b>U713</b><br>(2713)<br>*<br><br>(Z110)<br>(Z111) | <b>Communications board parameter 3 (CB parameter 3)</b><br>See U711                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 65535<br>1       | Ind: 2<br>FS=0<br>Type: O2  | P052 = 3<br>Online |
| <b>U714</b><br>(2714)<br>*<br><br>(Z110)<br>(Z111) | <b>Communications board parameter 4 (CB parameter 4)</b><br>See U711                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 65535<br>1       | Ind: 2<br>FS=0<br>Type: O2  | P052 = 3<br>Online |
| <b>U715</b><br>(2715)<br>*<br><br>(Z110)<br>(Z111) | <b>Communications board parameter 5 (CB parameter 5)</b><br>See U711                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 65535<br>1       | Ind: 2<br>FS=0<br>Type: O2  | P052 = 3<br>Online |
| <b>U716</b><br>(2716)<br>*<br><br>(Z110)<br>(Z111) | <b>Communications board parameter 6 (CB parameter 6)</b><br>See U711                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 65535<br>1       | Ind: 2<br>FS=0<br>Type: O2  | P052 = 3<br>Online |
| <b>U717</b><br>(2717)<br>*<br><br>(Z110)<br>(Z111) | <b>Communications board parameter 7 (CB parameter 7)</b><br>See U711                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 65535<br>1       | Ind: 2<br>FS=0<br>Type: O2  | P052 = 3<br>Online |
| <b>U718</b><br>(2718)<br>*<br><br>(Z110)<br>(Z111) | <b>Communication Board Parameter 8 (CB-Parameter 8)</b><br>See U711                                                                                                                                                                                                                                                                                                                                                                                                | 0 to 65535<br>1       | Ind: 2<br>FS=0<br>Type: O2  | P052 = 3<br>Online |
| <b>U719</b><br>(2719)<br>*<br><br>(Z110)<br>(Z111) | <b>Communications board parameter 9 (CB parameter 9)</b><br>See U711                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 65535<br>1       | Ind: 2<br>FS=0<br>Type: O2  | P052 = 3<br>Online |
| <b>U720</b><br>(2720)<br>*<br><br>(Z110)<br>(Z111) | <b>Communications board parameter 10 (CB parameter 10)</b><br>See U711                                                                                                                                                                                                                                                                                                                                                                                             | 0 to 65535<br>1       | Ind: 2<br>FS=0<br>Type: O2  | P052 = 3<br>Online |
| <b>U721</b><br>(2721)<br>*<br><br>(Z110)<br>(Z111) | <b>Communications board parameter 11 (CB parameter 11)</b><br>See U711                                                                                                                                                                                                                                                                                                                                                                                             | 0 to 65535<br>1       | Ind: 10<br>FS=0<br>Type: O2 | P052 = 3<br>Online |



| PNU                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Value range<br>[Unit]     | No. indices                  | See<br>Change                     |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------|-----------------------------------|
| <b>U722</b><br>(2722)<br>*<br><br>(Z110)<br>(Z111) | <b>Telegram failure time for CB and TB</b><br><br>i001: Telegram failure time for board location 2<br>i002: Telegram failure time for board location 3<br>i003: Fault delay time for 1 <sup>st</sup> CB or TB<br>i004: Fault delay time for 2 <sup>nd</sup> CB<br><br>Settings for telegram failure time:<br>0 No time monitoring; must be parameterized for sporadic (acyclic) telegrams<br>1...65500 Maximum permissible time interval between 2 data exchanges before fault message F082 can be output<br><br>Settings for fault delay time:<br>0 Instantaneous activation of F082<br>1...65499 Fault delay time before F082 is activated.<br>65500 F082 is never activated<br><br>If no process data are exchanged with the supplementary board for a period in excess of the telegram failure time, fault message F082 is activated as a function of the fault delay time.<br>Monitoring takes place in a 20 ms cycle. For this reason, it is only meaningful to set values that are multiples of 20 ms.<br><br><br><br>Note:<br>The telegram monitoring function is active <ul style="list-style-type: none"> <li>from the receipt of the first error-free telegram after connection of the electronics power supply</li> <li>from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout).</li> </ul> | 0 to 65000<br>[ms]<br>1ms | Ind: 4<br>FS=0<br>Type: O2   | P052 = 3<br>Online                |
| <b>U723</b><br>(2723)<br>*                         | <b>Timeout period for technology boards</b> [SW 2.1 and later]<br><br>i001: Timeout period until F080 fault value 1 (no heartbeat)<br>i002: Timeout period until F080 fault value 6 (delay until initialization is complete).<br>Additional permissible period after expiry of time set in index 001 for completion of initialization.<br><br>Example<br>U732.001 = 30, U732.002 = 20:<br>When the electronics supply is switched on, F080 fault value 1 is delayed by 30 s and F080 fault value 6 by 30s + 20s = 50s.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 20 to 60<br>[s]<br>1s     | Ind: 2<br>FS= 20<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line  |
| <b>U728</b><br>(2728)<br>*<br><br>(Z110)           | <b>Source for binector/connector converter for 1<sup>st</sup> CB/TB</b> [SW 1.9 and later]<br><br>Binectors to be converted to connector K3020<br>i001: 1 <sup>st</sup> binector (bit 0)<br>i002: 2 <sup>nd</sup> binector (bit 1)<br>...<br>i016: 16 <sup>th</sup> binector (bit 15)<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | All binector numbers<br>1 | Ind: 16<br>FS=0<br>Type: L2  | P052 = 3<br>P051 = 40<br>off-line |

| PNU                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Value range<br>[Unit]      | No. indices                                                                                            | See<br>Change                     |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>U729</b><br>(2729)<br>*                    | <b>Source for binector/connector converter for 2<sup>nd</sup> CB</b> [SW 1.9 and later]<br><br>Binectors to be converted to connector K8020<br><br>i001: 1 <sup>st</sup> binector (bit 0)<br>i002: 2 <sup>nd</sup> binector (bit 1)<br>...<br>i016: 16 <sup>th</sup> binector (bit 15)<br><br>Settings:<br>0 = binector B0000<br>1 = binector B0001<br>etc.                                                                                                                                                                                                                              | All binector numbers<br>1  | Ind: 16<br>FS=0<br>Type: L2                                                                            | P052 = 3<br>P051 = 40<br>off-line |
| <b>n732</b><br>(2732)<br><br>(Z110)<br>(Z111) | <b>CB/TB diagnostics</b><br><br>Diagnostic information about an installed communications board (CB) or technology board (TB).<br><br>i001 - i032: 1. CB/TB (lower slot ID letter)<br>i033 - i064: 2. CB (higher slot ID letter)<br>i065, i066: 1. CB/TB (internal diagnostic data)<br>i067, i068: 2. CB (internal diagnostic data)<br><br>For detailed information, please refer to operating instructions of relevant CB or TB.                                                                                                                                                         |                            | Ind: 68<br>Type: O2                                                                                    | P052 = 3                          |
| <b>n733</b><br>(2733)<br><br>(Z110)<br>(Z111) | <b>CB/TB receive data</b><br><br>Display of control words and setpoints (process data) that are transferred to the basic converter from a communications board (CB) or technology board (TB).<br><br>i001: 1 <sup>st</sup> process data word from 1 <sup>st</sup> CB/TB<br>...<br>i016: 16 <sup>th</sup> process data word from 1 <sup>st</sup> CB/TB<br>i017: 1 <sup>st</sup> process data word from 2 <sup>nd</sup> CB<br>...<br>i032: 16 <sup>th</sup> process data word from 2 <sup>nd</sup> CB                                                                                      |                            | Ind: 32<br>Type: L2                                                                                    | P052 = 3                          |
| <b>U734</b><br>(2734)<br>*                    | <b>Transmit data for first CB/TB (lower slot ID letter)</b><br><br>Selection of connectors whose contents must be injected as transmit data to the first communications board (CB) or technology board (TB).<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.<br><br>This parameter not only defines the transmit data, but also their position in the transmit telegram.<br><br>i001: Word 1 in PZD section of telegram<br>i002: Word 2 in PZD section of telegram<br>...<br>i016: Word 16 in PZD section of telegram<br><br>Status word 1 (K0032) should be linked to word 1. | All connector numbers<br>1 | Ind: 16<br>FS=<br>i001: 32<br>i002: 167<br>i003: 0<br>i004: 33<br>i005: 0<br>to<br>i016: 0<br>Type: L2 | P052 = 3<br>Online                |
| <b>n735</b><br>(2735)<br><br>(Z110)<br>(Z111) | <b>Display of transmit data to CB/TB</b><br><br>i001: 1 <sup>st</sup> process data word to 1 <sup>st</sup> CB or TB<br>...<br>i016: 16 <sup>th</sup> process data word to 1 <sup>st</sup> CB or TB<br>i017: 1 <sup>st</sup> process data word to 2 <sup>nd</sup> CB<br>...<br>i032: 16 <sup>th</sup> process data word to 2 <sup>nd</sup> CB                                                                                                                                                                                                                                             |                            | Ind: 32<br>Type: L2                                                                                    | P052 = 3                          |

| PNU                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Value range<br>[Unit]      | No. indices                 | See<br>Change      |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------|--------------------|
| <b>U736</b><br>(2736)<br>*<br><br>(Z111)      | <b>Transmit data for second CB (higher slot letter)</b><br>Selection of connectors whose contents must be injected as transmit data to a communications board (CB) with a higher slot ID letter.<br>0 = connector K0000<br>1 = connector K0001<br>etc.<br>This parameter not only defines the transmit data, but also their position in the transmit telegram.<br>i001: Word 1 in PZD section of telegram<br>i002: Word 2 in PZD section of telegram<br>...<br>i016: Word 16 in PZD section of telegram<br>Status word 1 (K0032) should be linked to word 1. | All connector numbers<br>1 | Ind: 16<br>FS=0<br>Type: L2 | P052 = 3<br>Online |
| <b>n738</b><br>(2738)<br><br>(Z110)<br>(Z111) | <b>Display of PKW job from supplementary boards</b><br>i001: 1 <sup>st</sup> word of PKW job from 1 <sup>st</sup> CB<br>...<br>i004: 4 <sup>th</sup> word of PKW job from 1 <sup>st</sup> CB<br>i005: 1 <sup>st</sup> word of PKW job from location 2 <sup>nd</sup> CB<br>...<br>i008: 4 <sup>th</sup> word of PKW job from 2 <sup>nd</sup> CB<br>i009: 1 <sup>st</sup> word of PKW job from TB<br>...<br>i012: 4 <sup>th</sup> word of PKW job from TB<br>Details refer to "Function diagrams", Section 8 Sheets Z110 and Z111                              |                            | Ind: 12<br>Type: L2         | P052 = 3           |
| <b>n739</b><br>(2739)<br><br>(Z110)<br>(Z111) | <b>Display of PKW response to supplementary boards</b><br>i001: 1 <sup>st</sup> word of PKW job from 1 <sup>st</sup> CB<br>...<br>i004: 4 <sup>th</sup> word of PKW job from 1 <sup>st</sup> CB<br>i005: 1 <sup>st</sup> word of PKW job from location 2 <sup>nd</sup> CB<br>...<br>i008: 4 <sup>th</sup> word of PKW job from 2 <sup>nd</sup> CB<br>i009: 1 <sup>st</sup> word of PKW job from TB<br>...<br>i012: 4 <sup>th</sup> word of PKW job from TB<br>Details refer to "Function diagrams", Section 8 Sheets Z110 and Z111                           |                            | Ind: 12<br>Type: L2         | P052 = 3           |

## 11.85 Configuring the SIMOLINK board

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |                            |                                 |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------|---------------------------------|
| <b>U740</b><br>(2740)<br>*<br><br>(Z121) | <b>SLB Node address</b><br>Node address of the SIMOLINK board (SLB) on the bus. The node address defines the telegrams to which the relevant board has write access. The node address also defines whether a node is to perform the additional function of dispatcher.<br>0 = Dispatcher (generates telegram circulation)<br>Not 0 = Transceiver<br>Only one node in a SIMOLINK ring may perform the function of dispatcher. Node address 0 may not be assigned to any node if a higher-level PLC is performing the dispatcher function as the SIMOLINK master. When an SLB is selected to operate as dispatcher, all nodes must be assigned consecutive addresses, starting with address 0 for the dispatcher.<br>i001: For first SLB in unit<br>i002: Reserved | 0 to 200<br>1 | Ind: 2<br>FS=0<br>Type: O2 | P052 = 3<br>P051 =40<br>Offline |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------|---------------------------------|

| PNU                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Value range<br>[Unit]        | No. indices                   | See<br>Change                   |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------|---------------------------------|
| <b>U741</b><br>(2741)<br>*<br>(Z121) | <b>SLB Telegram failure time</b><br>The telegram failure time defines the period within which a valid synchronizing telegram (SYNC telegram) must be received. Failure of any SYNC telegram to arrive within the set period indicates a communications error. The unit activates fault message F015 (see also U753) as a function of U741.<br><br>0 = No telegram failure monitoring<br><br>i001: For first SLB in unit<br>i002: Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0 to 6500<br>[ms]<br>1       | Ind: 2<br>FS=0<br>Type: O2    | P052 = 3<br>P051 =40<br>Online  |
| <b>U742</b><br>(2742)<br>*<br>(Z121) | <b>SLB Transmitter power</b><br>Setting of power of fiber optic transmitter<br><br>1 = 0m to 15m (length of plastic fiber optic cable)<br>2 = 15m to 25m (length of plastic fiber optic cable)<br>3 = 25m to 40m (length of plastic fiber optic cable)<br><br>Operation at a lower transmitter power increases the service life of the transmitter and receiver modules. Reducing the transmitter power also allows hidden fault sources on the transmission path (e.g. poor contacts on fiber optics) to be detected.<br><br>i001: For first SLB in unit<br>i002: Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1 to 3<br>1                  | Ind: 2<br>FS=3<br>Type: O2    | P052 = 3<br>P051 =40<br>Online  |
| <b>U744</b><br>(2744)<br>*<br>(Z121) | <b>SLB Selection of active SLB board</b><br>Selection of the active SIMOLINK board (SLB) when two SLBs are installed in one unit.<br><br>0 = Binector B0000<br>1 = Binector B0001 etc.<br><br>A binector value of 0 means "SLB in low slot is active".<br>A binector value of 1 is reserved for "SLB in high slot is active".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | All binector numbers         | Ind: None<br>FS=0<br>Type: L2 | P052 = 3<br>P051 =40<br>Online  |
| <b>U745</b><br>(2745)<br>*<br>(Z121) | <b>SLB No. of channels</b><br>Number of channels which dispatcher provides for each transceiver. Together with U746, the number of channels determines the number of addressable nodes.<br>This parameter is relevant only for the dispatcher.<br><br>i001: For first SLB in unit<br>i002: Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1 to 8<br>1                  | Ind: 2<br>FS=3<br>Type: O2    | P052 = 3<br>P051 =40<br>Offline |
| <b>U746</b><br>(2746)<br>*<br>(Z121) | <b>SLB Cycle time</b><br>The cycle time is the period required for all telegrams to be passed around the SIMOLINK ring. Together with U745, the cycle time determines the number of addressable nodes.<br>This parameter is relevant only for the dispatcher.<br><br>i001: For first SLB in unit<br>i002: Reserved<br><br><u>Caution:</u><br>Settings 0.20 ms to 0.99 ms are permissible only if option S00 is <u>not</u> activated. Otherwise F059 with fault value 3 is output.<br>If option S00 (free function blocks) is <u>not</u> activated <u>and</u> if an SLB cycle time of < 1.00 ms is set in parameter U746, connectors K7001 to K7008 are updated <u>immediately every time</u> a telegram is received. The other connectors (K7009 to K7016) and binectors B7100 to B7915 are updated only once in each computation cycle (= 1/6 line period). In addition, the connectors selected in U751.001 to U751.008 are read with <u>every</u> transmit telegram and the relevant up-to-date value transmitted. The connectors selected in parameters U751.009 to U751.016 are read only once in each computation cycle and written to the transmit buffer of the SLB.<br>[A cycle time of < 1.00 ms can be set in SW 1.9 and later] | 0.20 to 6.50<br>[ms]<br>0.01 | Ind:2<br>FS=1.20<br>Type: O2  | P052 = 3<br>P051 =40<br>Offline |

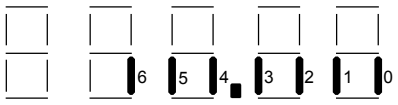
| PNU                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Value range<br>[Unit]      | No. indices                     | See<br>Change                   |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------|---------------------------------|
| <b>n748</b><br>(2748)<br><br>(Z121)      | <b>SLB Diagnosis</b><br><br>Visualization parameter which displays diagnostic information for an installed SIMOLINK board (SLB)<br><br>i001: Number of error-free synchronizing telegrams<br>i002: Number of CRC errors<br>i003: Number of timeout errors<br>i004: Last accessible bus address<br>i005: Address of node sending the special telegram "Timeout"<br>i006: Implemented bus cycle time<br>i007: Number of new configurations<br>i008: Reserved<br>...<br>i016: Reserved                                      |                            | Ind: 16<br>Type: O2             | P052 = 3                        |
| <b>U749</b><br>(2749)<br>*<br><br>(Z122) | <b>SLB Read address</b><br><br>Definition of node addresses and channels from which the SLB must read data (a total of 8 channels can be read according to the index entries). The digits before the decimal point in the input value define the node address and those after the point the channel number (See also Chapter 7 "Startup of SIMOLINK modules" and function diagrams, Chapter 8, Sheet Z122).<br><br>Example:<br>2.0 = address 2 channel 0                                                                 | 0.0 to 200.7<br>0.1        | Ind: 8<br>FS=0.0<br>Type: O2    | P052 = 3<br>P051 =40<br>Offline |
| <b>n750</b><br>(2750)<br><br>(Z122)      | <b>SLB Receive data</b><br><br>Visualization parameter for data received via the SIMOLINK board (See also Chapter 7 "Startup of SIMOLINK modules" and function diagrams, Chapter 8, Sheet Z122)<br><br>i001: Word 1 in PZD section of telegram<br>...<br>i016: Word 16 in PZD section of telegram                                                                                                                                                                                                                        |                            | Ind: 16<br>Type: L2             | P052 = 3                        |
| <b>U751</b><br>(2751)<br>*<br><br>(Z122) | <b>SLB Transmit data selection</b><br><br>Selection of connectors whose contents must be transferred as transmit data by the SLB (See also Chapter 7 "Startup of SIMOLINK modules" and function diagrams, Chapter 8, Sheet Z122).<br>0 = connector K0000<br>1 = connector K0001<br>etc.<br><br>In addition to the transmit data itself, its place in the transmit telegram is also defined.<br><br>i001: Channel0, low word<br>i002: Channel0, high word<br>...<br>i015: Channel7, low word<br>i016: Channel7, high word | All connector numbers      | Ind: 16<br>FS=0<br>Type: L2     | P052 = 3<br>P051 =40<br>Offline |
| <b>n752</b><br>(2752)<br><br>(Z122)      | <b>SLB Display of transmit data</b><br><br>Process data transmitted by SLB via SIMOLINK in hexadecimal notation (See also Chapter 7 "Startup of SIMOLINK modules" and function diagrams, Chapter 8, Sheet Z122).                                                                                                                                                                                                                                                                                                         |                            | Ind: 16<br>Type: L2             | P052 = 3                        |
| <b>U753</b><br>(2753)<br>*<br><br>(Z121) | <b>SLB Fault delay</b><br><br>Delay in activation of fault message F015 (see also U741)<br><br>0 = fault message is activated immediately the telegram failure monitor responds                                                                                                                                                                                                                                                                                                                                          | 0.0 to 100.0<br>[s]<br>0.1 | Ind: None<br>FS=0.0<br>Type: O2 | P052 = 3<br>P051 =40<br>Offline |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.86 Configuring the EB1 expansion board

|                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                   |                                |                                  |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------|----------------------------------|
| <b>U755</b><br>(2755)<br>*                | <b>Signal type of analog inputs on EB1</b><br><br>0 = Voltage input 0 to ± 10 V<br>1 = Current input 0 to ± 20 mA<br><br>(Z112)<br>(Z115)<br>i001: AI1 of the first EB1<br>i002: AI1 of the second EB1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0 to 1<br>1                       | Ind: 2<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online  |
| <b>U756</b><br>(2756)<br>(Z112)<br>(Z115) | <b>Normalization of analog inputs on EB1</b><br><br>This parameter specifies the percentage value which is generated for an input voltage of 10V (or an input current of 20mA) at the analog input.<br><br>The following general rule applies:<br><br>With a voltage input:<br><br>$U756[\%] = 10V * \frac{Y}{X}$<br>X .. input voltage in volts<br>Y .. % value which is generated for input voltage X<br><br>With a current input:<br><br>$U756[\%] = 20mA * \frac{Y}{X}$<br>X .. input current in mA<br>Y .. % value which is generated for input current X<br><br>i001: AI1 of the first EB1<br>i002: AI2 of the first EB1<br>i003: AI3 of the first EB1<br>i004: AI1 of the second EB1<br>i005: AI2 of the second EB1<br>i006: AI3 of the second EB1 | -1000.0 to 1000.0<br>[%]<br>0.1%  | Ind: 6<br>FS=100.0<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U757</b><br>(2757)<br>(Z112)<br>(Z115) | <b>Offset for analog inputs on EB1</b><br><br>i001: AI1 of the first EB1<br>i002: AI2 of the first EB1<br>i003: AI3 of the first EB1<br>i004: AI1 of the second EB1<br>i005: AI2 of the second EB1<br>i006: AI3 of the second EB1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -100.00 to 100.00<br>[%]<br>0.01% | Ind: 6<br>FS=0.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>U758</b><br>(2758)<br>*                | <b>Mode of signal injection at analog inputs on EB1</b><br><br>0 = Injection of signal with sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted<br><br>(Z112)<br>(Z115)<br>i001: AI1 of the first EB1<br>i002: AI2 of the first EB1<br>i003: AI3 of the first EB1<br>i004: AI1 of the second EB1<br>i005: AI2 of the second EB1<br>i006: AI3 of the second EB1                                                                                                                                                                                                                                                                                        | 0 to 3<br>1                       | Ind: 6<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |

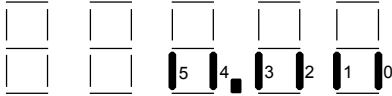
| PNU                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                     | Value range<br>[Unit]             | No. indices                | See<br>Change                    |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------|----------------------------------|
| <b>U759</b><br>(2759)<br>*<br><br>(Z112)<br>(Z115) | <b>Source for selection of sign reversal at analog inputs on EB1</b><br>Selection of binector to control <b>sign reversal at the analog input</b> ("1" state = reverse sign)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.<br><br>i001: AI1 of the first EB1<br>i002: AI2 of the first EB1<br>i003: AI3 of the first EB1<br>i004: AI1 of the second EB1<br>i005: AI2 of the second EB1<br>i006: AI3 of the second EB1 | All binector numbers<br>1         | Ind: 6<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>U760</b><br>(2760)<br>*<br><br>(Z112)<br>(Z115) | <b>Filtering time for analog inputs on EB1</b><br>Note: Hardware filtering of approximately 0.2 ms is applied as standard<br><br>i001: AI1 of the first EB1<br>i002: AI2 of the first EB1<br>i003: AI3 of the first EB1<br>i004: AI1 of the second EB1<br>i005: AI2 of the second EB1<br>i006: AI3 of the second EB1                                                                                                            | 0 to 10000<br>[ms]<br>1ms         | Ind: 6<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U761</b><br>(2761)<br>*<br><br>(Z112)<br>(Z115) | <b>Source for enabling of analog inputs on EB1</b><br>Selection of binector to control <b>enabling of the analog input</b> ("1" state = enabled)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.<br><br>i001: AI1 of the first EB1<br>i002: AI2 of the first EB1<br>i003: AI3 of the first EB1<br>i004: AI1 of the second EB1<br>i005: AI2 of the second EB1<br>i006: AI3 of the second EB1                             | All binector numbers<br>1         | Ind: 6<br>FS=1<br>Type: L2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>n762</b><br>(2762)<br><br>(Z112)<br>(Z115)      | <b>Display of analog inputs on EB1</b><br>i001: AI1 of the first EB1<br>i002: AI2 of the first EB1<br>i003: AI3 of the first EB1<br>i004: AI1 of the second EB1<br>i005: AI2 of the second EB1<br>i006: AI3 of the second EB1                                                                                                                                                                                                   | -200.00 to 199.99<br>[%]<br>0.01% | Ind: 6<br>Type: I2         | P052 = 3                         |
| <b>U763</b><br>(2763)<br>*<br><br>(Z113)<br>(Z116) | <b>Source for output value at analog outputs on EB1</b><br>Selection of connector whose value must be output at the analog output<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.<br><br>i001: AO1 of the first EB1<br>i002: AO2 of the first EB1<br>i003: AO1 of the second EB1<br>i004: AO2 of the second EB1                                                                                                       | All connector numbers<br>1        | Ind: 4<br>FS=0<br>Type: L2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U764</b><br>(2764)<br>*<br><br>(Z113)<br>(Z116) | <b>Mode of signal injection at analog outputs on EB1</b><br>0 = Injection of signal with sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted<br><br>i001: AO1 of the first EB1<br>i002: AO2 of the first EB1<br>i003: AO1 of the second EB1<br>i004: AO2 of the second EB1                                                  | 0 to 3<br>1                       | Ind: 4<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |

| PNU                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Value range<br>[Unit]             | No. indices                    | See<br>Change                    |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------|----------------------------------|
| <b>U765</b><br>(2765)<br>*<br>(Z113)<br>(Z116)     | <b>Filtering time for analog outputs on EB1</b><br><br>i001: AO1 of the first EB1<br>i002: AO2 of the first EB1<br>i003: AO1 of the second EB1<br>i004: AO2 of the second EB1                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0 to 10000<br>[ms]<br>1ms         | Ind: 4<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online  |
| <b>U766</b><br>(2766)<br><br>(Z113)<br>(Z116)      | <b>Normalization of analog outputs on EB1</b><br><br>$y[V] = x * \frac{U766}{100\%}$<br><br>x = normalization input (corresponds to filtering output)<br>y = normalization output (corresponds to output voltage at analog output with an offset of 0)<br><br>i001: AO1 of the first EB1<br>i002: AO2 of the first EB1<br>i003: AO1 of the second EB1<br>i004: AO2 of the second EB1                                                                                                                                                                                                                                                               | -200.00 to 199.99<br>[V]<br>0.01V | Ind: 4<br>FS=10.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U767</b><br>(2767)<br><br>(Z113)<br>(Z116)      | <b>Offset for analog outputs on EB1</b><br><br>i001: AO1 of the first EB1<br>i002: AO2 of the first EB1<br>i003: AO1 of the second EB1<br>i004: AO2 of the second EB1                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -10.00 to 10.00<br>[V]<br>0.01V   | Ind: 4<br>FS=0.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online  |
| <b>n768</b><br>(2768)<br><br>(Z113)<br>(Z116)      | <b>Display of analog outputs on EB1</b><br><br>i001: AO1 of the first EB1<br>i002: AO2 of the first EB1<br>i003: AO1 of the second EB1<br>i004: AO2 of the second EB1                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -200.0 to 199.99<br>[%]<br>0.01%  | Ind: 4<br>Type: I2             | P052 = 3                         |
| <b>U769</b><br>(2769)<br>*<br><br>(Z114)<br>(Z117) | <b>Source for output values at binary outputs on EB1</b><br><br>Selection of binectors to be applied to binary outputs at terminals 43 - 46.<br><br>0 = Binector B0000<br>1 = Binector B0001<br>etc.<br><br>i001: BO1 of the first EB1<br>i002: BO2 of the first EB1<br>i003: BO3 of the first EB1<br>i004: BO4 of the first EB1<br>i005: BO1 of the second EB1<br>i006: BO2 of the second EB1<br>i007: BO3 of the second EB1<br>i008: BO4 of the second EB1                                                                                                                                                                                       | All binector numbers<br>1         | Ind: 8<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>n770</b><br>(2770)<br><br>(Z114)<br>(Z117)      | <b>Display of status of binary inputs and outputs on EB1</b><br><br>Representation on operator panel (PMU):<br><br><br><br>Segment ON: Corresponding terminal is activated<br>(HIGH level is applied)<br>Segment OFF: Corresponding terminal is not activated<br>(LOW level is applied)<br><br>Segment or bit<br>0 ..... Terminal 40<br>1 ..... Terminal 41<br>2 ..... Terminal 42<br>3 ..... Terminal 43<br>4 ..... Terminal 44<br>5 ..... Terminal 45<br>6 ..... Terminal 46<br><br>i001: Terminal states of first EB1<br>i002: Terminal states of second EB1 |                                   | Ind: 2<br>Type: V2             | P052 = 3                         |



| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.87 Configuring the EB2 expansion board

|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                  |                                |                                 |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------|---------------------------------|
| <b>n773</b><br>(2773)<br><br>(Z118)<br>(Z119)  | <b>Display of status of binary inputs and outputs on EB2</b><br>Representation on operator panel (PMU):<br><br>Segment ON: Corresponding terminal is activated<br>(HIGH level is applied)<br>Segment OFF: Corresponding terminal is not activated<br>(LOW level is applied)<br><br>Segment or bit<br>0 ..... Terminal 53<br>1 ..... Terminal 54<br>2 ..... Terminal 39<br>3 ..... Terminal 41<br>4 ..... Terminal 43<br>5 ..... Terminal 45<br><br>i001: Terminal states of first EB2<br>i002: Terminal states of second EB2 |                                  | Ind: 2<br>Type: V2             | P052 = 3                        |
| <b>U774</b><br>(2774)<br>*<br>(Z118)<br>(Z119) | <b>Source for output values at binary outputs on EB2</b><br>Selection of binectors to be applied to binary outputs at terminals 39 - 46.<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.<br><br>i001: BO1 of the first EB2<br>i002: BO2 of the first EB2<br>i003: BO3 of the first EB2<br>i004: BO4 of the first EB2<br>i005: BO1 of the second EB2<br>i006: BO2 of the second EB2<br>i007: BO3 of the second EB2<br>i008: BO4 of the second EB2                                                                                                                                                      | All binector numbers<br>1        | Ind: 8<br>FS=0<br>Type: L2     | P052 = 3<br>P051 = 40<br>Online |
| <b>U775</b><br>(2775)<br>*<br>(Z118)<br>(Z119) | <b>Signal type of analog input on EB2</b><br><br>0 = voltage input 0 to $\pm 10$ V<br>1 = current input 0 to $\pm 20$ mA<br><br>i001: AI1 of the first EB2<br>i002: AI1 of the second EB2                                                                                                                                                                                                                                                                                                                                                                                                                     | 0 to 1<br>1                      | Ind: 2<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Online |
| <b>U776</b><br>(2776)<br><br>(Z118)<br>(Z119)  | <b>Normalization of analog input on EB2</b><br>This parameter specifies the percentage value which is generated for an input voltage of 10V (or an input current of 20mA) at the analog input.<br>The following general rule applies:<br>With a voltage input:<br>$U776 [\%] = 10 V * \frac{Y}{X}$ X .. input voltage in volts<br>Y .. % value which is generated for input voltage X<br><br>With a current input:<br>$U776 [\%] = 20 mA * \frac{Y}{X}$ X .. input current in mA<br>Y .. % value which is generated for input current X<br><br>i001: AI of the first EB2<br>i002: AI of the second EB2        | -1000.0 to 1000.0<br>[%]<br>0.1% | Ind: 2<br>FS=100.0<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |

| PNU                                                | Description                                                                                                                                                                                                                                                                                                        | Value range<br>[Unit]             | No. indices                   | See<br>Change                    |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------|----------------------------------|
| <b>U777</b><br>(2777)<br>(Z118)<br>(Z119)          | <b>Offset for analog input on EB2</b><br><br>i001: AI of the first EB2<br>i002: AI of the second EB2                                                                                                                                                                                                               | -100.00 to 100.00<br>[%]<br>0.01% | Ind: 2<br>FS=0.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>U778</b><br>(2778)<br>*<br><br>(Z118)<br>(Z119) | <b>Mode of signal injection at analog input on EB2</b><br><br>0 = Injection of signal with sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted<br><br>i001: AI of the first EB2<br>i002: AI of the second EB2  | 0 to 3<br>1                       | Ind: 2<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U779</b><br>(2779)<br>*<br><br>(Z118)<br>(Z119) | <b>Source for selection of sign reversal at analog input on EB2</b><br><br>Selection of binector to control <b>sign reversal at the analog input</b> ("1" state = reverse sign)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.<br><br>i001: AI of the first EB2<br>i002: AI of the second EB2             | All binector numbers<br>1         | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>U780</b><br>(2780)<br><br>(Z118)<br>(Z119)      | <b>Filtering time for analog input on EB2</b><br><br>Note: Hardware filtering of approximately 0.2 ms is applied as standard<br><br>i001: AI of the first EB2<br>i002: AI of the second EB2                                                                                                                        | 0 to 10000<br>[ms]<br>1ms         | Ind: 2<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online  |
| <b>U781</b><br>(2781)<br>*<br><br>(Z118)<br>(Z119) | <b>Source for enabling of analog inputs on EB2</b><br><br>Selection of binector to control <b>enabling of the analog input</b> ("1" state = enabled)<br><br>0 = binector B0000<br>1 = binector B0001<br>etc.<br><br>i001: AI of the first EB2<br>i002: AI of the second EB2                                        | All binector numbers<br>1         | Ind: 2<br>FS=1<br>Type: L2    | P052 = 3<br>P051 = 40<br>Offline |
| <b>n782</b><br>(2782)<br>(Z118)<br>(Z119)          | <b>Display of analog input on EB2</b><br><br>i001: AI of the first EB2<br>i002: AI of the second EB2                                                                                                                                                                                                               | -200.0 to 199.99<br>[%]<br>0.01%  | Ind: 2<br>Type: I2            | P052 = 3                         |
| <b>U783</b><br>(2783)<br>*<br><br>(Z118)<br>(Z119) | <b>Source for output value at analog output on EB2</b><br><br>Selection of connector whose value must be output at the analog output<br><br>0 = connector K0000<br>1 = connector K0001<br>etc.<br><br>i001: AO of the first EB2<br>i002: AO of the second EB2                                                      | All connector numbers<br>1        | Ind: 2<br>FS=0<br>Type: L2    | P052 = 3<br>P051 = 40<br>Online  |
| <b>U784</b><br>(2784)<br>*<br><br>(Z118)<br>(Z119) | <b>Mode of signal injection at analog output on EB2</b><br><br>0 = Injection of signal with sign<br>1 = Injection of absolute value of signal<br>2 = Injection of signal with sign, inverted<br>3 = Injection of absolute value of signal, inverted<br><br>i001: AO of the first EB2<br>i002: AO of the second EB2 | 0 to 3<br>1                       | Ind: 2<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online  |
| <b>U785</b><br>(2785)<br>(Z118)<br>(Z119)          | <b>Filtering time for analog outputs on EB2</b><br><br>i001: AO of the first EB2<br>i002: AO of the second EB2                                                                                                                                                                                                     | 0 to 10000<br>[ms]<br>1ms         | Ind: 2<br>FS=0<br>Type: O2    | P052 = 3<br>P051 = 40<br>Online  |

| PNU                                           | Description                                                                                                                                                                                                                                                                                                       | Value range<br>[Unit]             | No. indices                    | See<br>Change                   |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------|---------------------------------|
| <b>U786</b><br>(2786)<br><br>(Z118)<br>(Z119) | <b>Normalization of analog outputs on EB2</b><br><br>$y[V] = x * \frac{U786}{100\%}$<br>x = normalization input (corresponds to filtering output)<br>y = normalization output (corresponds to output voltage at analog output with an offset of 0)<br><br>i001: AO of the first EB2<br>i002: AO of the second EB2 | -200.00 to 199.99<br>[V]<br>0.01V | Ind: 2<br>FS=10.00<br>Type: I2 | P052 = 3<br>P051 = 40<br>Online |
| <b>U787</b><br>(2787)<br>(Z118)<br>(Z119)     | <b>Offset for analog output on EB2</b><br><br>i001: AO of the first EB2<br>i002: AO of the second EB2                                                                                                                                                                                                             | -10.00 to 10.00<br>[V]<br>0.01V   | Ind: 2<br>FS=0.00<br>Type: I2  | P052 = 3<br>P051 = 40<br>Online |
| <b>n788</b><br>(2788)<br>(Z118)<br>(Z119)     | <b>Display of analog outputs on EB2</b><br><br>i001: AO of the first EB2<br>i002: AO of the second EB2                                                                                                                                                                                                            | -200.00 to 199.99<br>[%]<br>0.01% | Ind: 2<br>Type: I2             | P052 = 3                        |

## 11.88 Configuring the SBP pulse encoder board

|                                             |                                                                                                                                                                                                                                                                                                          |                                    |                                   |                                  |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|----------------------------------|
| <b>U790</b><br>(2790)<br>*<br>(Z120)        | <b>Configuration of input level of A/B and CRTL tracks</b><br><br>0: HTL unipolar<br>1: TTL unipolar<br>2: HTL differential input<br>3: TTL/RS422 differential input                                                                                                                                     | 0 to 3<br>1                        | Ind: None<br>FS=1<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>U791</b><br>(2791)<br>*<br>(Z120)        | <b>Configuration of encoder supply voltage</b><br><br>The supply is subject to a current limit of 250mA<br><b>Caution:</b> Setting the parameter incorrectly can damage the encoder (i.e. 15 V voltage for an encoder which requires a 5 V supply).<br><br>0: 5V voltage supply<br>1: 15V voltage supply | 0 to 1<br>1                        | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>U792</b><br>(2792)<br>*<br>(Z120)        | <b>Number of pulses per revolution</b><br><br>Number of lines on one track around circumference of disk                                                                                                                                                                                                  | 100 to 20000<br>1                  | Ind: None<br>FS=1024<br>Type: O2  | P052 = 3<br>P051 = 40<br>Offline |
| <b>U793</b><br>(2793)<br>*<br>(Z120)        | <b>Encoder type</b><br><br>0: Encoder with A/B track (two tracks displaced by 90 degrees)<br>1: Encoder with separate forward and reverse tracks                                                                                                                                                         | 0 to 1<br>1                        | Ind: None<br>FS=0<br>Type: O2     | P052 = 3<br>P051 = 40<br>Offline |
| <b>U794</b><br>(2794)<br>(Z120)             | <b>Reference speed</b><br><br>When actual speed = reference speed a value of 100% is output in the appropriate diagnostic parameter (n795) and connector                                                                                                                                                 | 50.0 to 6500.0<br>[rev/min]<br>0.1 | Ind: None<br>FS=500.0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Online  |
| <b>n795</b><br>(2795)<br>(Z120)             | <b>Display of actual speed in % of reference speed</b>                                                                                                                                                                                                                                                   | -200.00 to 199.99<br>[%]           | Ind: None<br>Type: I2             | P052 = 3                         |
| <b>U796</b><br>(2796)<br>*<br>S00<br>(Z120) | <b>Resetting the position counter</b> [SW 2.0 and later]<br><br>Setting the type of resetting for position acquisition<br><br>0 = free-running (no reset)<br>1 = see function diagram Z120<br>2 = see function diagram Z120                                                                              | 0 to 2<br>1                        | Ind: none<br>FS=0<br>Type: O2     | P052 = 2<br>P051 = 40<br>online  |

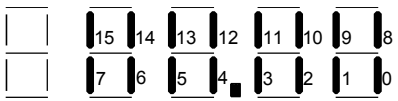
| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.89 Configuration of paralleling interface

Notes about parameterization of the paralleling interface see Chapter 6.9.2

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                            |                               |                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------|------------------------------------------|
| <b>U800</b><br>(2800)<br>*      | <b>Control word for parallel connection of SIMOREG converters</b><br><br>0: SIMOREG converters are not connected in parallel<br>1: SIMOREG converters are connected in parallel<br>The gating pulses are generated by each individual converter<br>(G195) 2: SIMOREG converters are connected in parallel<br>The gating pulses are generated by the master for all slaves                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0 to 2<br>1                | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline         |
| <b>U803</b><br>(2803)<br>*      | <b>Operating mode for the parallel connection</b><br><br>0 Standard mode<br>All parallel-connected SIMOREG devices must be in continuous operation. Failure (fault message, fuse blown) of <u>one</u> of the parallel-connected SIMOREG devices causes immediate pulse disabling for <u>all</u> SIMOREG devices.<br>(G195) 1 "N+1 mode" (redundancy mode)<br>On failure (fault message, fuse blown) of one of the parallel-connected SIMOREG devices, operation is maintained with the remaining SIMOREG devices.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0 to 1<br>1                | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line        |
| <b>U804</b><br>(2804)<br>*      | <b>Transmit data on paralleling interface</b><br>Selection of connectors whose contents must be injected as transmit data (master to slaves or slave to master) for the paralleling interface.<br>(G195) 0 = connector K0000<br>1 = connector K0001<br>etc.<br><br>This parameter not only defines the transmit data, but also their position in the transmit telegram.<br>i001: Word 1 of telegram<br>...<br>i005: Word 5 of telegram<br>i006: word 1 of the telegram, if "standby master"<br>...<br>i010: word 5 of the telegram, if "standby master"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | All connector numbers<br>1 | Ind: 10<br>FS=0<br>Type: L2   | P052 = 3<br>P051 = 40<br>Online          |
| <b>U805</b><br>(2805)<br>(G195) | <b>Control word for bus terminator of paralleling interface</b><br><br>0: No bus terminator<br>1: Bus terminator active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0 to 1<br>1                | Ind: None<br>FS=0<br>Type: O2 | <b>U805</b><br>(2805)<br>(G195)          |
| <b>U806</b><br>(2806)<br>*      | <b>Address for the parallel connection of SIMOREG devices</b><br><br>i001: Address of the masters or of the slaves<br>i002: Address of the "standby master" or slaves<br>(G195) 2: Slave device with address 2<br>3: Slave device with address 3<br>4: Slave device with address 4<br>5: Slave device with address 5<br>6: Slave device with address 6<br>12: Master device for 1 slave device with address 2<br>13: Master device for 2 slave devices with addresses 2 and 3<br>14: Master device for 3 slave devices with addresses 2, 3 and 4<br>15: Master device for 4 slave devices with addresses 2, 3, 4 and 5<br>16: Master device for 5 slave devices with addresses 2, 3, 4, 5 and 6<br><br>In "Standard" mode (U803 = 0), i001 and i002 must be set to the same value.<br>In "N+1 mode" (U803 = 1), a SIMOREG device has the "master" function, a SIMOREG device has the "standby Master" function and all other devices are slaves. In the slaves, i001 and i002 must be set to the same value.<br>On the master, a value of 12 to 16 must be set in i001, in i002 a value of 2 to 6.<br>In the "standby master", a value of 2 to 6 must be set in i001, in i002 a value of 12 to 16. | see column on left         | Ind: 2<br>FS=2<br>Type: O2    | <b>U806</b><br>(2806)<br>*<br><br>(G195) |

| PNU                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Value range<br>[Unit]            | No. indices                       | See<br>Change                            |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------|------------------------------------------|
| <b>U807</b><br>(2807)<br><br>(G195)      | <b>Telegram failure time on paralleling interface</b><br><br>0 No time monitoring<br>0.001...65.000 Permissible time interval between two data exchange operations before a fault message is output.<br><br>Fault message F014 is displayed if no data are exchanged with the parallel-connected converter within this delay period.<br>The monitoring function is implemented within a 20 ms cycle. For this reason, only setting values which constitute a multiple of 20 ms are meaningful.<br><br>Note:<br>The telegram monitoring function is active <ul style="list-style-type: none"> <li>from the receipt of the first error-free telegram after connection of the electronics power supply</li> <li>from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout).</li> </ul> | 0.000 to 65.000<br>[s]<br>0.001s | Ind: None<br>FS=0.100<br>Type: O2 | <b>U807</b><br>(2807)<br><br>(G195)      |
| <b>U808</b><br>(2808)<br>*<br><br>(G195) | <b>Source for triggering of message F014</b><br><br>Selection of binector which must trigger message F014 when it switches to log. "1"<br><br>6040 = binector B6040<br>6041 = binector B6041                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6040, 6041                       | Ind: None<br>FS=6040<br>Type: L2  | <b>U808</b><br>(2808)<br>*<br><br>(G195) |
| <b>n809</b><br>(2809)<br><br>(G195)      | <b>Diagnostic information for paralleling interface</b><br><br>i001 to i008=Free-running counter, overflow at 65535<br><br>i001: Number of error-free telegrams<br>i002: Number of errored telegrams<br>i003: Transmit Error Counter<br>i004: Receive Error Counter<br>i005: Phase Error Counter<br>i006: Baud rate Error Counter<br>i007: Bad BCC Counter<br>i008: Timeout Counter<br>i009: Number of telegrams with unknown identifier                                                                                                                                                                                                                                                                                                                                                                                                      | 0 to 65535                       | Ind: 9<br>Type: O2                | <b>n809</b><br>(2809)<br><br>(G195)      |

| PNU                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Value range<br>[Unit] | No. indices           | See<br>Change         |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|-----------------------|
| <b>n810</b><br>(2810) | <b>Diagnostic information for the paralleling interface</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       | Ind: None<br>Type: V2 | <b>n810</b><br>(2810) |
| (G195)                |  <p><u>Paralleling master: (i.e. when U800 = 1)</u></p> <p>Segment</p> <p>0 .....<br/>1 .....<br/>2 ..... ON: Slave with address 2 responding<br/>3 ..... ON: Slave with address 3 responding<br/>4 ..... ON: Slave with address 4 responding<br/>5 ..... ON: Slave with address 5 responding<br/>6 ..... ON: Slave with address 6 responding<br/>7 .....<br/>8 ..... OFF<br/>9 ..... OFF<br/>10 .....<br/>11 .....<br/>12 .....<br/>13 .....<br/>14 .....<br/>15 ..... ON: Master function active</p> <p><u>Paralleling slave: (i.e. when U800 = 2)</u></p> <p>Segment</p> <p>0 .....<br/>1 .....<br/>2 ..... ON: Data for slave with address 2 are ok<br/>3 ..... ON: Data for slave with address 3 are ok<br/>4 ..... ON: Data for slave with address 4 are ok<br/>5 ..... ON: Data for slave with address 5 are ok<br/>6 ..... ON: Data for slave with address 6 are ok<br/>7 .....<br/>8 ..... ON: Slave function active<br/>9 ..... ON: Firing pulses of master are used<br/>10 .....<br/>11 .....<br/>12 .....<br/>13 .....<br/>14 .....<br/>15 ..... OFF</p> |                       |                       | (G195)                |

| PNU                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Value range<br>[Unit] | No. indices         | See<br>Change |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|---------------|
| <b>n812</b><br>(2812)<br><br>(G195) | <b>Receive data on paralleling interface</b><br><u>When U806=1 (master) is selected</u><br>i001 Receive data from slave with address 2, word 1<br>...<br>i005 Receive data from slave with address 2, word 5<br>i006 Receive data from slave with address 3, word 1<br>...<br>i010 Receive data from slave with address 3, word 5<br>i011 Receive data from slave with address 4, word 1<br>...<br>i015 Receive data from slave with address 4, word 5<br>i016 Receive data from slave with address 5, word 1<br>...<br>i020 Receive data from slave with address 5, word 5<br>i021 Receive data from slave with address 6, word 1<br>...<br>i025 Receive data from slave with address 6, word 5<br><br><u>When U806=2 to 6 (slave) is selected:</u><br>i001 Receive data from master, word 1<br>...<br>i005 Receive data from master, word 5<br>i006 Not in use<br>...<br>i025 Not in use | 0000 to FFFFH<br>1    | Ind: 25<br>Type: L2 | P052 ≥ 0      |
| <b>n813</b><br>(2813)<br><br>(G195) | <b>Transmit data on paralleling interface</b><br><u>When U806=1 (master) is selected</u><br>i001 Transmit data to slaves, word 1<br>...<br>i005 Transmit data to slaves, word 5<br><br><u>When U806=2 to 6 (slave) is selected:</u><br>i001 Transmit data to master, word 1<br>...<br>i005 Transmit data to master, word 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0 to FFFFH            | Ind: 5<br>Type: L2  | P052 ≥ 0      |

## 11.90 Definition of the external power section

| Connection voltage (line voltage) and direct voltage armature |                                                                                                                                                                                                                                                                                                                                                                                                                           |                         |                                  |                                   |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------------|-----------------------------------|
| <b>U819</b><br>(2819)<br>*<br><br>(G101)                      | <b>Transmission ratio of external voltage transformer</b><br>[SW 2.0 and later]<br><br>The ratio between the output and input voltage of the voltage transformer is entered here.<br>e.g.: Input = 2000V<br>Output = 100V<br>→ U819 = 100/2000 = 0.05<br><br>i001: Transmission ratio of external voltage transformer for system voltage<br>i002: Transmission ratio of external voltage transformer for armature voltage | 0.001 to 1.000<br>0.001 | Ind: 2<br>FS=1.000<br>Type: O2   | P052 = 3<br>P051 = 40<br>offline  |
| <b>U820</b><br>(2820)<br>*<br><br>(G101)                      | <b>Rated connection voltage armature</b><br><br>Here you can set the rated connection voltage (rms value), for which the power section is suited (dielectric strength of the thyristors).<br>The value is indicated in parameter r071.<br>Parameter P078.001 (nominal input voltage armature) is limited to this value.                                                                                                   | 85 to 2000<br>[V]<br>1V | Ind: None<br>FS=1000<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |

| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Value range<br>[Unit]                 | No. indices                                       | See<br>Change                     |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------|-----------------------------------|
| U821<br>(2821)<br>*<br><br>(G101) | <b>Connection of the measuring leads</b><br>Here you can set the terminals on module A7044 to which the leads for measuring the line voltage and the armature voltage are connected.<br>The parameter value indicates the nominal rms value of the maximum line voltage that can be measured.<br><b>U821.001 Line voltage</b><br>0      No connection yet specified<br>85      Connection to XU4 / XV4 / XW4<br>250      Connection to XU3 / XV3 / XW3<br>575      Connection to XU2 / XV2 / XW2<br>1000      Connection to XU1 / XV1 / XW1<br><b>U821.002 Armature voltage</b> [SW 1.9 and later]<br>0      Connection selected in U821.001<br>85      Connection to XC4 / XD4<br>250      Connection to XC3 / XD3<br>575      Connection to XC2 / XD2<br>1000      Connection to XC1 / XD1 | 0,<br>85, 250, 575, 1000<br>[V]<br>1V | Ind: 2<br>FS=<br>i001: 1000<br>i002: 0<br>Typ: O2 | P052 = 3<br>P051 = 40<br>off-line |

### Armature current

The armature direct current is measured by evaluation of the signals of two line-side AC transformers.  
 The two current transformers must be connected to terminals X3-1 / X3-2 and X3-4 / X3-3 on module A7042.  
 Two load resistors of 10 Ω each are mounted on module A7042.

It is also possible to connect the two CTs externally in a V-connection through a diode rectifier.

The output of the V-connection must then be routed to terminals X3-4 / X3-3 (signal / ground) on module A7042.

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                  |                                    |                                   |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------|-----------------------------------|
| U822<br>(2822)<br>*<br><br>(G101) | <b>Rated direct current armature</b><br>Here it is necessary to set the output direct current to which the power section is suited in continuous operation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.0 to 6500.0<br>[A]<br>0.1A     | Ind: None<br>FS=0.0<br>Type: O2    | P052 = 3<br>P051 = 40<br>off-line |
| U823<br>(2823)<br>*<br><br>(G101) | <b>Load voltage at rated current armature</b><br>The compliance voltage derived from the following arithmetic formula is set here:<br><u>Calculation formula:</u> $u_B = R_B \cdot \ddot{u} \cdot I_d$<br>where:<br>$u_B$ = The load voltage searched for to be set in parameter U823<br>$R_B$ = Load resistance (default: 10 Ω)<br>$\ddot{u}$ = Transformation ratio of the current transformer ( $I_2 / I_1$ )<br>$I_d$ = Output direct current acc. to parameter U822<br><b>Note:</b><br>When using the differential amplifier to reduce the input voltage on the power interface (C98043-A7042) as described in Chapter 6.5, 1/10 of the load voltage must be set at rated direct current. | 200.0 to 1200.0<br>[mV]<br>0.1mV | Ind: None<br>FS=1000.0<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |
| U824<br>(2824)<br>*<br><br>(G101) | <b>Configuration of the current transformers</b><br>1      Current transformer in phases U and V<br>2      Current transformer in phases U and W<br>3      Current transformer in phases V and W<br>4      Current transformer connected externally in V-connection<br>5      Bipolar actual current signal<br>(actual current sensing with external shunt)<br>[settable only in SW 1.9 and later]                                                                                                                                                                                                                                                                                             | 1 to 5<br>1                      | Ind: None<br>FS=2<br>Type: O2      | P052 = 3<br>P051 = 40<br>off-line |
| U825<br>(2825)<br>*<br><br>(G101) | <b>Type of power section: 1Q / 4Q</b><br>1      1-quadrant power section<br>4      4-quadrant power section                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1 and 4<br>1                     | Ind: None<br>FS=1<br>Type: O2      | P052 = 3<br>P051 = 40<br>off-line |



| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.91 Miscellaneous

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         |                                                   |                                  |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------------------|----------------------------------|
| <b>U826</b><br>(2826)<br>*<br>(G163) | <b>Times for gating pulse chopping</b> [SW 1.9 and later]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1 to 105<br>[μs]<br>1μs | Ind: 4<br>FS=<br>i001: 50<br>i002: 35<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
|                                      | <p>i001 Length of first pulse<br/>i002 Length of other pulses</p> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>If U826.001 = 105 μs or U826.002 = 105 μs:<br/>Block pulse (without pulse chopping)</li> <li>If U826.001 ≤ U826.002 is set, then U826.001 is ignored and the first pulse is output with the same length as all other pulses</li> <li>Short pulses or long pulses are selected in P079<br/>P079 = 0: Short pulses (with length 890 μs)<br/>P079 = 1: Long pulses<br/>(pulse duration up to approx. 0.1 ms before next pulse)</li> </ul> |                         |                                                   |                                  |

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |                                 |                                   |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|---------------------------------|-----------------------------------|
| <b>Field</b>                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |                                 |                                   |
| <b>U828</b><br>(2828)<br>*<br>(G101) | <b>Rated connection voltage field</b><br><br>The power section for the field is suitable for a connection voltage of 460 Vrms (dielectric strength of the thyristors). The acquisition of the line voltage for the field is also dimensioned for this voltage.<br>If the field is operated with a rated line voltage of less than 130 Vrms, it is advisable to convert the hardware for line voltage measurement for the field on module A7044 to extra-low voltage.<br>Once this conversion has been performed, set parameter U828 to value 130 Vrms.<br>The value of U828 is indicated in parameter r074.<br>Parameter P078.002 (nominal input voltage field) is limited to this value.<br>130 Module A7044 converted to extra-low voltage<br>460 Module A7044 in the original state | 130 and 460<br>[V]<br>1V | Ind: None<br>FS=460<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |

|                                                                                                                                                                              |                                                                                                                        |             |                               |                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|-----------------------------------|
| <b>Measurement of the heat sink temperature</b><br>The heat sink temperature can be measured with an NTC.<br>The NTC must be connected to terminals X6 / X7 on module A7042. |                                                                                                                        |             |                               |                                   |
| <b>U830</b><br>(2830)<br>*<br>(G114)                                                                                                                                         | <b>Sensors for measuring heat sink temperature</b><br><br>0 No sensor present<br>1 NTC with 6.8 kΩ<br>2 NTC with 10 kΩ | 0 to 3<br>1 | Ind: None<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |

| PNU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Description                                                                                                                                                          | Value range<br>[Unit] | No. indices                   | See<br>Change                     |         |                              |            |                 |              |                 |               |                 |                |                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------|-----------------------------------|---------|------------------------------|------------|-----------------|--------------|-----------------|---------------|-----------------|----------------|-----------------|
| <b>Fuse monitoring</b><br><br>Fuse monitoring can be used universally. For example, it can be used to monitor fuses in the armature circuit, the field circuit, the fan circuit, or the primary side of a heavy-current transformer.<br><br>The terminals used (Faston tabs) on the fuse monitoring module (C98043-A7044) for the measuring leads depend on the voltage applied to a tripped fuse.<br><table><tr><td>Voltage</td><td>Measuring leads connected to</td></tr><tr><td>20 ... 85V</td><td>XS1_4 to XS12_4</td></tr><tr><td>&gt;85 ... 250V</td><td>XS1_3 to XS12_3</td></tr><tr><td>&gt;250 ... 600V</td><td>XS1_2 to XS12_2</td></tr><tr><td>&gt;600 ... 1000V</td><td>XS1_1 to XS12_1</td></tr></table> |                                                                                                                                                                      |                       |                               |                                   | Voltage | Measuring leads connected to | 20 ... 85V | XS1_4 to XS12_4 | >85 ... 250V | XS1_3 to XS12_3 | >250 ... 600V | XS1_2 to XS12_2 | >600 ... 1000V | XS1_1 to XS12_1 |
| Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Measuring leads connected to                                                                                                                                         |                       |                               |                                   |         |                              |            |                 |              |                 |               |                 |                |                 |
| 20 ... 85V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | XS1_4 to XS12_4                                                                                                                                                      |                       |                               |                                   |         |                              |            |                 |              |                 |               |                 |                |                 |
| >85 ... 250V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | XS1_3 to XS12_3                                                                                                                                                      |                       |                               |                                   |         |                              |            |                 |              |                 |               |                 |                |                 |
| >250 ... 600V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | XS1_2 to XS12_2                                                                                                                                                      |                       |                               |                                   |         |                              |            |                 |              |                 |               |                 |                |                 |
| >600 ... 1000V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | XS1_1 to XS12_1                                                                                                                                                      |                       |                               |                                   |         |                              |            |                 |              |                 |               |                 |                |                 |
| <b>U831</b><br>(2831)<br>*<br><br>(G101)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Fuse monitoring OFF / ON</b><br><br>0 Monitoring OFF<br>1 Monitoring ON<br><br>Response of the fuse monitoring causes a fault message F004 with the fault value 3 | 0 to 1<br>1           | Ind: None<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |         |                              |            |                 |              |                 |               |                 |                |                 |

|                                                                                                                          |                                                                                                                                                                                                                                                                                                                         |             |                               |                                   |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|-----------------------------------|
| <b>Monitoring of the device fan</b><br>A "fan OK" signal from the device fan must be connected to terminals 122 and 123. |                                                                                                                                                                                                                                                                                                                         |             |                               |                                   |
| <b>U832</b><br>(2832)<br>*                                                                                               | <b>Monitoring of the converter fan OFF / ON</b><br><br>0 Monitoring OFF<br>1 A LOW signal at term. 122 / 123 in operation activates error message F067 with error value 3<br>(G110) 2 A HIGH signal at term. 122 / 123 in operation activates error message F067 with error value 3 [settable only in SW 1.9 and later] | 0 to 2<br>1 | Ind: None<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |

|                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                             |             |                               |                                   |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|-----------------------------------|
| <b>External monitoring</b><br>The signaling contact for external monitoring must be connected to terminals 124 / 125. |                                                                                                                                                                                                                                                                                                                                                                                                             |             |                               |                                   |
| <b>U833</b><br>(2833)<br>*                                                                                            | <b>External monitoring OFF / ON</b><br><br>0 Monitoring AUS<br>1 A LOW signal at term. 124 / 125 in operation activates error message F003, or on power ON causes the device to dwell in operating state o4.2<br>(G110) 2 A HIGH signal at term. 124 / 125 in operation activates error message F003, or on power ON causes the device to dwell in operating state o4.2 [settable only in SW 1.9 and later] | 0 to 2<br>1 | Ind: None<br>FS=1<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |

|                            |                                                                                                                                                     |                           |                                 |                                   |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------------|-----------------------------------|
| <b>Relay output "Fan"</b>  |                                                                                                                                                     |                           |                                 |                                   |
| <b>U834</b><br>(2834)<br>* | <b>Source for the relay output "Fan" (terminals 120 / 121)</b><br>[SW 2.1 and later]<br><br>0 = Binector B0000<br>(G117) 1 = Binector B0001<br>etc. | All binector numbers<br>1 | Ind: None<br>FS=104<br>Type: L2 | P052 = 3<br>P051 = 40<br>off-line |

|                                                                                      |                                                                                                                                                                                         |                            |                                                                   |                                  |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------------------------------------------|----------------------------------|
| <b>Monitoring of device fan (fault message F067, fault value 3 and warning A067)</b> |                                                                                                                                                                                         |                            |                                                                   |                                  |
| <b>U835</b><br>(2835)                                                                | <b>Delay times</b> [SW 2.1 and later]<br><br>i001: ON delay for enabling the fault message and warning<br>(G110) i002: ON delay for fault message<br>i003: ON and OFF delay for warning | 0.0 to 60.0<br>[s]<br>0,1s | Ind: 3<br>FS=<br>i001: 15.0<br>i002: 5.0<br>i003: 2.5<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |

## 11.92 Rated DC current of external field device

|                            |                                                                                                                                                                       |                                |                                  |                                  |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------|----------------------------------|
| <b>U838</b><br>(2838)<br>* | <b>Rated DC current of external field device</b> [SW 1.9 and later]<br><br>0.00 Parameter not yet set<br><br>Note:<br>This parameter is operative only if P082 >= 21. | 0.00 to 600.00<br>[A]<br>0.01A | Ind: None<br>FS=0.00<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------|----------------------------------|

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

### 11.93 Simulation operation

#### Simulation operation

Simulation operation is used to test the power section (measurement of the firing pulses with a current probe). Firing pulses are output to a single thyristor (pulse distance = 20 ms, pulse duration = approx. 1 ms, firing pulse chopping as in normal operation). The thyristor is selected with parameter U840. The line voltage does not have to be applied during simulation operation.

Simulation operation is activated by setting a value > 0 in Parameter U840.

Simulation operation is then actually started when the SIMOREG CM is in an operating state ≥ o7.

As soon as the SIMOREG CM is in simulation operation, it goes into operating state o8.1 (simulation operation).

Simulation operation is exited by resetting parameter U840 to zero.

|                            |                                                    |                                  |                               |                                   |
|----------------------------|----------------------------------------------------|----------------------------------|-------------------------------|-----------------------------------|
| <b>U840</b><br>(2840)<br>* | <b>Control parameters for simulation operation</b> | 0,<br>11 to 16,<br>21 to 26<br>1 | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |
|                            | 0 No simulation operation                          |                                  |                               |                                   |
|                            | 11 Firing cable 11                                 |                                  |                               |                                   |
|                            | ...                                                |                                  |                               |                                   |
|                            | 16 Firing cable 16                                 |                                  |                               |                                   |
|                            | 21 Firing cable 21                                 |                                  |                               |                                   |
|                            | ...                                                |                                  |                               |                                   |
|                            | 26 Firing cable 26                                 |                                  |                               |                                   |

### 11.94 Parameter for DriveMonitor

|                                                                   |                                                  |  |  |  |
|-------------------------------------------------------------------|--------------------------------------------------|--|--|--|
| <b>U845</b><br><b>bis</b><br><b>n909</b><br>(2845<br>bis<br>2909) | <b>These parameters are used by DriveMonitor</b> |  |  |  |
|-------------------------------------------------------------------|--------------------------------------------------|--|--|--|

### 11.95 Slot deactivation

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |              |                            |                                   |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------|-----------------------------------|
| <b>U910</b><br>(2910)<br>*<br><br>(G101) | <b>Slot deactivation parameter</b> [SW 1.9 and later]<br><br>Parameter for deactivating supplementary boards, e.g. during start-up or troubleshooting (for details of slot identification codes, see diagram under parameter r063)<br><br>i001: -<br>i002: Slot D<br>i003: Slot E<br>i004: Slot F<br>i005: Slot G<br><br>0 Board in slot active<br>1 Board in slot not active<br><br>The deactivated slot is ignored during the search for installed supplementary boards when the supply voltage is next switched on. Likewise, activation of a slot does not take effect until the supply voltage has been switched off and on again.<br>Note:<br>Slot E can simply be deactivated to conceal a technology board (large format).<br>If a communications board is installed in addition to the technology board, and the technology board is concealed, then the communications board will not be processed either. | 0 and 1<br>1 | Ind: 5<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------|-----------------------------------|

### 11.96 Parameter for DriveMonitor

|                                                                   |                                                  |  |  |  |
|-------------------------------------------------------------------|--------------------------------------------------|--|--|--|
| <b>U911</b><br><b>bis</b><br><b>n949</b><br>(2911<br>bis<br>2949) | <b>These parameters are used by DriveMonitor</b> |  |  |  |
|-------------------------------------------------------------------|--------------------------------------------------|--|--|--|

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.97 Technology software in the basic converter, Option S00: Sampling times

Only active with optional technology software S00

### Sampling times

For each function block of the technology software S00, it is necessary to define in which "time slice" (i.e. with which sampling time) it is processed.

5 time slices are available:

| Time slice | Sampling time                                |                                            |
|------------|----------------------------------------------|--------------------------------------------|
| 1          | 1 * T0 (firing-pulse-synchronous time slice) | T0 = Mean distance between 2 firing pulses |
| 2          | 2 * T0 (firing-pulse-synchronous time slice) | T0 = 3.33 ms at 50 Hz line frequency       |
| 4          | 4 * T0 (firing-pulse-synchronous time slice) | T0 = 2.78 ms at 60 Hz line frequency       |
| 10         | 20 ms (not firing-pulse-synchronous)         |                                            |
| 20         | Block is not calculated                      |                                            |

|                            |                                                           |                |                 |       |                |                 |                 |                                                      |                                   |
|----------------------------|-----------------------------------------------------------|----------------|-----------------|-------|----------------|-----------------|-----------------|------------------------------------------------------|-----------------------------------|
| U950<br>(2950)<br>*<br>S00 | Selection of time slices for function blocks FB1 to FB100 |                |                 |       |                |                 | 1, 2, 4, 10, 20 | Ind: 100<br>FS=<br>see column<br>on left<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |
|                            | Index                                                     | Function block | Time slice (FS) | Index | Function block | Time slice (FS) |                 |                                                      |                                   |
|                            | i001                                                      | FB1            | 20              | i051  | FB51           | 1               |                 |                                                      |                                   |
|                            | i002                                                      | FB2            | 20              | i052  | FB52           | 1               |                 |                                                      |                                   |
|                            | i003                                                      | FB3            | 1               | i053  | FB53           | 1               |                 |                                                      |                                   |
|                            | i004                                                      | FB4            | 1               | i054  | FB54           | 10              |                 |                                                      |                                   |
|                            | i005                                                      | FB5            | 1               | i055  | FB55           | 1               |                 |                                                      |                                   |
|                            | i006                                                      | FB6            | 1               | i056  | FB56           | 1               |                 |                                                      |                                   |
|                            | i007                                                      | FB7            | 1               | i057  | FB57           | 1               |                 |                                                      |                                   |
|                            | i008                                                      | FB8            | 1               | i058  | FB58           | 10              |                 |                                                      |                                   |
|                            | i009                                                      | FB9            | 1               | i059  | FB59           | 20              |                 |                                                      |                                   |
|                            | i010                                                      | FB10           | 1               | i060  | FB60           | 1               |                 |                                                      |                                   |
|                            | i011                                                      | FB11           | 1               | i061  | FB61           | 1               |                 |                                                      |                                   |
|                            | i012                                                      | FB12           | 1               | i062  | FB62           | 1               |                 |                                                      |                                   |
|                            | i013                                                      | FB13           | 1               | i063  | FB63           | 1               |                 |                                                      |                                   |
|                            | i014                                                      | FB14           | 1               | i064  | FB64           | 20              |                 |                                                      |                                   |
|                            | i015                                                      | FB15           | 1               | i065  | FB65           | 1               |                 |                                                      |                                   |
|                            | i016                                                      | FB16           | 10              | i066  | FB66           | 1               |                 |                                                      |                                   |
|                            | i017                                                      | FB17           | 10              | i067  | FB67           | 1               |                 |                                                      |                                   |
|                            | i018                                                      | FB18           | 10              | i068  | FB68           | 20              |                 |                                                      |                                   |
|                            | i019                                                      | FB19           | 10              | i069  | FB69           | 20              |                 |                                                      |                                   |
|                            | i020                                                      | FB20           | 1               | i070  | FB70           | 1               |                 |                                                      |                                   |
|                            | i021                                                      | FB21           | 1               | i071  | FB71           | 1               |                 |                                                      |                                   |
|                            | i022                                                      | FB22           | 1               | i072  | FB72           | 1               |                 |                                                      |                                   |
|                            | i023                                                      | FB23           | 1               | i073  | FB73           | 1               |                 |                                                      |                                   |
|                            | i024                                                      | FB24           | 1               | i074  | FB74           | 1               |                 |                                                      |                                   |
|                            | i025                                                      | FB25           | 1               | i075  | FB75           | 1               |                 |                                                      |                                   |
|                            | i026                                                      | FB26           | 1               | i076  | FB76           | 1               |                 |                                                      |                                   |
|                            | i027                                                      | FB27           | 1               | i077  | FB77           | 1               |                 |                                                      |                                   |
|                            | i028                                                      | FB28           | 1               | i078  | FB78           | 1               |                 |                                                      |                                   |
|                            | i029                                                      | FB29           | 1               | i079  | FB79           | 1               |                 |                                                      |                                   |
|                            | i030                                                      | FB30           | 1               | i080  | FB80           | 1               |                 |                                                      |                                   |
|                            | i031                                                      | FB31           | 1               | i081  | FB81           | 1               |                 |                                                      |                                   |
|                            | i032                                                      | FB32           | 2               | i082  | FB82           | 1               |                 |                                                      |                                   |
|                            | i033                                                      | FB33           | 2               | i083  | FB83           | 1               |                 |                                                      |                                   |
|                            | i034                                                      | FB34           | 2               | i084  | FB84           | 1               |                 |                                                      |                                   |
|                            | i035                                                      | FB35           | 1               | i085  | FB85           | 1               |                 |                                                      |                                   |
|                            | i036                                                      | FB36           | 1               | i086  | FB86           | 1               |                 |                                                      |                                   |
|                            | i037                                                      | FB37           | 1               | i087  | FB87           | 1               |                 |                                                      |                                   |
|                            | i038                                                      | FB38           | 1               | i088  | FB88           | 1               |                 |                                                      |                                   |
|                            | i039                                                      | FB39           | 20              | i089  | FB89           | 20              |                 |                                                      |                                   |
|                            | i040                                                      | FB40           | 1               | i090  | FB90           | 1               |                 |                                                      |                                   |
|                            | i041                                                      | FB41           | 1               | i091  | FB91           | 1               |                 |                                                      |                                   |
|                            | i042                                                      | FB42           | 2               | i092  | FB92           | 1               |                 |                                                      |                                   |
|                            | i043                                                      | FB43           | 2               | i093  | FB93           | 1               |                 |                                                      |                                   |
|                            | i044                                                      | FB44           | 2               | i094  | FB94           | 1               |                 |                                                      |                                   |
|                            | i045                                                      | FB45           | 1               | i095  | FB95           | 1               |                 |                                                      |                                   |
|                            | i046                                                      | FB46           | 1               | i096  | FB96           | 1               |                 |                                                      |                                   |
|                            | i047                                                      | FB47           | 1               | i097  | FB97           | 1               |                 |                                                      |                                   |
|                            | i048                                                      | FB48           | 20              | i098  | FB98           | 1               |                 |                                                      |                                   |
|                            | i049                                                      | FB49           | 20              | i099  | FB99           | 1               |                 |                                                      |                                   |
|                            | i050                                                      | FB50           | 1               | i100  | FB100          | 1               |                 |                                                      |                                   |

| PNU                        | Description                                                        |                   |                       |       |                   |                       | Value range<br>[Unit] | No. indices                                          | See<br>Change                     |
|----------------------------|--------------------------------------------------------------------|-------------------|-----------------------|-------|-------------------|-----------------------|-----------------------|------------------------------------------------------|-----------------------------------|
| U951<br>(2951)<br>*<br>S00 | <b>Selection of time slices for function blocks FB101 to FB200</b> |                   |                       |       |                   |                       | 1, 2, 4, 10, 20       | Ind: 100<br>FS=<br>see column<br>on left<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |
|                            | Index                                                              | Function<br>block | Time<br>slice<br>(FS) | Index | Function<br>block | Time<br>slice<br>(FS) |                       |                                                      |                                   |
|                            | i001                                                               | FB101             | 1                     | i051  | FB151             | 1                     |                       |                                                      |                                   |
|                            | i002                                                               | FB102             | 1                     | i052  | FB152             | 1                     |                       |                                                      |                                   |
|                            | i003                                                               | FB103             | 1                     | i053  | FB153             | 1                     |                       |                                                      |                                   |
|                            | i004                                                               | FB104             | 1                     | i054  | FB154             | 1                     |                       |                                                      |                                   |
|                            | i005                                                               | FB105             | 1                     | i055  | FB155             | 1                     |                       |                                                      |                                   |
|                            | i006                                                               | FB106             | 1                     | i056  | FB156             | 1                     |                       |                                                      |                                   |
|                            | i007                                                               | FB107             | 1                     | i057  | FB157             | 1                     |                       |                                                      |                                   |
|                            | i008                                                               | FB108             | 1                     | i058  | FB158             | 1                     |                       |                                                      |                                   |
|                            | i009                                                               | FB109             | 1                     | i059  | FB159             | 1                     |                       |                                                      |                                   |
|                            | i010                                                               | FB110             | 1                     | i060  | FB160             | 1                     |                       |                                                      |                                   |
|                            | i011                                                               | FB111             | 1                     | i061  | FB161             | 1                     |                       |                                                      |                                   |
|                            | i012                                                               | FB112             | 1                     | i062  | FB162             | 1                     |                       |                                                      |                                   |
|                            | i013                                                               | FB113             | 1                     | i063  | FB163             | 1                     |                       |                                                      |                                   |
|                            | i014                                                               | FB114             | 1                     | i064  | FB164             | 1                     |                       |                                                      |                                   |
|                            | i015                                                               | FB115             | 1                     | i065  | FB165             | 1                     |                       |                                                      |                                   |
|                            | i016                                                               | FB116             | 2                     | i066  | FB166             | 1                     |                       |                                                      |                                   |
|                            | i017                                                               | FB117             | 20                    | i067  | FB167             | 1                     |                       |                                                      |                                   |
|                            | i018                                                               | FB118             | 1                     | i068  | FB168             | 1                     |                       |                                                      |                                   |
|                            | i019                                                               | FB119             | 1                     | i069  | FB169             | 1                     |                       |                                                      |                                   |
|                            | i020                                                               | FB120             | 1                     | i070  | FB170             | 1                     |                       |                                                      |                                   |
|                            | i021                                                               | FB121             | 1                     | i071  | FB171             | 1                     |                       |                                                      |                                   |
|                            | i022                                                               | FB122             | 1                     | i072  | FB172             | 1                     |                       |                                                      |                                   |
|                            | i023                                                               | FB123             | 1                     | i073  | FB173             | 1                     |                       |                                                      |                                   |
|                            | i024                                                               | FB124             | 1                     | i074  | FB174             | 1                     |                       |                                                      |                                   |
|                            | i025                                                               | FB125             | 1                     | i075  | FB175             | 1                     |                       |                                                      |                                   |
|                            | i026                                                               | FB126             | 1                     | i076  | FB176             | 1                     |                       |                                                      |                                   |
|                            | i027                                                               | FB127             | 1                     | i077  | FB177             | 1                     |                       |                                                      |                                   |
|                            | i028                                                               | FB128             | 1                     | i078  | FB178             | 1                     |                       |                                                      |                                   |
|                            | i029                                                               | FB129             | 1                     | i079  | FB179             | 1                     |                       |                                                      |                                   |
|                            | i030                                                               | FB130             | 1                     | i080  | FB180             | 1                     |                       |                                                      |                                   |
|                            | i031                                                               | FB131             | 1                     | i081  | FB181             | 1                     |                       |                                                      |                                   |
|                            | i032                                                               | FB132             | 1                     | i082  | FB182             | 1                     |                       |                                                      |                                   |
|                            | i033                                                               | FB133             | 1                     | i083  | FB183             | 1                     |                       |                                                      |                                   |
|                            | i034                                                               | FB134             | 1                     | i084  | FB184             | 1                     |                       |                                                      |                                   |
|                            | i035                                                               | FB135             | 1                     | i085  | FB185             | 1                     |                       |                                                      |                                   |
|                            | i036                                                               | FB136             | 1                     | i086  | FB186             | 1                     |                       |                                                      |                                   |
|                            | i037                                                               | FB137             | 1                     | i087  | FB187             | 1                     |                       |                                                      |                                   |
|                            | i038                                                               | FB138             | 1                     | i088  | FB188             | 1                     |                       |                                                      |                                   |
|                            | i039                                                               | FB139             | 1                     | i089  | FB189             | 1                     |                       |                                                      |                                   |
|                            | i040                                                               | FB140             | 1                     | i090  | FB190             | 1                     |                       |                                                      |                                   |
|                            | i041                                                               | FB141             | 1                     | i091  | FB191             | 1                     |                       |                                                      |                                   |
|                            | i042                                                               | FB142             | 1                     | i092  | FB192             | 1                     |                       |                                                      |                                   |
|                            | i043                                                               | FB143             | 1                     | i093  | FB193             | 1                     |                       |                                                      |                                   |
|                            | i044                                                               | FB144             | 1                     | i094  | FB194             | 1                     |                       |                                                      |                                   |
|                            | i045                                                               | FB145             | 1                     | i095  | FB195             | 1                     |                       |                                                      |                                   |
|                            | i046                                                               | FB146             | 1                     | i096  | FB196             | 10                    |                       |                                                      |                                   |
|                            | i047                                                               | FB147             | 1                     | i097  | FB197             | 10                    |                       |                                                      |                                   |
|                            | i048                                                               | FB148             | 20                    | i098  | FB198             | 10                    |                       |                                                      |                                   |
|                            | i049                                                               | FB149             | 20                    | i099  | FB199             | 10                    |                       |                                                      |                                   |
|                            | i050                                                               | FB150             | 1                     | i100  | FB200             | 1                     |                       |                                                      |                                   |

| PNU                        | Description                                                 |                   |                       |       |                   |                       | Value range<br>[Unit] | No. indices                                          | See<br>Change                     |
|----------------------------|-------------------------------------------------------------|-------------------|-----------------------|-------|-------------------|-----------------------|-----------------------|------------------------------------------------------|-----------------------------------|
| U952<br>(2952)<br>*<br>S00 | Selection of time slices for function blocks FB201 to FB300 |                   |                       |       |                   |                       | 1, 2, 4, 10, 20       | Ind: 100<br>FS=<br>see column<br>on left<br>Type: O2 | P052 = 3<br>P051 = 40<br>off-line |
|                            | Index                                                       | Function<br>block | Time<br>slice<br>(FS) | Index | Function<br>block | Time<br>slice<br>(FS) |                       |                                                      |                                   |
|                            | i001                                                        | FB201             | 1                     | i051  | FB251             | 1                     |                       |                                                      |                                   |
|                            | i002                                                        | FB202             | 1                     | i052  | FB252             | 1                     |                       |                                                      |                                   |
|                            | i003                                                        | FB203             | 1                     | i053  | FB253             | 1                     |                       |                                                      |                                   |
|                            | i004                                                        | FB204             | 1                     | i054  | FB254             | 1                     |                       |                                                      |                                   |
|                            | i005                                                        | FB205             | 1                     | i055  | FB255             | 20                    |                       |                                                      |                                   |
|                            | i006                                                        | FB206             | 1                     | i056  | FB256             | 1                     |                       |                                                      |                                   |
|                            | i007                                                        | FB207             | 1                     | i057  | FB257             | 1                     |                       |                                                      |                                   |
|                            | i008                                                        | FB208             | 1                     | i058  | FB258             | 1                     |                       |                                                      |                                   |
|                            | i009                                                        | FB209             | 1                     | i059  | FB259             | 1                     |                       |                                                      |                                   |
|                            | i010                                                        | FB210             | 1                     | i060  | FB260             | 10                    |                       |                                                      |                                   |
|                            | i011                                                        | FB211             | 1                     | i061  | FB261             | 10                    |                       |                                                      |                                   |
|                            | i012                                                        | FB212             | 10                    | i062  | FB262             | 10                    |                       |                                                      |                                   |
|                            | i013                                                        | FB213             | 10                    | i063  | FB263             | 10                    |                       |                                                      |                                   |
|                            | i014                                                        | FB214             | 10                    | i064  | FB264             | 10                    |                       |                                                      |                                   |
|                            | i015                                                        | FB215             | 1                     | i065  | FB265             | 10                    |                       |                                                      |                                   |
|                            | i016                                                        | FB216             | 1                     | i066  | FB266             | 10                    |                       |                                                      |                                   |
|                            | i017                                                        | FB217             | 1                     | i067  | FB267             | 10                    |                       |                                                      |                                   |
|                            | i018                                                        | FB218             | 1                     | i068  | FB268             | 10                    |                       |                                                      |                                   |
|                            | i019                                                        | FB219             | 1                     | i069  | FB269             | 10                    |                       |                                                      |                                   |
|                            | i020                                                        | FB220             | 1                     | i070  | FB270             | 10                    |                       |                                                      |                                   |
|                            | i021                                                        | FB221             | 1                     | i071  | FB271             | 10                    |                       |                                                      |                                   |
|                            | i022                                                        | FB222             | 1                     | i072  | FB272             | 10                    |                       |                                                      |                                   |
|                            | i023                                                        | FB223             | 1                     | i073  | FB273             | 10                    |                       |                                                      |                                   |
|                            | i024                                                        | FB224             | 1                     | i074  | FB274             | 10                    |                       |                                                      |                                   |
|                            | i025                                                        | FB225             | 1                     | i075  | FB275             | 10                    |                       |                                                      |                                   |
|                            | i026                                                        | FB226             | 1                     | i076  | FB276             | 10                    |                       |                                                      |                                   |
|                            | i027                                                        | FB227             | 1                     | i077  | FB277             | 10                    |                       |                                                      |                                   |
|                            | i028                                                        | FB228             | 1                     | i078  | FB278             | 10                    |                       |                                                      |                                   |
|                            | i029                                                        | FB229             | 10                    | i079  | FB279             | 10                    |                       |                                                      |                                   |
|                            | i030                                                        | FB230             | 1                     | i080  | FB280             | 10                    |                       |                                                      |                                   |
|                            | i031                                                        | FB231             | 1                     | i081  | FB281             | 10                    |                       |                                                      |                                   |
|                            | i032                                                        | FB232             | 1                     | i082  | FB282             | 10                    |                       |                                                      |                                   |
|                            | i033                                                        | FB233             | 1                     | i083  | FB283             | 10                    |                       |                                                      |                                   |
|                            | i034                                                        | FB234             | 20                    | i084  | FB284             | 10                    |                       |                                                      |                                   |
|                            | i035                                                        | FB235             | 20                    | i085  | FB285             | 10                    |                       |                                                      |                                   |
|                            | i036                                                        | FB236             | 20                    | i086  | FB286             | 10                    |                       |                                                      |                                   |
|                            | i037                                                        | FB237             | 20                    | i087  | FB287             | 10                    |                       |                                                      |                                   |
|                            | i038                                                        | FB238             | 20                    | i088  | FB288             | 10                    |                       |                                                      |                                   |
|                            | i039                                                        | FB239             | 20                    | i089  | FB289             | 10                    |                       |                                                      |                                   |
|                            | i040                                                        | FB240             | 1                     | i090  | FB290             | 10                    |                       |                                                      |                                   |
|                            | i041                                                        | FB241             | 1                     | i091  | FB291             | 10                    |                       |                                                      |                                   |
|                            | i042                                                        | FB242             | 1                     | i092  | FB292             | 10                    |                       |                                                      |                                   |
|                            | i043                                                        | FB243             | 1                     | i093  | FB293             | 10                    |                       |                                                      |                                   |
|                            | i044                                                        | FB244             | 1                     | i094  | FB294             | 10                    |                       |                                                      |                                   |
|                            | i045                                                        | FB245             | 1                     | i095  | FB295             | 10                    |                       |                                                      |                                   |
|                            | i046                                                        | FB246             | 10                    | i096  | FB296             | 10                    |                       |                                                      |                                   |
|                            | i047                                                        | FB247             | 10                    | i097  | FB297             | 10                    |                       |                                                      |                                   |
|                            | i048                                                        | FB248             | 10                    | i098  | FB298             | 10                    |                       |                                                      |                                   |
|                            | i049                                                        | FB249             | 10                    | i099  | FB299             | 20                    |                       |                                                      |                                   |
|                            | i050                                                        | FB250             | 1                     | i100  | FB300             | 20                    |                       |                                                      |                                   |

## 11.98 Parameter for DriveMonitor

|                                              |                                           |  |  |  |
|----------------------------------------------|-------------------------------------------|--|--|--|
| n953<br>bis<br>n959<br>(2953<br>bis<br>2959) | These parameters are used by DriveMonitor |  |  |  |
|----------------------------------------------|-------------------------------------------|--|--|--|

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.99 Technology software in basic unit, S00 option: Altering the processing sequence of function blocks

Only active with optional technology software S00

### Processing sequence of function blocks

The function blocks of the S00 technology software are processed within the computational cycle in the sequence defined in parameters U960 to U962:

1. Function block with number set in U960 index.001
- ...
100. Function block with number set in U960 index.100
101. Function block with number set in U961 index.001
- ...
200. Function block with number set in U961 index.100
201. Function block with number set in U962 index.001
- etc.

The numbers are parameterized in ascending sequence (1, 2, 3, ...) in the factory setting (standard sequence).

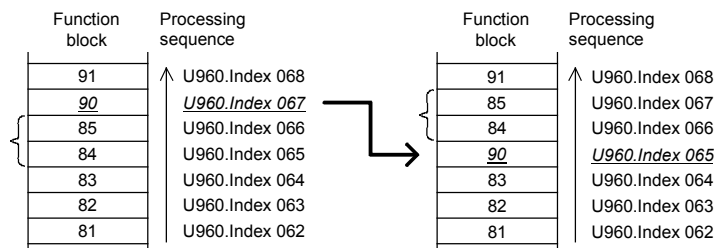
### Altering the processing sequence:

If a new function block number is entered (i.e. moved from another location) in a certain index of parameter U960, U961 or U962, then the new processing sequence is defined such that the function block previously entered in this index will be processed after the newly entered block. The gap which may be left at the old location of the moved (newly entered) function block is closed by shifting the function block numbers behind the space forward by one position.

#### Example 1:

Starting with the standard sequence setting, the processing sequence must be altered such that function block 90 (analog signal selector switch) will be processed immediately after function block 83 (tracking/storage element):

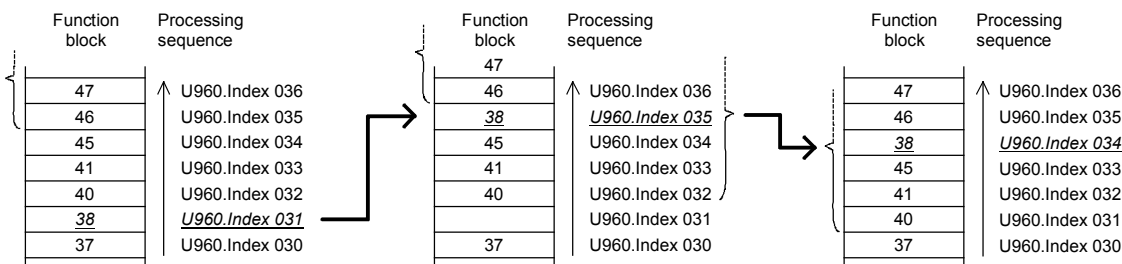
Function block no. 90 must be entered in the index in which the number of the function block previously processed after block 83 (84 in U960.9065) is currently stored. Function block numbers (84 and 85) in the following indices of U960 will be shifted up to the next index automatically.



#### Example 2:

Starting with the standard sequence setting, the processing sequence must be altered such that function block 38 (sign inverter) will be processed immediately after function block 45 (divider):

Function block number 38 must be entered in the index in which the number of the function block previously processed after function block 45 (46 in U960.i035) is currently stored. The function block numbers stored in the indices immediately above this position shift up by one index, then all numbers immediately above the gap left shift down automatically by one index.



| PNU                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Value range<br>[Unit]          | No. indices                                      | See<br>Change                     |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------|-----------------------------------|
| <b>U960</b><br>(2960)<br>*<br>S00 | <b>Processing sequence of function blocks of S00 technology software (1)</b><br><br>i001: Number of function block for 1 <sup>st</sup> place in processing sequence<br><br>i002: Number of function block for 2 <sup>nd</sup> place in processing sequence<br><br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Numbers of all function blocks | Ind: 100<br>FS=<br>Standard sequence<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>U961</b><br>(2961)<br>*<br>S00 | <b>Processing sequence of function blocks of S00 technology software (2)</b><br><br>i001: Number of function block for 101 <sup>st</sup> place in processing sequence<br><br>i002: Number of function block for 102 <sup>nd</sup> place in processing sequence<br><br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Numbers of all function blocks | Ind: 100<br>FS=<br>Standard sequence<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>U962</b><br>(2962)<br>*<br>S00 | <b>Processing sequence of function blocks of S00 technology software (3)</b><br><br>i001: Number of function block for 201 <sup>st</sup> place in processing sequence<br><br>i002: Number of function block for 202 <sup>nd</sup> place in processing sequence<br><br>etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Numbers of all function blocks | Ind: 100<br>FS=<br>Standard sequence<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline  |
| <b>U969</b><br>(2969)<br>*<br>S00 | <b>Automatic setting and activation of the execution sequence</b><br><br>0 Return<br><br>1 Set standard sequence:<br>The numbers of the function blocks are entered in ascending order in Parameters U960, U961 and U962. The parameter is then automatically set to value 0.<br><br>2 Set optimum sequence:<br>U960, U961, and U962 are set in such a way that as few deadtimes as possible occur. After that, the parameter is automatically set to value 0 again.<br><br>3 Set standard setting of the sampling times.<br>U950, U951, and U952 are set to the factory setting.<br><br>4 Automatic activation / deactivation:<br>U950, U951 and U952 are set in such a way that the unwired function blocks are deselected and the wired function blocks are selected (activated), if they are not yet selected.<br>The time slice 10 (sampling time 20 ms) is set for all function blocks not previously activated, the time slice is left unchanged for all previously activated function blocks. | 0 to 4<br>1                    | Ind: None<br>FS=0<br>Type: O2                    | P052 = 3<br>P051 = 40<br>off-line |



| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

## 11.100 Enabling of technology software in basic unit, S00 option ("freely assignable function blocks")

The S00 technology option can only be utilized on SIMOREG CM converters on which this option has been enabled by a proper PIN number. The software remains enabled after software updates, i.e. it need not be enabled again after new software has been installed.

### Permanent enabling of S00 technology option (subject to charge):

Please proceed as follows if you wish to enable the S00 technology option:

- Find out the serial number of your SIMOREG CM unit (e.g. "Q6K31253320005"):
  - The serial number is specified on the delivery note
  - The serial number is printed on the rating plate of the SIMOREG CM
  - The serial number can be displayed in parameter r069 on the OP1S
- Find out the PIN number (a number between 2001 and 65535) which matches the converter serial number:
  - If you have ordered the SIMOREG CM with S00 option, you will find the PIN number printed on a sticker on the unit and specified on the delivery note.
  - If not, please contact your local Siemens sales office to obtain the correct PIN number.
- Enter the PIN number in parameter U977 and complete your entry by pressing button <P>. This parameter is automatically reset to 0 after the entry is made. Enter the PIN number with care as you only have five attempts.
- Technology option S00 is now enabled, which can be verified in n978 = 2000.

Technology option S00 can be disabled by entering U997 = PIN - 1 (e.g. for test purposes). Parameter n978 then displays 500. The option is enabled again by entering U977 = PIN.

### Temporary enabling of S00 technology option (free of charge):

The S00 technology option can be enabled **once**, free of charge, on all converters for 500 hours of use by means of a special PIN number. This 500-hour period can be used for test purposes or for the operation of replacement units which have been ordered without the S00 option (i.e. to cover the period until a PIN number for permanent enabling is obtained).

The 500 hours are counted by the hours run counter (r048), i.e. only the time that the drive is actually switched on is counted. When the 500-hour period has expired, the S00 option is disabled automatically if the PIN number for permanent enabling has not been entered in the meantime.

The special PIN number is: U977 = **1500** (identical number for all units)

Temporary enabling of the option can be interrupted with PIN U977 = **500**. The remaining time credit remains valid for the next period of use with the temporarily enabling PIN number.

Alarm **A059** is output if the time credit is less than 50 hours and the S00 technology option is temporarily enabled.

Fault message **F059** is displayed if the time credit of 500 hours has run out and the S00 option is still temporarily enabled.

### System response when S00 technology option is not enabled:

The connectors and binectors associated with freely assignable function blocks are not updated (they are set to 0 when the electronics voltage is connected; when the time credit for temporary enabling has run out, they remain frozen at the last recorded values until the electronics voltage is disconnected again).

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                               |                                  |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------|----------------------------------|
| <b>U977</b><br>(2977)<br>*<br>S00 | <b>PIN number for S00 option</b><br><br>This parameter is automatically reset to "0" after entry of the PIN number. Take care to enter the PIN number correctly. You are only allowed up to 5 attempts!                                                                                                                                                                                                                                                                                                                             | 0 to 65535<br>1    | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>Offline |
| <b>n978</b><br>(2978)<br><br>S00  | <b>"S00 enabled" display</b><br><br>0      The optional S00 technology software is disabled<br>The time credit for temporary enabling has run out<br><br>xxx    The optional S00 technology software is not enabled.<br>xxx = number of credit hours which are still available for use<br>under temporary enabling PIN number<br><br>1xxx   The optional S00 technology software is temporarily enabled.<br>xxx = number of credit hours still available<br><br>2000   The optional S00 technology software is permanently enabled. | see column on left | Ind: None<br>Type: O2         | P052 = 3                         |

| PNU | Description | Value range<br>[Unit] | No. indices | See<br>Change |
|-----|-------------|-----------------------|-------------|---------------|
|-----|-------------|-----------------------|-------------|---------------|

### 11.101 Parameter access for experts

|                            |                                                                                                                                                                                                                                                                                                                                                                                                       |                |                               |                                  |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------|----------------------------------|
| <b>U979</b><br>(2979)<br>* | <b>Parameter access for experts</b> [SW 1.9 and later]<br><br>999 Parameter access for experts is activated.<br>This means that even offline parameters can be modified in operation.<br><br>Notes:<br>The value of this parameter is lost when the electronics power supply is switched off.<br>Parameters can be modified only if both P051 and P052 as well as P927 are set to the correct values. | 0 to 2000<br>1 | Ind: None<br>FS=0<br>Type: O2 | P052 = 3<br>P051 = 40<br>on-line |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------|----------------------------------|

### 11.102 List of existing and modified U and n parameters

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |                      |          |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------|----------|
| <b>n980</b><br>(2980) | <b>List of existing parameter numbers, continuation</b><br><br>Viewing parameter for displaying the first 100 parameter numbers in the U or n parameter range (numbers 2000 to 2999).<br>The parameters are arranged in ascending sequence.<br>The list is continued in the parameter whose number is displayed in index 101. This means, for example,<br>2981 = n981<br><br>The first 0 to be displayed signals that no further parameter numbers are stored. |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n981</b><br>(2981) | <b>List of existing parameter numbers, continuation</b><br>See n980.                                                                                                                                                                                                                                                                                                                                                                                           |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n982</b><br>(2982) | <b>List of existing parameter numbers, continuation</b><br>See n980.                                                                                                                                                                                                                                                                                                                                                                                           |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n983</b><br>(2983) | <b>List of existing parameter numbers, continuation</b><br>See n980.                                                                                                                                                                                                                                                                                                                                                                                           |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n984</b><br>(2984) | <b>List of existing parameter numbers, continuation</b><br>See n980.                                                                                                                                                                                                                                                                                                                                                                                           |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n985</b><br>(2985) | <b>List of existing parameter numbers, continuation</b><br>See n980.                                                                                                                                                                                                                                                                                                                                                                                           |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n986</b><br>(2986) | <b>List of existing parameter numbers, continuation</b><br>See n980.                                                                                                                                                                                                                                                                                                                                                                                           |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n987</b><br>(2987) | <b>List of existing parameter numbers, continuation</b><br>See n980.                                                                                                                                                                                                                                                                                                                                                                                           |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n988</b><br>(2988) | <b>List of existing parameter numbers, continuation</b><br>See n980.                                                                                                                                                                                                                                                                                                                                                                                           |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n989</b><br>(2989) | <b>List of existing parameter numbers, continuation</b><br>See n980.                                                                                                                                                                                                                                                                                                                                                                                           |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n990</b><br>(2990) | <b>List of modified parameters, continuation</b><br><br>Viewing parameter for displaying the first 100 modified parameters in the U or n parameter range (numbers 2000 to 2999).<br>The parameters are arranged in ascending sequence.<br>The list is continued in the parameter whose number is displayed in index 101. This means, for example,<br>2991 = n991<br><br>The first 0 to be displayed signals that there are no further modified parameters.     |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n991</b><br>(2991) | <b>List of modified parameters, continuation</b><br>See n990.                                                                                                                                                                                                                                                                                                                                                                                                  |  | Ind: 101<br>Type: O2 | P052 = 3 |
| <b>n992</b><br>(2992) | <b>List of modified parameters, continuation</b><br>See n990.                                                                                                                                                                                                                                                                                                                                                                                                  |  | Ind: 101<br>Type: O2 | P052 = 3 |

| PNU                   | Description                                                   | Value range<br>[Unit] | No. indices          | See<br>Change |
|-----------------------|---------------------------------------------------------------|-----------------------|----------------------|---------------|
| <b>n993</b><br>(2993) | <b>List of modified parameters, continuation</b><br>See n990. |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| <b>n994</b><br>(2994) | <b>List of modified parameters, continuation</b><br>See n990. |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| <b>n995</b><br>(2995) | <b>List of modified parameters, continuation</b><br>See n990. |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| <b>n996</b><br>(2996) | <b>List of modified parameters, continuation</b><br>See n990. |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| <b>n997</b><br>(2997) | <b>List of modified parameters, continuation</b><br>See n990. |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| <b>n998</b><br>(2998) | <b>List of modified parameters, continuation</b><br>See n990. |                       | Ind: 101<br>Type: O2 | P052 = 3      |
| <b>n999</b><br>(2999) | <b>List of modified parameters, continuation</b><br>See n990. |                       | Ind: 101<br>Type: O2 | P052 = 3      |

# List of connectors and binectors

## 12.1 Connector list

The values of connectors can be displayed via parameters r041, r042, r043 and P044.

The following numeric representation applies to all connectors:

In the internal software representation, 100% corresponds to the number 4000 hex = 16384 dec. The value range is -200.00% ... +199.99%, corresponding to 8000 hex ... 7FFF hex. The connectors are transferred via the serial interfaces in this internal mode of representation.

100% corresponds to converter rated quantities r072.i02 (currents, armature), r073.i02 (currents, field), P078.i01 (line voltages, armature).

| Connector            | Description                                                                                                               | Normalization            | Function<br>diag., Sheet |
|----------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|
| <b>Fixed values</b>  |                                                                                                                           |                          |                          |
| <b>K0000</b>         | Fixed value 0                                                                                                             |                          | G120                     |
| <b>K0001</b>         | Fixed value 100.00%                                                                                                       | $16384 \triangleq 100\%$ | G120                     |
| <b>K0002</b>         | Fixed value 200.00%                                                                                                       | $16384 \triangleq 100\%$ | G120                     |
| <b>K0003</b>         | Fixed value -100.00%                                                                                                      | $16384 \triangleq 100\%$ | G120                     |
| <b>K0004</b>         | Fixed value -200.00%                                                                                                      | $16384 \triangleq 100\%$ | G120                     |
| <b>K0005</b>         | Fixed value 50.00%                                                                                                        | $16384 \triangleq 100\%$ | G120                     |
| <b>K0006</b>         | Fixed value 150.00%                                                                                                       | $16384 \triangleq 100\%$ | G120                     |
| <b>K0007</b>         | Fixed value -50.00%                                                                                                       | $16384 \triangleq 100\%$ | G120                     |
| <b>K0008</b>         | Fixed value -150.00%                                                                                                      | $16384 \triangleq 100\%$ | G120                     |
| <b>K0009</b>         | Fixed value 0 or special function specified in each case                                                                  |                          |                          |
| <b>Analog inputs</b> |                                                                                                                           |                          |                          |
| <b>K0010</b>         | Analog input, terminal 4 / 5 (main setpoint)<br>Raw value after A/D conversion (unfiltered, not normalized)               | $16384 \triangleq 100\%$ | G113                     |
| <b>K0011</b>         | Analog input, terminal 4 / 5 (main setpoint)<br>After normalization, offset injection, filtering                          | $16384 \triangleq 100\%$ | G113                     |
| <b>K0012</b>         | Analog input, terminal 103 / 104 (main actual value)<br>Raw value after A/D conversion (unfiltered, not normalized)       | $16384 \triangleq 100\%$ | G113                     |
| <b>K0013</b>         | Analog input, terminal 103 / 104 (main actual value)<br>After normalization, offset injection, filtering                  | $16384 \triangleq 100\%$ | G113                     |
| <b>K0014</b>         | Analog input, terminal 6 / 7 (analog selectable input 1)<br>Raw value after A/D conversion (unfiltered, not normalized)   | $16384 \triangleq 100\%$ | G113                     |
| <b>K0015</b>         | Analog input, terminal 6 / 7 (analog selectable input 1)<br>After normalization, offset injection, filtering              | $16384 \triangleq 100\%$ | G113                     |
| <b>K0016</b>         | Analog input, terminal 8 / 9 (analog selectable input 2)<br>Raw value after A/D conversion (unfiltered, not normalized)   | $16384 \triangleq 100\%$ | G114                     |
| <b>K0017</b>         | Analog input, terminal 8 / 9 (analog selectable input 2)<br>After normalization, offset injection, filtering              | $16384 \triangleq 100\%$ | G114                     |
| <b>K0018</b>         | Analog input, terminal 10 / 11 (analog selectable input 3)<br>Raw value after A/D conversion (unfiltered, not normalized) | $16384 \triangleq 100\%$ | G114                     |
| <b>K0019</b>         | Analog input, terminal 10 / 11 (analog selectable input 3)<br>After normalization, offset injection, filtering            | $16384 \triangleq 100\%$ | G114                     |

| Connector                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Normalization    | Function<br>diag., Sheet |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------|
| <b>Binary inputs, binary outputs</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                          |
| <b>K0020</b>                         | Binary inputs, terminals 36 to 43 and 211 to 214, E Stop<br>Bit0 = Status of terminal 36<br>Bit1 = Status of terminal 37<br>Bit2 = Status of terminal 38<br>Bit3 = Status of terminal 39<br>Bit4 = Status of terminal 40<br>Bit5 = Status of terminal 41<br>Bit6 = Status of terminal 42<br>Bit7 = Status of terminal 43<br>Bit8 = Status of terminal 211<br>Bit9 = Status of terminal 212<br>Bit10 = Status of terminal 213<br>Bit11 = Status of terminal 214<br>Bit12 = 0 ... E Stop is active<br>1 ... No E Stop is active | $1 \triangleq 1$ | G110                     |
| <b>K0021</b>                         | Binary outputs, terminals 46 to 52, 109/110, 120/121<br>Bit0 = Status of terminal 46<br>Bit1 = Status of terminal 48<br>Bit2 = Status of terminal 50<br>Bit3 = Status of terminal 52<br>Bit6 = Status of terminal 120/121<br>Bit7 = Status of terminal 109/110                                                                                                                                                                                                                                                                | $1 \triangleq 1$ | G112<br>G117             |

|                       |                                 |                          |      |
|-----------------------|---------------------------------|--------------------------|------|
| <b>Analog outputs</b> |                                 |                          |      |
| <b>K0026</b>          | Analog output, terminal 14 / 15 | $16384 \triangleq 100\%$ | G115 |
| <b>K0027</b>          | Analog output, terminal 16 / 17 | $16384 \triangleq 100\%$ | G115 |
| <b>K0028</b>          | Analog output, terminal 18 / 19 | $16384 \triangleq 100\%$ | G116 |
| <b>K0029</b>          | Analog output, terminal 20 / 21 | $16384 \triangleq 100\%$ | G116 |

|                                  |                                             |                  |      |
|----------------------------------|---------------------------------------------|------------------|------|
| <b>Control word, status word</b> |                                             |                  |      |
| <b>K0030</b>                     | Control word 1                              | $1 \triangleq 1$ | G180 |
| <b>K0031</b>                     | Control word 2                              | $1 \triangleq 1$ | G181 |
| <b>K0032</b>                     | Status word 1                               | $1 \triangleq 1$ | G182 |
| <b>K0033</b>                     | Status word 2                               | $1 \triangleq 1$ | G183 |
| <b>K0034</b>                     | Active function data set [SW 2.0 and later] | $1 \triangleq 1$ | G175 |
| <b>K0035</b>                     | Active BICO data set [SW 2.0 and later]     | $1 \triangleq 1$ | G175 |

|                                                  |                                                          |                          |      |
|--------------------------------------------------|----------------------------------------------------------|--------------------------|------|
| <b>Evaluation of the pulse encoder board SBP</b> |                                                          |                          |      |
| <b>KK0036</b>                                    | Position actual value of SBP [SW 2.0 and later]          | $1 \triangleq 1$         | Z120 |
| <b>K0038</b>                                     | Actual speed value of SBP in rev./min [SW 2.0 and later] | $1 \triangleq 1$ rpm     | Z120 |
| <b>K0039</b>                                     | Actual speed value of SBP                                | $16384 \triangleq 100\%$ | Z120 |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                |                          |      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------|------|
| <b>Pulse encoder evaluation</b><br>The pulse encoder evaluation function supplies an actual speed value (K0040 und K0041) and an actual position value (K0042, K0043, K0044, KK0046).<br>The pulses of the pulse encoder are counted according to sign to generate the actual position value (a hardware counter is used for this purpose.)<br>The setting in parameter P144 (multiple evaluation) is also relevant,<br>i.e. when P144 = 0, every positive edge of the first track of the pulse encoder is counted,<br>when P144 = 1, every edge of the first track of the encoder is counted,<br>when P144 = 2, every edge of both tracks of the encoder is counted.<br>When P145 = 1 (automatic switchover of multiple evaluation), the position sensor (K0042, K0043, K0044, KK0046) produces invalid data!<br>K0042 and K0043 together form a signed 24-bit actual position value.<br>(value range: FF80 0000H to 007F FFFFH or $-2^{23}$ to $+2^{23}-1$ ) |                                                |                          |      |
| <b>K0040</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Actual speed value from pulse encoder          | $16384 \triangleq 100\%$ | G145 |
| <b>K0041</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Absolute actual speed value from pulse encoder | $16384 \triangleq 100\%$ | G145 |

| Connector     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Normalization                | Function diag., Sheet |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------|
| <b>K0042</b>  | Actual position value, LOW word<br>LOW word of 24-bit actual position value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | $1 \triangleq 1$             | G145                  |
| <b>K0043</b>  | Actual position value, HIGH word<br>HIGH word of 24-bit actual position value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | $1 \triangleq 1$             | G145                  |
| <b>K0044</b>  | Actual position value, number of zero markers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | $1 \triangleq 1$             | G145                  |
| <b>KK0046</b> | Actual position value [SW 1.9 and later]<br>Actual position value extended in the software to a 32-bit value<br>(value range: 8000 0000H to 7FFF FFFFH or $-2^{31}$ to $+2^{31}-1$ )                                                                                                                                                                                                                                                                                                                                                                                                                      | $1 \triangleq 1$             | G145                  |
| <b>KK0047</b> | Deceleration distance [SW 1.9 and later]<br>When setpoint 0 is applied to the ramp-function generator input, the speed setpoint at the generator output is reduced to zero according to the current settings for ramp-down and transition roundings.<br>This double-word connector specifies the requisite deceleration distance as the number of increments of the pulse encoder (defined in parameters P140 ff.).<br>This deceleration distance calculation is correct only on the condition that the parameterized ramp-down time and transition roundings do not change during the braking operation. | $1 \triangleq 1$             | G136                  |
| <b>K0048</b>  | Actual speed value from pulse encoder in rpm [SW 2.0 and later]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | $1 \triangleq 1 \text{ rpm}$ | G145                  |

| Heatsink temperature |                      |                                        |      |
|----------------------|----------------------|----------------------------------------|------|
| <b>K0050</b>         | Heatsink temperature | $16384 \triangleq 100^{\circ}\text{C}$ | G114 |

| Motor interface                                                                                         |                                                         |                                        |      |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------------|------|
| K0050 is always set to 0 when a PTC thermistor or no temperature sensor is connected (P490.x $\neq$ 1). |                                                         |                                        |      |
| <b>K0051</b>                                                                                            | Motor temperature 1 (from sensor to terminal 22 / 23)   | $16384 \triangleq 100^{\circ}\text{C}$ | G185 |
| <b>K0052</b>                                                                                            | Motor temperature 2 (from sensor to terminal 204 / 205) | $16384 \triangleq 100^{\circ}\text{C}$ | G185 |

| Closed-loop armature current control, auto-reversing stage, armature gating unit |                                                                                                                                                                     |                                                                                              |      |
|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------|
| <b>K0100</b>                                                                     | Firing angle (armature)                                                                                                                                             | $16384 \triangleq 0^{\circ}$<br>$0 \triangleq 90^{\circ}$<br>$-16384 \triangleq 180^{\circ}$ | G163 |
| <b>K0101</b>                                                                     | Firing angle (armature) before limitation                                                                                                                           | $16384 \triangleq 0^{\circ}$<br>$0 \triangleq 90^{\circ}$<br>$-16384 \triangleq 180^{\circ}$ | G163 |
| <b>K0102</b>                                                                     | Precontrol value + armature current controller output<br>(gating unit input)                                                                                        | $16384 \triangleq 0^{\circ}$<br>$0 \triangleq 90^{\circ}$<br>$-16384 \triangleq 180^{\circ}$ | G162 |
| <b>K0103</b>                                                                     | $100\% \cdot \frac{\text{duration of current flow}}{\text{time between 2 firing pulses}}$ [SW 2.0 and later]                                                        | $16384 \triangleq 100\%$                                                                     | G162 |
| <b>K0105</b>                                                                     | Code of triggered thyristor pair in a thyristor bridge for switching through the corresponding line phase:<br>0 UV      2 UW      4 VW<br>6 VU      8 WU      10 WV | $1 \triangleq 1$                                                                             |      |
| <b>K0106</b>                                                                     | Selected torque direction                                                                                                                                           | 0 = No torque direction<br>1 = Torque direction I<br>2 = Torque direction II                 | G163 |
| <b>K0107</b>                                                                     | Internal actual current value, signed (armature), averaged over the last 6 current peaks in each case, normalized to rated motor current [SW 1.9 and later]         | $16384 \triangleq 100\%$ of P100                                                             | G162 |
| <b>K0109</b>                                                                     | Internal signed actual current value (armature), averaged over the last 6 current peaks in each case                                                                | $16384 \triangleq 100\%$                                                                     | G162 |
| <b>K0110</b>                                                                     | Current controller output (armature)                                                                                                                                | $16384 \triangleq 100\%$                                                                     | G162 |
| <b>K0111</b>                                                                     | Current controller output, P component (armature)                                                                                                                   | $16384 \triangleq 100\%$                                                                     | G162 |
| <b>K0112</b>                                                                     | Current controller output, I component (armature)                                                                                                                   | $16384 \triangleq 100\%$                                                                     | G162 |
| <b>K0113</b>                                                                     | Current controller actual value/setpoint deviation (armature)                                                                                                       | $16384 \triangleq 100\%$                                                                     | G162 |
| <b>K0114</b>                                                                     | Internal signed actual current value (armature), averaged over one firing cycle                                                                                     | $16384 \triangleq 100\%$                                                                     | G162 |

| Connector | Description                                                                                                                                                                                                                                                                                                                                                                                  | Normalization                                                        | Function diag., Sheet |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------|
| K0115     | Current controller actual value (armature)                                                                                                                                                                                                                                                                                                                                                   | 16384 $\triangle$ 100%                                               | G162                  |
| K0116     | Absolute value of internal actual current (armature)                                                                                                                                                                                                                                                                                                                                         | 16384 $\triangle$ 100%                                               | G162                  |
| K0117     | Internal signed actual current value (armature)                                                                                                                                                                                                                                                                                                                                              | 16384 $\triangle$ 100%                                               | G162                  |
| K0118     | Current controller setpoint (armature)                                                                                                                                                                                                                                                                                                                                                       | 16384 $\triangle$ 100%                                               | G162                  |
| K0119     | Current controller setpoint (armature) before absolute-value generation                                                                                                                                                                                                                                                                                                                      | 16384 $\triangle$ 100%                                               | G162                  |
| K0120     | Current setpoint (armature) before reduced gear stressing                                                                                                                                                                                                                                                                                                                                    | 16384 $\triangle$ 100%                                               | G161                  |
| K0121     | Precontrol output (armature)                                                                                                                                                                                                                                                                                                                                                                 | 16384 $\triangle$ 0°<br>0 $\triangle$ 90°<br>-16384 $\triangle$ 180° | G162                  |
| K0122     | EMF which is applied as an input value for the armature precontrol (generated from K0123 or K0124 depending on P162, filtered acc. to P163)                                                                                                                                                                                                                                                  | 16384 $\triangle$ P078.001 * $\frac{3\sqrt{2}}{\pi}$                 | G162                  |
| K0123     | EMF= $U_a - I_a * R_a - L_a * di_a/dt$ , where the <u>measured</u> armature voltage is applied as $U_a$ (Note: K0287 is the result of PT1 filtering with 10ms)                                                                                                                                                                                                                               | 16384 $\triangle$ P078.001 * $\frac{3\sqrt{2}}{\pi}$                 |                       |
| K0124     | EMF= $U_a - I_a * R_a - L_a * di_a/dt$ , where the armature voltage <u>calculated</u> from the delay angle, measured armature conduction interval and mean line voltage is applied as $U_a$ . If this calculation cannot be made or is insufficiently accurate (e.g. with a conduction angle < 10°, average armature current value < 2 % in r072.002), K0124 assumes the value set in K0123. | 16384 $\triangle$ P078.001 * $\frac{3\sqrt{2}}{\pi}$                 |                       |
| K0125     | Armature current setpoint after reduced gearbox stressing or current setpoint integrator                                                                                                                                                                                                                                                                                                     |                                                                      | G162                  |

**Current limitation**

|       |                                                                           |                        |      |
|-------|---------------------------------------------------------------------------|------------------------|------|
| K0131 | Lowest positive current limit (armature)                                  | 16384 $\triangle$ 100% | G161 |
| K0132 | Highest negative current limit (armature)                                 | 16384 $\triangle$ 100% | G161 |
| K0133 | Current setpoint (armature) before limitation (incl. additional setpoint) | 16384 $\triangle$ 100% | G161 |
| K0134 | Current setpoint (armature) before torque limitation                      | 16384 $\triangle$ 100% | G160 |

**Torque limitation, speed limiting controller**Normalization of torque connectors:

An armature current corresponding to 100% of the converter rated DC current (r072.002) with a motor flux (K0290) corresponding to 100 % of the rated motor field current (P102) produces a torque of 100%.

Note:

Whether connectors K0140, K0141, K0145 and K0147 act as the torque setpoint or the current setpoint depends on P170 (setting determines which quantity is divided by motor flux).

|       |                                                                 |                        |      |
|-------|-----------------------------------------------------------------|------------------------|------|
| K0136 | Speed limiting controller, active torque limit 1                | 16384 $\triangle$ 100% | G160 |
| K0137 | Speed limiting controller, active torque limit 2                | 16384 $\triangle$ 100% | G160 |
| K0140 | Torque setpoint (after speed limiting controller)               | 16384 $\triangle$ 100% | G160 |
| K0141 | Torque setpoint (after torque limitation)                       | 16384 $\triangle$ 100% | G160 |
| K0142 | Actual torque value                                             | 16384 $\triangle$ 100% | G162 |
| K0143 | Upper torque limit                                              | 16384 $\triangle$ 100% | G160 |
| K0144 | Lower torque limit                                              | 16384 $\triangle$ 100% | G160 |
| K0145 | Torque setpoint before limitation (incl. additional setpoint)   | 16384 $\triangle$ 100% | G160 |
| K0147 | Torque setpoint before limitation (without additional setpoint) | 16384 $\triangle$ 100% | G160 |
| K0148 | Torque setpoint (from speed controller)                         | 16384 $\triangle$ 100% | G152 |
| K0149 | Torque actual value related to P100 * P102 [SW 2.0 and later]   | 16384 $\triangle$ 100% | G162 |

**Compensation of moment of inertia (dv/dt injection)**

|       |                                                                                                                                               |                        |      |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------|
| K0150 | Component of precontrol for speed controller calculated from $d(K0168)/dt * P540$                                                             | 16384 $\triangle$ 100% | G153 |
| K0152 | Component of precontrol for speed controller calculated from $f(K0164) * P541$ (= function of speed actual value/setpoint deviation in K0164) | 16384 $\triangle$ 100% | G153 |



| Connector                                                                                        | Description                                                                           | Normalization          | Function diag., Sheet |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------|-----------------------|
| <b>Speed controller</b>                                                                          |                                                                                       |                        |                       |
| <b>Setpoint processing, ramp-function generator, friction and moment of inertia compensation</b> |                                                                                       |                        |                       |
| K0160                                                                                            | Speed controller output                                                               | 16384 $\triangle$ 100% | G152                  |
| K0161                                                                                            | P component                                                                           | 16384 $\triangle$ 100% | G152                  |
| K0162                                                                                            | I component                                                                           | 16384 $\triangle$ 100% | G152                  |
| K0164                                                                                            | Setpoint/actual value deviation                                                       | 16384 $\triangle$ 100% | G152                  |
| K0165                                                                                            | Generation of setpoint/actual value deviation output                                  | 16384 $\triangle$ 100% | G152                  |
| K0166                                                                                            | Selected actual speed value (absolute value)                                          | 16384 $\triangle$ 100% | G151                  |
| K0167                                                                                            | Selected actual speed value (signed)                                                  | 16384 $\triangle$ 100% | G151                  |
| K0168                                                                                            | D component output * (-1)                                                             | 16384 $\triangle$ 100% | G152                  |
| K0169                                                                                            | D component output                                                                    | 16384 $\triangle$ 100% | G152                  |
| K0170                                                                                            | Speed setpoint from ramp-function generator after limitation                          | 16384 $\triangle$ 100% | G137                  |
| K0171                                                                                            | Precontrol for speed controller (friction and moment of inertia compensation)         | 16384 $\triangle$ 100% | G153                  |
| K0172                                                                                            | Component of precontrol determined by friction for speed controller                   | 16384 $\triangle$ 100% | G153                  |
| K0173                                                                                            | Filtered component of precontrol determined by moment of inertia for speed controller | 16384 $\triangle$ 100% | G153                  |
| K0174                                                                                            | Filtering element output for nset filtering                                           | 16384 $\triangle$ 100% | G152                  |
| K0176                                                                                            | Speed droop                                                                           | 16384 $\triangle$ 100% | G151                  |
| K0177                                                                                            | Band-stop output 1                                                                    | 16384 $\triangle$ 100% | G152                  |
| K0178                                                                                            | Band-stop output 2                                                                    | 16384 $\triangle$ 100% | G152                  |
| K0179                                                                                            | Filtering element output for nact filtering                                           | 16384 $\triangle$ 100% | G152                  |
| K0181                                                                                            | Lowest positive setpoint limit                                                        | 16384 $\triangle$ 100% | G137                  |
| K0182                                                                                            | Highest negative setpoint limit                                                       | 16384 $\triangle$ 100% | G137                  |
| K0183                                                                                            | Speed setpoint before limitation                                                      | 16384 $\triangle$ 100% | G137                  |
| K0190                                                                                            | Ramp-function generator output (before speed setpoint limitation)                     | 16384 $\triangle$ 100% | G136                  |
| K0191                                                                                            | dv/dt (rise in ramp-function generator output in time period set in P542)             | 16384 $\triangle$ 100% | G136                  |
| K0192                                                                                            | Effective ramp-function generator input variable                                      | 16384 $\triangle$ 100% | G136                  |
| K0193                                                                                            | Setpoint input for ramp-function generator                                            | 16384 $\triangle$ 100% | G135                  |
| K0194                                                                                            | Total of main setpoint (limited) + additional setpoint                                | 16384 $\triangle$ 100% | G135                  |
| K0195                                                                                            | Ramp-function generator input before the setpoint reduction                           | 16384 $\triangle$ 100% | G135                  |
| K0196                                                                                            | Effective positive limit for main setpoint                                            | 16384 $\triangle$ 100% | G135                  |
| K0197                                                                                            | Effective negative limit for main setpoint                                            | 16384 $\triangle$ 100% | G135                  |
| K0198                                                                                            | Main setpoint before limitation                                                       | 16384 $\triangle$ 100% | G135                  |

|                                                                         |                                                   |                        |      |
|-------------------------------------------------------------------------|---------------------------------------------------|------------------------|------|
| <b>Crawling setpoint, inching setpoint, oscillation, fixed setpoint</b> |                                                   |                        |      |
| K0201                                                                   | Crawling setpoint                                 | 16384 $\triangle$ 100% | G130 |
| K0202                                                                   | Inching setpoint                                  | 16384 $\triangle$ 100% | G129 |
| K0203                                                                   | Oscillation setpoint                              | 16384 $\triangle$ 100% | G128 |
| K0204                                                                   | Fixed setpoint                                    | 16384 $\triangle$ 100% | G127 |
| K0206                                                                   | Crawling setpoint: Output value of function block | 16384 $\triangle$ 100% | G130 |
| K0207                                                                   | Inching setpoint: Output value of function block  | 16384 $\triangle$ 100% | G129 |
| K0208                                                                   | Oscillation: Output value of function block       | 16384 $\triangle$ 100% | G128 |
| K0209                                                                   | Fixed setpoint: Output value of function block    | 16384 $\triangle$ 100% | G127 |

|                                    |                                       |                                    |      |
|------------------------------------|---------------------------------------|------------------------------------|------|
| <b>Connector selector switches</b> |                                       |                                    |      |
| K0230                              | Output of connector selector switch 1 | [SW 1.9 and later] 1 $\triangle$ 1 | G124 |
| K0231                              | Output of connector selector switch 2 | [SW 1.9 and later] 1 $\triangle$ 1 | G124 |



| Connector                      | Description                                                                      | Normalization          | Function diag., Sheet |
|--------------------------------|----------------------------------------------------------------------------------|------------------------|-----------------------|
| <b>Motorized potentiometer</b> |                                                                                  |                        |                       |
| K0240                          | Motorized potentiometer output (setpoint from potentiometer)                     | 16384 $\triangle$ 100% | G126                  |
| K0241                          | dy/dt (rise in ramp-function generator output in time period set in P542 + P465) | 16384 $\triangle$ 100% | G126                  |
| K0242                          | Ramp-function generator input in motorized potentiometer (setpoint)              | 16384 $\triangle$ 100% | G126                  |

|                                                             |                                                                        |                                                                      |      |
|-------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------|------|
| <b>Closed-loop field current control, field gating unit</b> |                                                                        |                                                                      |      |
| K0250                                                       | Firing angle (field)                                                   | 16384 $\triangle$ 0°<br>0 $\triangle$ 90°<br>-16384 $\triangle$ 180° | G166 |
| K0251                                                       | Firing angle (field) before limitation                                 | 16384 $\triangle$ 0°<br>0 $\triangle$ 90°<br>-16384 $\triangle$ 180° | G166 |
| K0252                                                       | Precontrol value + field current controller output (gating unit input) | 16384 $\triangle$ 0°<br>0 $\triangle$ 90°<br>-16384 $\triangle$ 180° | G166 |
| K0260                                                       | Current controller output (field)                                      | 16384 $\triangle$ 100%                                               | G166 |
| K0261                                                       | Current controller P component (field)                                 | 16384 $\triangle$ 100%                                               | G166 |
| K0262                                                       | Current controller I component (field)                                 | 16384 $\triangle$ 100%                                               | G166 |
| K0263                                                       | Current controller setpoint/actual value deviation (field)             | 16384 $\triangle$ 100%                                               | G166 |
| K0265                                                       | Actual value at field current controller input                         | 16384 $\triangle$ 100%                                               | G166 |
| K0266                                                       | Absolute internal actual current value (field)                         | 16384 $\triangle$ 100%                                               | G166 |
| K0268                                                       | Setpoint at field current controller input                             | 16384 $\triangle$ 100%                                               | G166 |
| K0271                                                       | Precontrol output (field)                                              | 16384 $\triangle$ 100%                                               | G166 |

|                                |                                                                           |                                                                                          |      |
|--------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------|
| <b>Closed-loop EMF control</b> |                                                                           |                                                                                          |      |
| K0273                          | Lowest positive current limit (field)                                     | 16384 $\triangle$ 100%                                                                   | G165 |
| K0274                          | Lowest negative current limit (field)                                     | 16384 $\triangle$ 100%                                                                   | G165 |
| K0275                          | Current controller setpoint (field) before standstill field               | 16384 $\triangle$ 100%                                                                   | G165 |
| K0276                          | Current controller setpoint (field) before limitation                     | 16384 $\triangle$ 100%                                                                   | G165 |
| K0277                          | Current controller setpoint (field) before summing stage at limiter input | 16384 $\triangle$ 100%                                                                   | G165 |
| K0278                          | Precontrol value + EMF controller output                                  | 16384 $\triangle$ 100%                                                                   | G165 |
| K0280                          | EMF controller output                                                     | 16384 $\triangle$ 100%                                                                   | G165 |
| K0281                          | P component of EMF controller                                             | 16384 $\triangle$ 100%                                                                   | G165 |
| K0282                          | I component of EMF controller                                             | 16384 $\triangle$ 100%                                                                   | G165 |
| K0283                          | EMF controller, setpoint/actual value deviation                           | 16384 $\triangle$ 100%                                                                   | G165 |
| K0284                          | EMF controller, setpoint/actual value deviation after droop               | 16384 $\triangle$ 100%                                                                   | G165 |
| K0285                          | EMF controller actual value                                               | 16384 $\triangle$ P078.001* $\frac{3\sqrt{2}}{\pi}$                                      | G165 |
| K0286                          | Absolute value of actual EMF                                              | 16384 $\triangle$ P078.001* $\frac{3\sqrt{2}}{\pi}$                                      | G165 |
| K0287                          | Signed actual EMF value                                                   | 16384 $\triangle$ P078.001* $\frac{3\sqrt{2}}{\pi}$                                      | G165 |
| K0288                          | EMF controller setpoint                                                   | 16384 $\triangle$ P078.001* $\frac{3\sqrt{2}}{\pi}$                                      | G165 |
| K0289                          | EMF setpoint                                                              | 16384 $\triangle$ P078.001* $\frac{3\sqrt{2}}{\pi}$                                      | G165 |
| K0290                          | Motor flux                                                                | 16384 $\triangle$ 100%<br>100% motor flux is reached at rated motor field current (P102) | G166 |
| K0291                          | Absolute actual armature voltage                                          | 16384 $\triangle$ P078.001* $\frac{3\sqrt{2}}{\pi}$                                      |      |

| Connector | Description                    | Normalization                                           | Function diag., Sheet |
|-----------|--------------------------------|---------------------------------------------------------|-----------------------|
| K0292     | Signed actual armature voltage | $16384 \triangleq P078.001 \cdot \frac{3\sqrt{2}}{\pi}$ |                       |
| K0293     | Precontrol output (EMF)        | $16384 \triangleq 100\%$                                | G165                  |

| General connectors |                                                                                                                                                                                              |                             |      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------|
| K0301              | Line voltage U-V (armature)                                                                                                                                                                  | $16384 \triangleq P078.001$ |      |
| K0302              | Line voltage V-W (armature)                                                                                                                                                                  | $16384 \triangleq P078.001$ |      |
| K0303              | Line voltage W-U (armature)                                                                                                                                                                  | $16384 \triangleq P078.001$ |      |
| K0304              | Line voltage (field)                                                                                                                                                                         | $16384 \triangleq 400V$     |      |
| K0305              | Average line voltage (armature), filtered                                                                                                                                                    | $16384 \triangleq P078.001$ |      |
| K0306              | Line frequency                                                                                                                                                                               | $16384 \triangleq 50,0Hz$   |      |
| K0307              | Motor power output<br><u>Normalization:</u> $16384 \triangleq P100 * (P101 - P100 * P110)$                                                                                                   | see Column 2                |      |
| K0309              | Calculated motor temperature rise<br><u>Normalization:</u> $16384 \triangleq$ the overtemperature which is reached at a continuous current corresponding to the rated motor armature current | see Column 2                |      |
| K0310              | no meaning                                                                                                                                                                                   |                             |      |
| K0311              | Hours run [SW 1.9 and later]                                                                                                                                                                 | $1 \triangleq 1h$           | G189 |

| Fixed setpoints |                       |                          |      |
|-----------------|-----------------------|--------------------------|------|
| K0401           | Fixed value 1 (P401)  | $16384 \triangleq 100\%$ | G120 |
| K0402           | Fixed value 2 (P402)  | $16384 \triangleq 100\%$ | G120 |
| K0403           | Fixed value 3 (P403)  | $16384 \triangleq 100\%$ | G120 |
| K0404           | Fixed value 4 (P404)  | $16384 \triangleq 100\%$ | G120 |
| K0405           | Fixed value 5 (P405)  | $16384 \triangleq 100\%$ | G120 |
| K0406           | Fixed value 6 (P406)  | $16384 \triangleq 100\%$ | G120 |
| K0407           | Fixed value 7 (P407)  | $16384 \triangleq 100\%$ | G120 |
| K0408           | Fixed value 8 (P408)  | $16384 \triangleq 100\%$ | G120 |
| K0409           | Fixed value 9 (P409)  | $16384 \triangleq 100\%$ | G120 |
| K0410           | Fixed value 10 (P410) | $16384 \triangleq 100\%$ | G120 |
| K0411           | Fixed value 11 (P411) | $16384 \triangleq 100\%$ | G120 |
| K0412           | Fixed value 12 (P412) | $16384 \triangleq 100\%$ | G120 |
| K0413           | Fixed value 13 (P413) | $16384 \triangleq 100\%$ | G120 |
| K0414           | Fixed value 14 (P414) | $16384 \triangleq 100\%$ | G120 |
| K0415           | Fixed value 15 (P415) | $16384 \triangleq 100\%$ | G120 |
| K0416           | Fixed value 16 (P416) | $16384 \triangleq 100\%$ | G120 |

| Start pulse for the speed controller |                                                            |                                  |      |
|--------------------------------------|------------------------------------------------------------|----------------------------------|------|
| K0451                                | Fixed setting value 1 for the n controller I component     | $16384 \triangleq 100\%$ of P100 | G150 |
| K0452                                | Setting value 1 for the n controller I component, weighted | $16384 \triangleq 100\%$ of P100 | G150 |
| K0453                                | Fixed setting value 2 for the n controller I component     | $16384 \triangleq 100\%$ of P100 | G150 |
| K0454                                | Setting value for the n controller I component             | $16384 \triangleq 100\%$ of P100 | G150 |

| 4-step master switch |                                      |                          |      |
|----------------------|--------------------------------------|--------------------------|------|
| K0510                | Setpoint of the 4-step master switch | $16384 \triangleq 100\%$ | G125 |

| General connectors |                                                       |  |  |
|--------------------|-------------------------------------------------------|--|--|
| K0800              | Operating status (code number) with one decimal place |  |  |

| Connector    | Description                                                                                                                                                                                                                                                                                     | Normalization | Function diag., Sheet |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|
| <b>K0801</b> | Latest fault and alarm message<br>Low byte: Latest alarm message<br>If several alarms are active simultaneously, the alarm with the lowest number is displayed here.<br>Value "0" means that no alarm is active.<br>High byte: Latest fault message<br>Value "0" means that no fault is active. |               | G189                  |
| <b>K0810</b> | Limitation bits<br>The meaning of these bits is described in Section 11, Parameter List, under parameter r040.                                                                                                                                                                                  |               |                       |

|              |                              |  |  |
|--------------|------------------------------|--|--|
| <b>K0900</b> | Optimization run, setpoint 0 |  |  |
| <b>K0901</b> | Optimization run, setpoint 1 |  |  |
| <b>K0902</b> | Optimization run, setpoint 2 |  |  |
| <b>K0903</b> | Optimization run, setpoint 3 |  |  |
| <b>K0904</b> | Optimization run, setpoint 4 |  |  |

| Connectors for raw data of pulse encoder evaluation |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|
| <b>K0910</b>                                        | Measuring time for speed evaluation of pulse encoder<br>1 corresponds to 41.6666 ns if K0912 = xxxx xx0x (divisor 1:1)<br>1 corresponds to 83.3333 ns if K0912 = xxxx x01x (divisor 1:2)<br>1 corresponds to 166.666 ns if K0912 = xxxx x11x (divisor 1:4)<br>This value is always slightly higher than the measuring time set in P147.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  | G145 |
| <b>K0911</b>                                        | Number of pulses during measuring time set in K0910<br>The speed of the pulse encoder can be calculated from connectors K0910, K0911 and K0912 by the following equation:<br>$n_{act} [rev / s] = \frac{K0911 * 24\,000\,000}{Pulse\ no.\ of\ encoder * Meas.\ time}$<br>Pulse number of encoder = 1*P141,<br>if K0912 = xx0x xxxx (1x evaluation)<br>Pulse number of encoder = 2*P141,<br>if K0912 = x01x xxxx (2x evaluation)<br>Pulse number of encoder = 4*P141,<br>if K0912 = x11x xxxx (4x evaluation)<br>Meas. time = 1* K0910 if K0912 = xxxx xx0x (divisor 1:1)<br>Meas. time = 2* K0910 if K0912 = xxxx x01x (divisor 1:2)<br>Meas. time = 4* K0910 if K0912 = xxxx x11x (divisor 1:4)                                                                                                                                                                                                                                 |  | G145 |
| <b>K0912</b>                                        | Status of speed evaluation of pulse encoder<br>xxxx xxx0 = asynchronous measurement<br>xxxx xxx1 = (gating-pulse-)synchronized measurement<br>xxxx xx0x = divisor 1:1<br>xxxx x01x = divisor 1:2<br>xxxx x11x = divisor 1:4<br>xxx0 0xxx = pulse encoder type1 (P140 = 1)<br>xxx1 0xxx = pulse encoder type1a (P140 = 2)<br>xxx0 1xxx = pulse encoder type2 (P140 = 3)<br>xxx1 1xxx = pulse encoder type3 (P140 = 4)<br>xx0x xxxx = 1x evaluation<br>x01x xxxx = 2x evaluation<br>x11x xxxx = 4x evaluation<br>0xxx xxxx = No pulse encoder error<br>1xxx xxxx = Pulse encoder signal states occurred during the measurement which may not occur on a rotating pulse encoder. They indicate a signal short circuit or an interruption in a pulse encoder signal.<br>When the pulse encoder is stationary or oscillating around one position, signal states of this type are perfectly normal and do not indicate a signal fault. |  | G145 |

| Connector    | Description                                                                                                                                                                                  | Normalization              | Function<br>diag., Sheet |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------|
| <b>K0960</b> | Time interval between averaged line synchronization time reference point and "unfiltered" zero crossing of scanned and software-filtered line voltage in 1.334 $\mu$ s (when P152 = 1 to 20) | $1 \triangleq 1,334 \mu$ s |                          |
| <b>K0970</b> | Positive line zero crossing of phase U-V (as T1 instant)                                                                                                                                     |                            |                          |
| <b>K0971</b> | Negative line zero crossing of phase W-U (as T1 instant)                                                                                                                                     |                            |                          |
| <b>K0972</b> | Positive line zero crossing of phase V-W (as T1 instant)                                                                                                                                     |                            |                          |
| <b>K0973</b> | Negative line zero crossing of phase U-V (as T1 instant)                                                                                                                                     |                            |                          |
| <b>K0974</b> | Positive line zero crossing of phase W-U (as T1 instant)                                                                                                                                     |                            |                          |
| <b>K0975</b> | Negative line zero crossing of phase V-W (as T1 instant)                                                                                                                                     |                            |                          |
| <b>K0976</b> | Positive line zero crossing, field supply                                                                                                                                                    |                            |                          |
| <b>K0977</b> | Negative line zero crossing, field supply                                                                                                                                                    |                            |                          |
| <b>K0984</b> | Last line zero crossing used (as T1 instant) (field)                                                                                                                                         |                            |                          |
| <b>K0985</b> | Field firing instant (as T1 instant)                                                                                                                                                         |                            |                          |
| <b>K0986</b> | Last line zero crossing used (as T1 instant) (armature)                                                                                                                                      |                            |                          |
| <b>K0987</b> | Armature firing instant (as T1 instant)                                                                                                                                                      |                            |                          |
| <b>K0988</b> | Firing pulse cycle time (time difference between current and previous armature firing instant) in T1 increments of 1.334 $\mu$ s each                                                        |                            |                          |

| Connector    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Normalization | Function diag., Sheet |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|
| <b>K0989</b> | <p>Information about torque direction and firing angle</p> <p>Nibble 0 .. Torque direction<br/> 0 = M0 (--)<br/> 1 = MI<br/> 2 = MII<br/> 9 = The master waits in M0 until all slaves have reached the RUN state</p> <p>Nibble 1 .. Code number for firing angle<br/> 1 = Firing angle requested by current controller+precontrol implemented<br/> 2 = Firing angle requested by current controller+precontrol was &gt; P151. It has been implemented or limited to 165 °<br/> 3 = Alpha-W pulse at 165°<br/> 4 = Alpha-W pulse at P151 angle setting<br/> 5 = Firing angle requested by current controller+precontrol could not be implemented due to strong pulse compression<br/> 6 = Slave connected in parallel could not adapt its computing cycle to the firing angle of the paralleling master<br/> 7 = No firing angle received from paralleling master<br/> 8 = The cycle time received from the paralleling master is too long<br/> 9 = The firing angle of the paralleling master has been implemented</p> <p>Nibble 2 .. Code number for requested torque direction<br/> 0: Not RUN ( ≥ 01.0)<br/> 1: Torque direction acc. to current setpoint K119 (==&gt; M0, MI, MII)<br/> 2: Wait for enable from parallel drive [acc. to P165] (==&gt; M0)<br/> 3: Firing angle of &gt; 165 degrees requested (==&gt; M0)<br/> 4: Additional wait time in auto-reversing stage (==&gt; M0)<br/> 5: Output 165-degree pulse without second pulse in the old torque direction (==&gt; MI, MII)<br/> 6: Output Alpha-W pulse (as set in P151) without second pulse in the old torque direction (==&gt; MI, MII)<br/> 7: Torque direction request during short-circuit test of thyristor check function (==&gt; MI)<br/> 8: Torque direction request during open circuit test of thyristor check function (==&gt; M0, MI, MII)<br/> 9: The selected thyristor pair is disabled during thyristor check (==&gt; M0)<br/> A: No meaning<br/> B: Torque direction of paralleling is being implemented (==&gt; M0, MI, MII)<br/> C: Simulation operation (==&gt; MI, MII) [SW 1.8 and later]<br/> D: The command "Fire all thyristors simultaneously" is being executed (see also under P0176) [SW 1.8 and later]<br/> E: Output 165-degree pulse with second pulse in the old torque direction (==&gt; MI, MII) (see also P0179) [SW 1.9 and later]<br/> F: Output Alpha-W pulse (as set in P151) with second pulse in the old torque direction (==&gt; MI, MII) (see also P0179) [SW 1.9 and later]</p> <p>Nibble 3 .. Code number for zero current signal [SW 1.8 and later]<br/> 0: The "I=0" signal is not evaluated because no change in torque direction is required<br/> 1: I &lt;&gt; 0<br/> 2: I = 0 for less than 0.1 msec<br/> 3: I = 0 for more than 0.1 msec<br/> 4: I = 0 for more than 0.6 msec<br/> 5: Ia-act (K116) is &lt; 1 % for more than 6 current peaks</p> |               |                       |
| <b>K0990</b> | Current total processor capacity utilization (C167)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |                       |
| <b>K0991</b> | Projected total processor capacity utilization (C167) for maximum line frequency (65 Hz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                       |
| <b>K0992</b> | Total processor capacity (C167) currently utilized by background routines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                       |

| Connector | Description                                                                                             | Normalization | Function diag., Sheet |
|-----------|---------------------------------------------------------------------------------------------------------|---------------|-----------------------|
| K0993     | Total processor capacity (C167) currently utilized by routines synchronized with field firing pulses    |               |                       |
| K0994     | Total processor capacity (C167) currently utilized by routines synchronized with armature firing pulses |               |                       |

| Serial interface 1 (USS1 on G-SST1) |                                                      |                 |      |
|-------------------------------------|------------------------------------------------------|-----------------|------|
| K2001                               | USS1 receive data, word 1                            | 1 $\triangle$ 1 | G170 |
| K2002                               | USS1 receive data, word 2                            | 1 $\triangle$ 1 | G170 |
| K2003                               | USS1 receive data, word 3                            | 1 $\triangle$ 1 | G170 |
| K2004                               | USS1 receive data, word 4                            | 1 $\triangle$ 1 | G170 |
| K2005                               | USS1 receive data, word 5                            | 1 $\triangle$ 1 | G170 |
| K2006                               | USS1 receive data, word 6                            | 1 $\triangle$ 1 | G170 |
| K2007                               | USS1 receive data, word 7                            | 1 $\triangle$ 1 | G170 |
| K2008                               | USS1 receive data, word 8                            | 1 $\triangle$ 1 | G170 |
| K2009                               | USS1 receive data, word 9                            | 1 $\triangle$ 1 | G170 |
| K2010                               | USS1 receive data, word 10                           | 1 $\triangle$ 1 | G170 |
| K2011                               | USS1 receive data, word 11                           | 1 $\triangle$ 1 | G170 |
| K2012                               | USS1 receive data, word 12                           | 1 $\triangle$ 1 | G170 |
| K2013                               | USS1 receive data, word 13                           | 1 $\triangle$ 1 | G170 |
| K2014                               | USS1 receive data, word 14                           | 1 $\triangle$ 1 | G170 |
| K2015                               | USS1 receive data, word 15                           | 1 $\triangle$ 1 | G170 |
| K2016                               | USS1 receive data, word 16                           | 1 $\triangle$ 1 | G170 |
| K2020                               | Output of binector/connector converter for G-SST1    | 1 $\triangle$ 1 | G170 |
| KK2031                              | USS1 receive data, word 1 and 2 [SW 2.0 and later]   | 1 $\triangle$ 1 | G169 |
| KK2032                              | USS1 receive data, word 2 and 3 [SW 2.0 and later]   | 1 $\triangle$ 1 | G169 |
| KK2033                              | USS1 receive data, word 3 and 4 [SW 2.0 and later]   | 1 $\triangle$ 1 | G169 |
| KK2034                              | USS1 receive data, word 4 and 5 [SW 2.0 and later]   | 1 $\triangle$ 1 | G169 |
| KK2035                              | USS1 receive data, word 5 and 6 [SW 2.0 and later]   | 1 $\triangle$ 1 | G169 |
| KK2036                              | USS1 receive data, word 6 and 7 [SW 2.0 and later]   | 1 $\triangle$ 1 | G169 |
| KK2037                              | USS1 receive data, word 7 and 8 [SW 2.0 and later]   | 1 $\triangle$ 1 | G169 |
| KK2038                              | USS1 receive data, word 8 and 9 [SW 2.0 and later]   | 1 $\triangle$ 1 | G169 |
| KK2039                              | USS1 receive data, word 9 and 10 [SW 2.0 and later]  | 1 $\triangle$ 1 | G169 |
| KK2040                              | USS1 receive data, word 10 and 11 [SW 2.0 and later] | 1 $\triangle$ 1 | G169 |
| KK2041                              | USS1 receive data, word 11 and 12 [SW 2.0 and later] | 1 $\triangle$ 1 | G169 |
| KK2042                              | USS1 receive data, word 12 and 13 [SW 2.0 and later] | 1 $\triangle$ 1 | G169 |
| KK2043                              | USS1 receive data, word 13 and 14 [SW 2.0 and later] | 1 $\triangle$ 1 | G169 |
| KK2044                              | USS1 receive data, word 14 and 15 [SW 2.0 and later] | 1 $\triangle$ 1 | G169 |
| KK2045                              | USS1 receive data, word 15 and 16 [SW 2.0 and later] | 1 $\triangle$ 1 | G169 |

| Process data exchange with 1 <sup>st</sup> CB/TB |                                                  |                 |      |
|--------------------------------------------------|--------------------------------------------------|-----------------|------|
| K3001                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1  | 1 $\triangle$ 1 | Z110 |
| K3002                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2  | 1 $\triangle$ 1 | Z110 |
| K3003                                            | Receive data from 1 <sup>st</sup> CB/TB, word 3  | 1 $\triangle$ 1 | Z110 |
| K3004                                            | Receive data from 1 <sup>st</sup> CB/TB, word 4  | 1 $\triangle$ 1 | Z110 |
| K3005                                            | Receive data from 1 <sup>st</sup> CB/TB, word 5  | 1 $\triangle$ 1 | Z110 |
| K3006                                            | Receive data from 1 <sup>st</sup> CB/TB, word 6  | 1 $\triangle$ 1 | Z110 |
| K3007                                            | Receive data from 1 <sup>st</sup> CB/TB, word 7  | 1 $\triangle$ 1 | Z110 |
| K3008                                            | Receive data from 1 <sup>st</sup> CB/TB, word 8  | 1 $\triangle$ 1 | Z110 |
| K3009                                            | Receive data from 1 <sup>st</sup> CB/TB, word 9  | 1 $\triangle$ 1 | Z110 |
| K3010                                            | Receive data from 1 <sup>st</sup> CB/TB, word 10 | 1 $\triangle$ 1 | Z110 |

| Connector | Description                                                                         | Normalization   | Function diag., Sheet |
|-----------|-------------------------------------------------------------------------------------|-----------------|-----------------------|
| K3011     | Receive data from 1 <sup>st</sup> CB/TB, word 11                                    | 1 $\triangle$ 1 | Z110                  |
| K3012     | Receive data from 1 <sup>st</sup> CB/TB, word 12                                    | 1 $\triangle$ 1 | Z110                  |
| K3013     | Receive data from 1 <sup>st</sup> CB/TB, word 13                                    | 1 $\triangle$ 1 | Z110                  |
| K3014     | Receive data from 1 <sup>st</sup> CB/TB, word 14                                    | 1 $\triangle$ 1 | Z110                  |
| K3015     | Receive data from 1 <sup>st</sup> CB/TB, word 15                                    | 1 $\triangle$ 1 | Z110                  |
| K3016     | Receive data from 1 <sup>st</sup> CB/TB, word 16                                    | 1 $\triangle$ 1 | Z110                  |
| K3020     | Output of binector/connector converter for 1 <sup>st</sup> CB/TB [SW 1.9 and later] | 1 $\triangle$ 1 | Z110                  |
| KK3031    | Receive data from 1 <sup>st</sup> CB/TB, word 1 and 2 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124                  |
| KK3032    | Receive data from 1 <sup>st</sup> CB/TB, word 2 and 3 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124                  |
| KK3033    | Receive data from 1 <sup>st</sup> CB/TB, word 3 and 4 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124                  |
| KK3034    | Receive data from 1 <sup>st</sup> CB/TB, word 4 and 5 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124                  |
| KK3035    | Receive data from 1 <sup>st</sup> CB/TB, word 5 and 6 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124                  |
| KK3036    | Receive data from 1 <sup>st</sup> CB/TB, word 6 and 7 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124                  |
| KK3037    | Receive data from 1 <sup>st</sup> CB/TB, word 7 and 8 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124                  |
| KK3038    | Receive data from 1 <sup>st</sup> CB/TB, word 8 and 9 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124                  |
| KK3039    | Receive data from 1 <sup>st</sup> CB/TB, word 9 and 10 [SW 2.0 and later]           | 1 $\triangle$ 1 | Z124                  |
| KK3040    | Receive data from 1 <sup>st</sup> CB/TB, word 10 and 11 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124                  |
| KK3041    | Receive data from 1 <sup>st</sup> CB/TB, word 11 and 12 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124                  |
| KK3042    | Receive data from 1 <sup>st</sup> CB/TB, word 12 and 13 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124                  |
| KK3043    | Receive data from 1 <sup>st</sup> CB/TB, word 13 and 14 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124                  |
| KK3044    | Receive data from 1 <sup>st</sup> CB/TB, word 14 and 15 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124                  |
| KK3045    | Receive data from 1 <sup>st</sup> CB/TB, word 15 and 16 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124                  |

**SCB1 with SCI1**

|       |                                                 |                 |      |
|-------|-------------------------------------------------|-----------------|------|
| K4101 | SCI, slave 1, analog input 1 [SW 1.9 and later] | 1 $\triangle$ 1 | Z150 |
| K4102 | SCI, slave 1, analog input 2 [SW 1.9 and later] | 1 $\triangle$ 1 | Z150 |
| K4103 | SCI, slave 1, analog input 3 [SW 1.9 and later] | 1 $\triangle$ 1 | Z150 |
| K4201 | SCI, slave 2, analog input 1 [SW 1.9 and later] | 1 $\triangle$ 1 | Z151 |
| K4202 | SCI, slave 2, analog input 2 [SW 1.9 and later] | 1 $\triangle$ 1 | Z151 |
| K4203 | SCI, slave 2, analog input 3 [SW 1.9 and later] | 1 $\triangle$ 1 | Z151 |

**Expansion boards**

|       |                                              |                        |      |
|-------|----------------------------------------------|------------------------|------|
| K5101 | 1st analog input of 1st plugged EB1          | 16384 $\triangle$ 100% | Z112 |
| K5102 | 2nd analog input of 1st plugged EB1          | 16384 $\triangle$ 100% | Z112 |
| K5103 | 3rd analog input of 1st plugged EB1          | 16384 $\triangle$ 100% | Z112 |
| K5104 | 1st analog output of 1st plugged EB1         | 16384 $\triangle$ 100% | Z113 |
| K5105 | 2nd analog output of 1st plugged EB1         | 16384 $\triangle$ 100% | Z113 |
| K5106 | Binary inputs and outputs of 1st plugged EB1 | 1 $\triangle$ 1        | Z114 |
| K5111 | Analog input of 1st plugged EB2              | 16384 $\triangle$ 100% | Z118 |
| K5112 | Analog output of 1st plugged EB2             | 16384 $\triangle$ 100% | Z118 |
| K5113 | Binary inputs and outputs of 1st plugged EB2 | 1 $\triangle$ 1        | Z118 |
| K5201 | 1st analog input of 2nd plugged EB1          | 16384 $\triangle$ 100% | Z115 |
| K5202 | 2nd analog input of 2nd plugged EB1          | 16384 $\triangle$ 100% | Z115 |
| K5203 | 3rd analog input of 2nd plugged EB1          | 16384 $\triangle$ 100% | Z115 |
| K5204 | 1st analog output of 2nd plugged EB1         | 16384 $\triangle$ 100% | Z116 |
| K5205 | 2nd analog output of 2nd plugged EB1         | 16384 $\triangle$ 100% | Z116 |
| K5206 | Binary inputs and outputs of 2nd plugged EB1 | 1 $\triangle$ 1        | Z117 |
| K5211 | Analog input of 2nd plugged EB2              | 16384 $\triangle$ 100% | Z119 |
| K5212 | Analog output of 2nd plugged EB2             | 16384 $\triangle$ 100% | Z119 |

| Connector | Description                                  | Normalization   | Function<br>diag., Sheet |
|-----------|----------------------------------------------|-----------------|--------------------------|
| K5213     | Binary inputs and outputs of 2nd plugged EB2 | 1 $\triangle$ 1 | Z119                     |

| Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2) |                                                   |                 |            |
|------------------------------------------------------|---------------------------------------------------|-----------------|------------|
| K6001                                                | USS2 / Peer2 receive data, word 1                 | 1 $\triangle$ 1 | G171, G173 |
| K6002                                                | USS2 / Peer2 receive data, word 2                 | 1 $\triangle$ 1 | G171, G173 |
| K6003                                                | USS2 / Peer2 receive data, word 3                 | 1 $\triangle$ 1 | G171, G173 |
| K6004                                                | USS2 / Peer2 receive data, word 4                 | 1 $\triangle$ 1 | G171, G173 |
| K6005                                                | USS2 / Peer2 receive data, word 5                 | 1 $\triangle$ 1 | G171, G173 |
| K6006                                                | USS2 receive data, word 6                         | 1 $\triangle$ 1 | G171       |
| K6007                                                | USS2 receive data, word 7                         | 1 $\triangle$ 1 | G171       |
| K6008                                                | USS2 receive data, word 8                         | 1 $\triangle$ 1 | G171       |
| K6009                                                | USS2 receive data, word 9                         | 1 $\triangle$ 1 | G171       |
| K6010                                                | USS2 receive data, word 10                        | 1 $\triangle$ 1 | G171       |
| K6011                                                | USS2 receive data, word 11                        | 1 $\triangle$ 1 | G171       |
| K6012                                                | USS2 receive data, word 12                        | 1 $\triangle$ 1 | G171       |
| K6013                                                | USS2 receive data, word 13                        | 1 $\triangle$ 1 | G171       |
| K6014                                                | USS2 receive data, word 14                        | 1 $\triangle$ 1 | G171       |
| K6015                                                | USS2 receive data, word 15                        | 1 $\triangle$ 1 | G171       |
| K6016                                                | USS2 receive data, word 16                        | 1 $\triangle$ 1 | G171       |
| K6020                                                | Output of binector/connector converter for G-SST2 | 1 $\triangle$ 1 | G171, G173 |

| Paralleling interface |                                                       |                 |      |
|-----------------------|-------------------------------------------------------|-----------------|------|
| K6021                 | Word 1 from master / Word 1 from slave with address 2 | 1 $\triangle$ 1 | G195 |
| K6022                 | Word 2 from master / Word 2 from slave with address 2 | 1 $\triangle$ 1 | G195 |
| K6023                 | Word 3 from master / Word 3 from slave with address 2 | 1 $\triangle$ 1 | G195 |
| K6024                 | Word 4 from master / Word 4 from slave with address 2 | 1 $\triangle$ 1 | G195 |
| K6025                 | Word 5 from master / Word 5 from slave with address 2 | 1 $\triangle$ 1 | G195 |
| K6031                 | Word 1 from slave with address 3                      | 1 $\triangle$ 1 | G195 |
| K6032                 | Word 2 from slave with address 3                      | 1 $\triangle$ 1 | G195 |
| K6033                 | Word 3 from slave with address 3                      | 1 $\triangle$ 1 | G195 |
| K6034                 | Word 4 from slave with address 3                      | 1 $\triangle$ 1 | G195 |
| K6035                 | Word 5 from slave with address 3                      | 1 $\triangle$ 1 | G195 |
| K6041                 | Word 1 from slave with address 4                      | 1 $\triangle$ 1 | G195 |
| K6042                 | Word 2 from slave with address 4                      | 1 $\triangle$ 1 | G195 |
| K6043                 | Word 3 from slave with address 4                      | 1 $\triangle$ 1 | G195 |
| K6044                 | Word 4 from slave with address 4                      | 1 $\triangle$ 1 | G195 |
| K6045                 | Word 5 from slave with address 4                      | 1 $\triangle$ 1 | G195 |
| K6051                 | Word 1 from slave with address 5                      | 1 $\triangle$ 1 | G195 |
| K6052                 | Word 2 from slave with address 5                      | 1 $\triangle$ 1 | G195 |
| K6053                 | Word 3 from slave with address 5                      | 1 $\triangle$ 1 | G195 |
| K6054                 | Word 4 from slave with address 5                      | 1 $\triangle$ 1 | G195 |
| K6055                 | Word 5 from slave with address 5                      | 1 $\triangle$ 1 | G195 |
| K6061                 | Word 1 from slave with address 6                      | 1 $\triangle$ 1 | G195 |
| K6062                 | Word 2 from slave with address 6                      | 1 $\triangle$ 1 | G195 |
| K6063                 | Word 3 from slave with address 6                      | 1 $\triangle$ 1 | G195 |
| K6064                 | Word 4 from slave with address 6                      | 1 $\triangle$ 1 | G195 |
| K6065                 | Word 5 from slave with address 6                      | 1 $\triangle$ 1 | G195 |



| Connector                                                   | Description                                                | Normalization   | Function diag., Sheet |
|-------------------------------------------------------------|------------------------------------------------------------|-----------------|-----------------------|
| <b>Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)</b> |                                                            |                 |                       |
| <b>KK6081</b>                                               | USS2 / Peer2 receive data, word 1 and 2 [SW 2.0 and later] | 1 $\triangle$ 1 | G169                  |
| <b>KK6082</b>                                               | USS2 / Peer2 receive data, word 2 and 3 [SW 2.0 and later] | 1 $\triangle$ 1 | G169                  |
| <b>KK6083</b>                                               | USS2 / Peer2 receive data, word 3 and 4 [SW 2.0 and later] | 1 $\triangle$ 1 | G169                  |
| <b>KK6084</b>                                               | USS2 / Peer2 receive data, word 4 and 5 [SW 2.0 and later] | 1 $\triangle$ 1 | G169                  |
| <b>KK6085</b>                                               | USS2 receive data, word 5 and 6 [SW 2.0 and later]         | 1 $\triangle$ 1 | G169                  |
| <b>KK6086</b>                                               | USS2 receive data, word 6 and 7 [SW 2.0 and later]         | 1 $\triangle$ 1 | G169                  |
| <b>KK6087</b>                                               | USS2 receive data, word 7 and 8 [SW 2.0 and later]         | 1 $\triangle$ 1 | G169                  |
| <b>KK6088</b>                                               | USS2 receive data, word 8 and 9 [SW 2.0 and later]         | 1 $\triangle$ 1 | G169                  |
| <b>KK6089</b>                                               | USS2 receive data, word 9 and 10 [SW 2.0 and later]        | 1 $\triangle$ 1 | G169                  |
| <b>KK6090</b>                                               | USS2 receive data, word 10 and 11 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |
| <b>KK6091</b>                                               | USS2 receive data, word 11 and 12 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |
| <b>KK6092</b>                                               | USS2 receive data, word 12 and 13 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |
| <b>KK6093</b>                                               | USS2 receive data, word 13 and 14 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |
| <b>KK6094</b>                                               | USS2 receive data, word 14 and 15 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |
| <b>KK6095</b>                                               | USS2 receive data, word 15 and 16 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |

|                                            |                                                             |                 |      |
|--------------------------------------------|-------------------------------------------------------------|-----------------|------|
| <b>Process data exchange with SIMOLINK</b> |                                                             |                 |      |
| <b>K7001</b>                               | Receive data from SIMOLINK, word 1                          | 1 $\triangle$ 1 | Z122 |
| <b>K7002</b>                               | Receive data from SIMOLINK, word 2                          | 1 $\triangle$ 1 | Z122 |
| <b>K7003</b>                               | Receive data from SIMOLINK, word 3                          | 1 $\triangle$ 1 | Z122 |
| <b>K7004</b>                               | Receive data from SIMOLINK, word 4                          | 1 $\triangle$ 1 | Z122 |
| <b>K7005</b>                               | Receive data from SIMOLINK, word 5                          | 1 $\triangle$ 1 | Z122 |
| <b>K7006</b>                               | Receive data from SIMOLINK, word 6                          | 1 $\triangle$ 1 | Z122 |
| <b>K7007</b>                               | Receive data from SIMOLINK, word 7                          | 1 $\triangle$ 1 | Z122 |
| <b>K7008</b>                               | Receive data from SIMOLINK, word 8                          | 1 $\triangle$ 1 | Z122 |
| <b>K7009</b>                               | Receive data from SIMOLINK, word 9                          | 1 $\triangle$ 1 | Z122 |
| <b>K7010</b>                               | Receive data from SIMOLINK, word 10                         | 1 $\triangle$ 1 | Z122 |
| <b>K7011</b>                               | Receive data from SIMOLINK, word 11                         | 1 $\triangle$ 1 | Z122 |
| <b>K7012</b>                               | Receive data from SIMOLINK, word 12                         | 1 $\triangle$ 1 | Z122 |
| <b>K7013</b>                               | Receive data from SIMOLINK, word 13                         | 1 $\triangle$ 1 | Z122 |
| <b>K7014</b>                               | Receive data from SIMOLINK, word 14                         | 1 $\triangle$ 1 | Z122 |
| <b>K7015</b>                               | Receive data from SIMOLINK, word 15                         | 1 $\triangle$ 1 | Z122 |
| <b>K7016</b>                               | Receive data from SIMOLINK, word 16                         | 1 $\triangle$ 1 | Z122 |
| <b>KK7031</b>                              | Receive data from SIMOLINK, word 1 and 2 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124 |
| <b>KK7032</b>                              | Receive data from SIMOLINK, word 2 and 3 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124 |
| <b>KK7033</b>                              | Receive data from SIMOLINK, word 3 and 4 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124 |
| <b>KK7034</b>                              | Receive data from SIMOLINK, word 4 and 5 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124 |
| <b>KK7035</b>                              | Receive data from SIMOLINK, word 5 and 6 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124 |
| <b>KK7036</b>                              | Receive data from SIMOLINK, word 6 and 7 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124 |
| <b>KK7037</b>                              | Receive data from SIMOLINK, word 7 and 8 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124 |
| <b>K7101</b>                               | Receive data from SIMOLINK, special data word 1             | 1 $\triangle$ 1 | Z122 |
| <b>K7102</b>                               | Receive data from SIMOLINK, special data word 2             | 1 $\triangle$ 1 | Z122 |
| <b>K7103</b>                               | Receive data from SIMOLINK, special data word 3             | 1 $\triangle$ 1 | Z122 |
| <b>K7104</b>                               | Receive data from SIMOLINK, special data word 4             | 1 $\triangle$ 1 | Z122 |
| <b>K7105</b>                               | Receive data from SIMOLINK, special data word 5             | 1 $\triangle$ 1 | Z122 |
| <b>K7106</b>                               | Receive data from SIMOLINK, special data word 6             | 1 $\triangle$ 1 | Z122 |
| <b>K7107</b>                               | Receive data from SIMOLINK, special data word 7             | 1 $\triangle$ 1 | Z122 |
| <b>K7108</b>                               | Receive data from SIMOLINK, special data word 8             | 1 $\triangle$ 1 | Z122 |

| Connector     | Description                                                              | Normalization   | Function diag., Sheet |
|---------------|--------------------------------------------------------------------------|-----------------|-----------------------|
| <b>KK7131</b> | Receive data from SIMOLINK, special data word 1 and 2 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124                  |
| <b>KK7132</b> | Receive data from SIMOLINK, special data word 2 and 3 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124                  |
| <b>KK7133</b> | Receive data from SIMOLINK, special data word 3 and 4 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124                  |
| <b>KK7134</b> | Receive data from SIMOLINK, special data word 4 and 5 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124                  |
| <b>KK7135</b> | Receive data from SIMOLINK, special data word 5 and 6 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124                  |
| <b>KK7136</b> | Receive data from SIMOLINK, special data word 6 and 7 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124                  |
| <b>KK7137</b> | Receive data from SIMOLINK, special data word 7 and 8 [SW 2.0 and later] | 1 $\triangle$ 1 | Z124                  |

| Process data exchange with 2 <sup>nd</sup> CB |                                                                                  |                 |      |
|-----------------------------------------------|----------------------------------------------------------------------------------|-----------------|------|
| <b>K8001</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 1                                     | 1 $\triangle$ 1 | Z111 |
| <b>K8002</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 2                                     | 1 $\triangle$ 1 | Z111 |
| <b>K8003</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 3                                     | 1 $\triangle$ 1 | Z111 |
| <b>K8004</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 4                                     | 1 $\triangle$ 1 | Z111 |
| <b>K8005</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 5                                     | 1 $\triangle$ 1 | Z111 |
| <b>K8006</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 6                                     | 1 $\triangle$ 1 | Z111 |
| <b>K8007</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 7                                     | 1 $\triangle$ 1 | Z111 |
| <b>K8008</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 8                                     | 1 $\triangle$ 1 | Z111 |
| <b>K8009</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 9                                     | 1 $\triangle$ 1 | Z111 |
| <b>K8010</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 10                                    | 1 $\triangle$ 1 | Z111 |
| <b>K8011</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 11                                    | 1 $\triangle$ 1 | Z111 |
| <b>K8012</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 12                                    | 1 $\triangle$ 1 | Z111 |
| <b>K8013</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 13                                    | 1 $\triangle$ 1 | Z111 |
| <b>K8014</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 14                                    | 1 $\triangle$ 1 | Z111 |
| <b>K8015</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 15                                    | 1 $\triangle$ 1 | Z111 |
| <b>K8016</b>                                  | Receive data from 2 <sup>nd</sup> CB, word 16                                    | 1 $\triangle$ 1 | Z111 |
| <b>K8020</b>                                  | Output of binector/connector converter for 2 <sup>nd</sup> CB [SW 1.9 and later] | 1 $\triangle$ 1 | Z111 |
| <b>KK8031</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 1 and 2 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124 |
| <b>KK8032</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 2 and 3 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124 |
| <b>KK8033</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 3 and 4 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124 |
| <b>KK8034</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 4 and 5 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124 |
| <b>KK8035</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 5 and 6 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124 |
| <b>KK8036</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 6 and 7 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124 |
| <b>KK8037</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 7 and 8 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124 |
| <b>KK8038</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 8 and 9 [SW 2.0 and later]            | 1 $\triangle$ 1 | Z124 |
| <b>KK8039</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 9 and 10 [SW 2.0 and later]           | 1 $\triangle$ 1 | Z124 |
| <b>KK8040</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 10 and 11 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124 |
| <b>KK8041</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 11 and 12 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124 |
| <b>KK8042</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 12 and 13 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124 |
| <b>KK8043</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 13 and 14 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124 |
| <b>KK8044</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 14 and 15 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124 |
| <b>KK8045</b>                                 | Receive data from 2 <sup>nd</sup> CB, word 15 and 16 [SW 2.0 and later]          | 1 $\triangle$ 1 | Z124 |

| Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3) |                                   |                 |            |
|------------------------------------------------------|-----------------------------------|-----------------|------------|
| <b>K9001</b>                                         | USS3 / Peer3 receive data, word 1 | 1 $\triangle$ 1 | G172, G174 |
| <b>K9002</b>                                         | USS3 / Peer3 receive data, word 2 | 1 $\triangle$ 1 | G172, G174 |
| <b>K9003</b>                                         | USS3 / Peer3 receive data, word 3 | 1 $\triangle$ 1 | G172, G174 |
| <b>K9004</b>                                         | USS3 / Peer3 receive data, word 4 | 1 $\triangle$ 1 | G172, G174 |
| <b>K9005</b>                                         | USS3 / Peer3 receive data, word 5 | 1 $\triangle$ 1 | G172, G174 |
| <b>K9006</b>                                         | USS3 receive data, word 6         | 1 $\triangle$ 1 | G172       |

| Connector | Description                                                | Normalization   | Function diag., Sheet |
|-----------|------------------------------------------------------------|-----------------|-----------------------|
| K9007     | USS3 receive data, word 7                                  | 1 $\triangle$ 1 | G172                  |
| K9008     | USS3 receive data, word 8                                  | 1 $\triangle$ 1 | G172                  |
| K9009     | USS3 receive data, word 9                                  | 1 $\triangle$ 1 | G172                  |
| K9010     | USS3 receive data, word 10                                 | 1 $\triangle$ 1 | G172                  |
| K9011     | USS3 receive data, word 11                                 | 1 $\triangle$ 1 | G172                  |
| K9012     | USS3 receive data, word 12                                 | 1 $\triangle$ 1 | G172                  |
| K9013     | USS3 receive data, word 13                                 | 1 $\triangle$ 1 | G172                  |
| K9014     | USS3 receive data, word 14                                 | 1 $\triangle$ 1 | G172                  |
| K9015     | USS3 receive data, word 15                                 | 1 $\triangle$ 1 | G172                  |
| K9016     | USS3 receive data, word 16                                 | 1 $\triangle$ 1 | G172                  |
| K9020     | Output of binector/connector converter for G-SST3          | 1 $\triangle$ 1 | G172, G174            |
| KK9081    | USS3 / Peer3 receive data, word 1 and 2 [SW 2.0 and later] | 1 $\triangle$ 1 | G169                  |
| KK9082    | USS3 / Peer3 receive data, word 2 and 3 [SW 2.0 and later] | 1 $\triangle$ 1 | G169                  |
| KK9083    | USS3 / Peer3 receive data, word 3 and 4 [SW 2.0 and later] | 1 $\triangle$ 1 | G169                  |
| KK9084    | USS3 / Peer3 receive data, word 4 and 5 [SW 2.0 and later] | 1 $\triangle$ 1 | G169                  |
| KK9085    | USS3 receive data, word 5 and 6 [SW 2.0 and later]         | 1 $\triangle$ 1 | G169                  |
| KK9086    | USS3 receive data, word 6 and 7 [SW 2.0 and later]         | 1 $\triangle$ 1 | G169                  |
| KK9087    | USS3 receive data, word 7 and 8 [SW 2.0 and later]         | 1 $\triangle$ 1 | G169                  |
| KK9088    | USS3 receive data, word 8 and 9 [SW 2.0 and later]         | 1 $\triangle$ 1 | G169                  |
| KK9089    | USS3 receive data, word 9 and 10 [SW 2.0 and later]        | 1 $\triangle$ 1 | G169                  |
| KK9090    | USS2 receive data, word 10 and 11 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |
| KK9091    | USS3 receive data, word 11 and 12 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |
| KK9092    | USS3 receive data, word 12 and 13 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |
| KK9093    | USS3 receive data, word 13 and 14 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |
| KK9094    | USS3 receive data, word 14 and 15 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |
| KK9095    | USS3 receive data, word 15 and 16 [SW 2.0 and later]       | 1 $\triangle$ 1 | G169                  |

**Technology software S00: Binector/connector converters**

|       |                                          |       |                 |      |
|-------|------------------------------------------|-------|-----------------|------|
| K9113 | Output of binector/connector converter 1 | FB 13 | 1 $\triangle$ 1 | B121 |
| K9114 | Output of binector/connector converter 2 | FB 14 | 1 $\triangle$ 1 | B121 |
| K9115 | Output of binector/connector converter 3 | FB 15 | 1 $\triangle$ 1 | B121 |

**Technology software S00: Adders / Subtractors**

|       |                                                  |       |                        |      |
|-------|--------------------------------------------------|-------|------------------------|------|
| K9120 | Output of adder/subtractor 1                     | FB 20 | 16384 $\triangle$ 100% | B125 |
| K9121 | Output of adder/subtractor 2                     | FB 21 | 16384 $\triangle$ 100% | B125 |
| K9122 | Output of adder/subtractor 3                     | FB 22 | 16384 $\triangle$ 100% | B125 |
| K9123 | Output of adder/subtractor 4                     | FB 23 | 16384 $\triangle$ 100% | B125 |
| K9124 | Output of adder/subtractor 5                     | FB 24 | 16384 $\triangle$ 100% | B125 |
| K9125 | Output of adder/subtractor 6                     | FB 25 | 16384 $\triangle$ 100% | B125 |
| K9126 | Output of adder/subtractor 7                     | FB 26 | 16384 $\triangle$ 100% | B125 |
| K9127 | Output of adder/subtractor 8                     | FB 27 | 16384 $\triangle$ 100% | B125 |
| K9128 | Output of adder/subtractor 9                     | FB 28 | 16384 $\triangle$ 100% | B125 |
| K9129 | Output of adder/subtractor 10                    | FB 29 | 16384 $\triangle$ 100% | B125 |
| K9130 | Output of adder/subtractor 11                    | FB 30 | 16384 $\triangle$ 100% | B125 |
| K9131 | Output of adder/subtractor 12                    | FB 31 | 16384 $\triangle$ 100% | B125 |
| K9132 | Output of adder/subtractor 13 [SW 1.8 and later] | FB 32 | 16384 $\triangle$ 100% | B125 |
| K9133 | Output of adder/subtractor 14 [SW 1.8 and later] | FB 33 | 16384 $\triangle$ 100% | B125 |
| K9134 | Output of adder/subtractor 15 [SW 1.8 and later] | FB 34 | 16384 $\triangle$ 100% | B125 |

| Connector                                                          | Description                          | Normalization | Function<br>diag., Sheet |      |
|--------------------------------------------------------------------|--------------------------------------|---------------|--------------------------|------|
| Technology software S00: Sign inverters, switchable sign inverters |                                      |               |                          |      |
| K9135                                                              | Output of sign inverter 1            | FB 35         | 16384 $\triangle$ 100%   | B125 |
| K9136                                                              | Output of sign inverter 2            | FB 36         | 16384 $\triangle$ 100%   | B125 |
| K9137                                                              | Output of sign inverter 3            | FB 37         | 16384 $\triangle$ 100%   | B125 |
| K9138                                                              | Output of sign inverter 4            | FB 38         | 16384 $\triangle$ 100%   | B125 |
| K9140                                                              | Output of switchable sign inverter 1 | FB 40         | 16384 $\triangle$ 100%   | B125 |
| K9141                                                              | Output of switchable sign inverter 2 | FB 41         | 16384 $\triangle$ 100%   | B125 |

| Technology software S00: Dividers, multipliers, high-resolution multipliers/dividers |                                                |                    |       |                        |      |
|--------------------------------------------------------------------------------------|------------------------------------------------|--------------------|-------|------------------------|------|
| K9142                                                                                | Output of divider 4                            | [SW 1.8 and later] | FB 42 | 16384 $\triangle$ 100% | B131 |
| K9143                                                                                | Output of divider 5                            | [SW 1.8 and later] | FB 43 | 16384 $\triangle$ 100% | B131 |
| K9144                                                                                | Output of divider 6                            | [SW 1.8 and later] | FB 44 | 16384 $\triangle$ 100% | B131 |
| K9145                                                                                | Output of divider 1                            |                    | FB 45 | 16384 $\triangle$ 100% | B131 |
| K9146                                                                                | Output of divider 2                            |                    | FB 46 | 16384 $\triangle$ 100% | B131 |
| K9147                                                                                | Output of divider 3                            |                    | FB 47 | 16384 $\triangle$ 100% | B131 |
| K9150                                                                                | Output of multiplier 1                         |                    | FB 50 | 16384 $\triangle$ 100% | B130 |
| K9151                                                                                | Output of multiplier 2                         |                    | FB 51 | 16384 $\triangle$ 100% | B130 |
| K9152                                                                                | Output of multiplier 3                         |                    | FB 52 | 16384 $\triangle$ 100% | B130 |
| K9153                                                                                | Output of multiplier 4                         |                    | FB 53 | 16384 $\triangle$ 100% | B130 |
| K9155                                                                                | Output of high-resolution multiplier/divider 1 |                    | FB 55 | 16384 $\triangle$ 100% | B131 |
| K9156                                                                                | Output of high-resolution multiplier/divider 2 |                    | FB 56 | 16384 $\triangle$ 100% | B131 |
| K9157                                                                                | Output of high-resolution multiplier/divider 3 |                    | FB 57 | 16384 $\triangle$ 100% | B131 |

| Technology software S00: Absolute-value generator with filter |                                                  |       |                        |      |
|---------------------------------------------------------------|--------------------------------------------------|-------|------------------------|------|
| K9160                                                         | Output of absolute-value generator with filter 1 | FB 60 | 16384 $\triangle$ 100% | B135 |
| K9161                                                         | Output of absolute-value generator with filter 2 | FB 61 | 16384 $\triangle$ 100% | B135 |
| K9162                                                         | Output of absolute-value generator with filter 3 | FB 62 | 16384 $\triangle$ 100% | B135 |
| K9163                                                         | Output of absolute-value generator with filter 4 | FB 63 | 16384 $\triangle$ 100% | B135 |

| Technology software S00: Limiters |                                           |                           |                        |      |
|-----------------------------------|-------------------------------------------|---------------------------|------------------------|------|
| K9165                             | Limiter 1: Fixed limiting value           | FB 65                     | 16384 $\triangle$ 100% | B135 |
| K9166                             | Limiter 1: Positive limiting value * (-1) | FB 65                     | 16384 $\triangle$ 100% | B135 |
| K9167                             | Limiter 1: Output                         | FB 65                     | 16384 $\triangle$ 100% | B135 |
| K9168                             | Limiter 2: Fixed limiting value           | FB 66                     | 16384 $\triangle$ 100% | B135 |
| K9169                             | Limiter 2: Positive limiting value * (-1) | FB 66                     | 16384 $\triangle$ 100% | B135 |
| K9170                             | Limiter 2: Output                         | FB 66                     | 16384 $\triangle$ 100% | B135 |
| K9171                             | Limiter 3: Fixed limiting value           | FB 67                     | 16384 $\triangle$ 100% | B135 |
| K9172                             | Limiter 3: Positive limiting value * (-1) | FB 67                     | 16384 $\triangle$ 100% | B135 |
| K9173                             | Limiter 3: Output                         | FB 67                     | 16384 $\triangle$ 100% | B135 |
| K9174                             | Limiter 4: Fixed limiting value           | [SW 2.0 and later] FB 212 | 16384 $\triangle$ 100% | B134 |
| K9175                             | Limiter 4: Positive limiting value * (-1) | [SW 2.0 and later] FB 212 | 16384 $\triangle$ 100% | B134 |
| K9176                             | Limiter 4: Output                         | [SW 2.0 and later] FB 212 | 16384 $\triangle$ 100% | B134 |
| K9177                             | Limiter 5: Fixed limiting value           | [SW 2.0 and later] FB 213 | 16384 $\triangle$ 100% | B134 |
| K9178                             | Limiter 5: Positive limiting value * (-1) | [SW 2.0 and later] FB 213 | 16384 $\triangle$ 100% | B134 |
| K9179                             | Limiter 5: Output                         | [SW 2.0 and later] FB 213 | 16384 $\triangle$ 100% | B134 |

| Technology software S00: Limit-value monitor with filter |                                                            |       |                        |      |  |
|----------------------------------------------------------|------------------------------------------------------------|-------|------------------------|------|--|
| K9180                                                    | Limit-value monitor with filter 1: Filtered input quantity | FB 70 | 16384 $\triangle$ 100% | B136 |  |
| K9181                                                    | Limit-value monitor with filter 1: Fixed operating point   | FB 70 | 16384 $\triangle$ 100% | B136 |  |

| Connector | Description                                                | Normalization                | Function diag., Sheet |
|-----------|------------------------------------------------------------|------------------------------|-----------------------|
| K9182     | Limit-value monitor with filter 2: Filtered input quantity | FB 71 16384 $\triangle$ 100% | B136                  |
| K9183     | Limit-value monitor with filter 2: Fixed operating point   | FB 71 16384 $\triangle$ 100% | B136                  |
| K9184     | Limit-value monitor with filter 3: Filtered input quantity | FB 72 16384 $\triangle$ 100% | B136                  |
| K9185     | Limit-value monitor with filter 3: Fixed operating point   | FB 72 16384 $\triangle$ 100% | B136                  |

| Technology software S00: Limit-value monitor without filter |                                                             |                              |      |
|-------------------------------------------------------------|-------------------------------------------------------------|------------------------------|------|
| K9186                                                       | Limit-value monitor without filter 1: Fixed operating point | FB 73 16384 $\triangle$ 100% | B137 |
| K9187                                                       | Limit-value monitor without filter 2: Fixed operating point | FB 74 16384 $\triangle$ 100% | B137 |
| K9188                                                       | Limit-value monitor without filter 3: Fixed operating point | FB 75 16384 $\triangle$ 100% | B137 |
| K9189                                                       | Limit-value monitor without filter 4: Fixed operating point | FB 76 16384 $\triangle$ 100% | B137 |
| K9190                                                       | Limit-value monitor without filter 5: Fixed operating point | FB 77 16384 $\triangle$ 100% | B138 |
| K9191                                                       | Limit-value monitor without filter 6: Fixed operating point | FB 78 16384 $\triangle$ 100% | B138 |
| K9192                                                       | Limit-value monitor without filter 7: Fixed operating point | FB 79 16384 $\triangle$ 100% | B138 |

| Technology software S00: Minimum selection, maximum selection |                          |                              |      |
|---------------------------------------------------------------|--------------------------|------------------------------|------|
| K9193                                                         | Minimum selection output | FB 80 16384 $\triangle$ 100% | B140 |
| K9194                                                         | Maximum selection output | FB 81 16384 $\triangle$ 100% | B140 |

| Technology software S00: Tracking/storage elements |                                      |                              |      |
|----------------------------------------------------|--------------------------------------|------------------------------|------|
| K9195                                              | Output of tracking/storage element 1 | FB 82 16384 $\triangle$ 100% | B145 |
| K9196                                              | Output of tracking/storage element 2 | FB 83 16384 $\triangle$ 100% | B145 |

| Technology software S00: Connector memories |                           |                              |      |
|---------------------------------------------|---------------------------|------------------------------|------|
| K9197                                       | Output connector memory 1 | FB 84 16384 $\triangle$ 100% | B145 |
| K9198                                       | Output connector memory 2 | FB 85 16384 $\triangle$ 100% | B145 |

| Technology software S00: Connector changeover switches |                                       |                              |      |
|--------------------------------------------------------|---------------------------------------|------------------------------|------|
| K9210                                                  | Output connector changeover switch 1  | FB 90 16384 $\triangle$ 100% | B150 |
| K9210                                                  | Output connector changeover switch 1  | FB 90 16384 $\triangle$ 100% | B150 |
| K9211                                                  | Output connector changeover switch 2  | FB 91 16384 $\triangle$ 100% | B150 |
| K9212                                                  | Output connector changeover switch 3  | FB 92 16384 $\triangle$ 100% | B150 |
| K9213                                                  | Output connector changeover switch 4  | FB 93 16384 $\triangle$ 100% | B150 |
| K9214                                                  | Output connector changeover switch 5  | FB 94 16384 $\triangle$ 100% | B150 |
| K9215                                                  | Output connector changeover switch 6  | FB 95 16384 $\triangle$ 100% | B150 |
| K9216                                                  | Output connector changeover switch 7  | FB 96 16384 $\triangle$ 100% | B150 |
| K9217                                                  | Output connector changeover switch 8  | FB 97 16384 $\triangle$ 100% | B150 |
| K9218                                                  | Output connector changeover switch 9  | FB 98 16384 $\triangle$ 100% | B150 |
| K9219                                                  | Output connector changeover switch 10 | FB 99 16384 $\triangle$ 100% | B150 |

| Technology software S00: Integrators |                        |                               |      |
|--------------------------------------|------------------------|-------------------------------|------|
| K9220                                | Output of integrator 1 | FB 100 16384 $\triangle$ 100% | B155 |
| K9221                                | Output of integrator 2 | FB 101 16384 $\triangle$ 100% | B155 |
| K9222                                | Output of integrator 3 | FB 102 16384 $\triangle$ 100% | B155 |

| Technology software S00: DT1 elements |                                   |                               |      |
|---------------------------------------|-----------------------------------|-------------------------------|------|
| K9223                                 | Output of DT1 element 1           | FB 103 16384 $\triangle$ 100% | B155 |
| K9224                                 | Output of DT1 element 1, inverted | FB 103 16384 $\triangle$ 100% | B155 |
| K9225                                 | Output of DT1 element 2           | FB 104 16384 $\triangle$ 100% | B155 |
| K9226                                 | Output of DT1 element 2, inverted | FB 104 16384 $\triangle$ 100% | B155 |
| K9227                                 | Output of DT1 element 3           | FB 105 16384 $\triangle$ 100% | B155 |

| Connector | Description                       | Normalization                 | Function diag., Sheet |
|-----------|-----------------------------------|-------------------------------|-----------------------|
| K9228     | Output of DT1 element 3, inverted | FB 105 16384 $\triangle$ 100% | B155                  |

| Technology software S00: Characteristic blocks |                                  |                               |      |
|------------------------------------------------|----------------------------------|-------------------------------|------|
| K9229                                          | Output of characteristic block 1 | FB 106 16384 $\triangle$ 100% | B160 |
| K9230                                          | Output of characteristic block 2 | FB 107 16384 $\triangle$ 100% | B160 |
| K9231                                          | Output of characteristic block 3 | FB 108 16384 $\triangle$ 100% | B160 |

| Technology software S00: Dead zones |                       |                               |      |
|-------------------------------------|-----------------------|-------------------------------|------|
| K9232                               | Output of dead zone 1 | FB 109 16384 $\triangle$ 100% | B161 |
| K9233                               | Output of dead zone 2 | FB 110 16384 $\triangle$ 100% | B161 |
| K9234                               | Output of dead zone 3 | FB 111 16384 $\triangle$ 100% | B161 |

| Technology software S00: Setpoint branching |                           |                               |      |
|---------------------------------------------|---------------------------|-------------------------------|------|
| K9235                                       | Setpoint branching output | FB 112 16384 $\triangle$ 100% | B161 |

| Technology software S00: Simple ramp-function generator |                                       |                               |      |
|---------------------------------------------------------|---------------------------------------|-------------------------------|------|
| K9236                                                   | Simple ramp-function generator output | FB 113 16384 $\triangle$ 100% | B165 |

| Technology software S00: Technology controller |                                                                         |                               |      |
|------------------------------------------------|-------------------------------------------------------------------------|-------------------------------|------|
| K9240                                          | Technology controller, signed actual value                              | FB 114 16384 $\triangle$ 100% | B170 |
| K9241                                          | Technology controller, absolute actual value                            | FB 114 16384 $\triangle$ 100% | B170 |
| K9242                                          | D component                                                             | FB 114 16384 $\triangle$ 100% | B170 |
| K9243                                          | Technology controller, setpoint                                         | FB 114 16384 $\triangle$ 100% | B170 |
| K9244                                          | Technology controller, filtered setpoint                                | FB 114 16384 $\triangle$ 100% | B170 |
| K9245                                          | Setpoint/actual value deviation                                         | FB 114 16384 $\triangle$ 100% | B170 |
| K9246                                          | Setpoint/actual value deviation after droop                             | FB 114 16384 $\triangle$ 100% | B170 |
| K9247                                          | P component                                                             | FB 114 16384 $\triangle$ 100% | B170 |
| K9248                                          | I component                                                             | FB 114 16384 $\triangle$ 100% | B170 |
| K9249                                          | Technology controller output before limitation                          | FB 114 16384 $\triangle$ 100% | B170 |
| K9250                                          | Positive limit for technology controller output                         | FB 114 16384 $\triangle$ 100% | B170 |
| K9251                                          | Negative limit for technology controller output                         | FB 114 16384 $\triangle$ 100% | B170 |
| K9252                                          | Positive limit for technology controller output * (-1)                  | FB 114 16384 $\triangle$ 100% | B170 |
| K9253                                          | Technology controller output after limitation                           | FB 114 16384 $\triangle$ 100% | B170 |
| K9254                                          | Technology controller output after multiplication with weighting factor | FB 114 16384 $\triangle$ 100% | B170 |

| Technology software S00: Speed/velocity calculator, velocity/speed calculator |                                            |                               |      |
|-------------------------------------------------------------------------------|--------------------------------------------|-------------------------------|------|
| K9256                                                                         | Speed/velocity calculator: Actual velocity | FB 115 16384 $\triangle$ 100% | B190 |
| K9257                                                                         | Velocity/speed calculator: Speed setpoint  | FB 115 16384 $\triangle$ 100% | B190 |

| Technology software S00: Variable moment of inertia [SW 1.8 and later] |                                     |                        | FB 116 |
|------------------------------------------------------------------------|-------------------------------------|------------------------|--------|
| K9258                                                                  | Variable moment of inertia (output) | 16384 $\triangle$ 100% | B191   |

| Technology software S00: Limiters |                                           |                                                  |      |
|-----------------------------------|-------------------------------------------|--------------------------------------------------|------|
| K9260                             | Limiter 6: Fixed limiting value           | [SW 2.0 and later] FB 214 16384 $\triangle$ 100% | B134 |
| K9261                             | Limiter 6: Positive limiting value * (-1) | [SW 2.0 and later] FB 214 16384 $\triangle$ 100% | B134 |
| K9262                             | Limiter 6: Output                         | [SW 2.0 and later] FB 214 16384 $\triangle$ 100% | B134 |

| Technology software S00: Connector changeover switches |                                       |                                                  |      |
|--------------------------------------------------------|---------------------------------------|--------------------------------------------------|------|
| K9265                                                  | Output connector changeover switch 11 | [SW 2.0 and later] FB 196 16384 $\triangle$ 100% | B150 |
| K9266                                                  | Output connector changeover switch 12 | [SW 2.0 and later] FB 197 16384 $\triangle$ 100% | B150 |



| Connector | Description                                                     | Normalization          | Function diag., Sheet |
|-----------|-----------------------------------------------------------------|------------------------|-----------------------|
| K9267     | Output connector changeover switch 13 [SW 2.0 and later] FB 198 | 16384 $\triangle$ 100% | B150                  |
| K9268     | Output connector changeover switch 14 [SW 2.0 and later] FB 199 | 16384 $\triangle$ 100% | B150                  |
| K9269     | Output connector changeover switch 15 [SW 2.0 and later] FB 229 | 16384 $\triangle$ 100% | B150                  |

| Technology software S00: PI controller 1 [SW 1.8 and later] |                                                                 |                        | FB260 |
|-------------------------------------------------------------|-----------------------------------------------------------------|------------------------|-------|
| K9300                                                       | Input quantity filtered                                         | 16384 $\triangle$ 100% | B180  |
| K9301                                                       | P component                                                     | 16384 $\triangle$ 100% | B180  |
| K9302                                                       | I component                                                     | 16384 $\triangle$ 100% | B180  |
| K9303                                                       | Output PI controller before limitation                          | 16384 $\triangle$ 100% | B180  |
| K9304                                                       | Output PI controller after limitation                           | 16384 $\triangle$ 100% | B180  |
| K9305                                                       | Positive limit for the output of the PI controller              | 16384 $\triangle$ 100% | B180  |
| K9306                                                       | Positive limit for the output of the PI controller (K9305) * -1 | 16384 $\triangle$ 100% | B180  |
| K9307                                                       | Negative limit for the output of the PI controller              | 16384 $\triangle$ 100% | B180  |

| Technology software S00: PI controller 2 [SW 1.8 and later] |                                                                 |                        | FB261 |
|-------------------------------------------------------------|-----------------------------------------------------------------|------------------------|-------|
| K9310                                                       | Input quantity filtered                                         | 16384 $\triangle$ 100% | B181  |
| K9311                                                       | P component                                                     | 16384 $\triangle$ 100% | B181  |
| K9312                                                       | I component                                                     | 16384 $\triangle$ 100% | B181  |
| K9313                                                       | Output PI controller before limitation                          | 16384 $\triangle$ 100% | B181  |
| K9314                                                       | Output PI controller after limitation                           | 16384 $\triangle$ 100% | B181  |
| K9315                                                       | Positive limit for the output of the PI controller              | 16384 $\triangle$ 100% | B181  |
| K9316                                                       | Positive limit for the output of the PI controller (K9315) * -1 | 16384 $\triangle$ 100% | B181  |
| K9317                                                       | Negative limit for the output of the PI controller              | 16384 $\triangle$ 100% | B181  |

| Technology software S00: PI controller 3 [SW 1.8 and later] |                                                                 |                        | FB262 |
|-------------------------------------------------------------|-----------------------------------------------------------------|------------------------|-------|
| K9320                                                       | Input quantity filtered                                         | 16384 $\triangle$ 100% | B182  |
| K9321                                                       | P component                                                     | 16384 $\triangle$ 100% | B182  |
| K9322                                                       | I component                                                     | 16384 $\triangle$ 100% | B182  |
| K9323                                                       | Output PI controller before limitation                          | 16384 $\triangle$ 100% | B182  |
| K9324                                                       | Output PI controller after limitation                           | 16384 $\triangle$ 100% | B182  |
| K9325                                                       | Positive limit for the output of the PI controller              | 16384 $\triangle$ 100% | B182  |
| K9326                                                       | Positive limit for the output of the PI controller (K9325) * -1 | 16384 $\triangle$ 100% | B182  |
| K9327                                                       | Negative limit for the output of the PI controller              | 16384 $\triangle$ 100% | B182  |

| Technology software S00: PI controller 4 [SW 1.8 and later] |                                                                 |                        | FB263 |
|-------------------------------------------------------------|-----------------------------------------------------------------|------------------------|-------|
| K9330                                                       | Input quantity filtered                                         | 16384 $\triangle$ 100% | B183  |
| K9331                                                       | P component                                                     | 16384 $\triangle$ 100% | B183  |
| K9332                                                       | I component                                                     | 16384 $\triangle$ 100% | B183  |
| K9333                                                       | Output PI controller before limitation                          | 16384 $\triangle$ 100% | B183  |
| K9334                                                       | Output PI controller after limitation                           | 16384 $\triangle$ 100% | B183  |
| K9335                                                       | Positive limit for the output of the PI controller              | 16384 $\triangle$ 100% | B183  |
| K9336                                                       | Positive limit for the output of the PI controller (K9335) * -1 | 16384 $\triangle$ 100% | B183  |
| K9337                                                       | Negative limit for the output of the PI controller              | 16384 $\triangle$ 100% | B183  |

| Technology software S00: PI controller 5 [SW 1.8 and later] |                                        |                        | FB264 |
|-------------------------------------------------------------|----------------------------------------|------------------------|-------|
| K9340                                                       | Input quantity filtered                | 16384 $\triangle$ 100% | B184  |
| K9341                                                       | P component                            | 16384 $\triangle$ 100% | B184  |
| K9342                                                       | I component                            | 16384 $\triangle$ 100% | B184  |
| K9343                                                       | Output PI controller before limitation | 16384 $\triangle$ 100% | B184  |
| K9344                                                       | Output PI controller after limitation  | 16384 $\triangle$ 100% | B184  |

| Connector | Description                                                     | Normalization          | Function diag., Sheet |
|-----------|-----------------------------------------------------------------|------------------------|-----------------------|
| K9345     | Positive limit for the output of the PI controller              | 16384 $\triangle$ 100% | B184                  |
| K9346     | Positive limit for the output of the PI controller (K9345) * -1 | 16384 $\triangle$ 100% | B184                  |
| K9347     | Negative limit for the output of the PI controller              | 16384 $\triangle$ 100% | B184                  |

| Technology software S00: PI controller 6 [SW 1.8 and later] |                                                                 |                        | FB265 |
|-------------------------------------------------------------|-----------------------------------------------------------------|------------------------|-------|
| K9350                                                       | Input quantity filtered                                         | 16384 $\triangle$ 100% | B185  |
| K9351                                                       | P component                                                     | 16384 $\triangle$ 100% | B185  |
| K9352                                                       | I component                                                     | 16384 $\triangle$ 100% | B185  |
| K9353                                                       | Output PI controller before limitation                          | 16384 $\triangle$ 100% | B185  |
| K9354                                                       | Output PI controller after limitation                           | 16384 $\triangle$ 100% | B185  |
| K9355                                                       | Positive limit for the output of the PI controller              | 16384 $\triangle$ 100% | B185  |
| K9356                                                       | Positive limit for the output of the PI controller (K9355) * -1 | 16384 $\triangle$ 100% | B185  |
| K9357                                                       | Negative limit for the output of the PI controller              | 16384 $\triangle$ 100% | B185  |

| Technology software S00: PI controller 7 [SW 1.8 and later] |                                                                 |                        | FB266 |
|-------------------------------------------------------------|-----------------------------------------------------------------|------------------------|-------|
| K9360                                                       | Input quantity filtered                                         | 16384 $\triangle$ 100% | B186  |
| K9361                                                       | P component                                                     | 16384 $\triangle$ 100% | B186  |
| K9362                                                       | I component                                                     | 16384 $\triangle$ 100% | B186  |
| K9363                                                       | Output PI controller before limitation                          | 16384 $\triangle$ 100% | B186  |
| K9364                                                       | Output PI controller after limitation                           | 16384 $\triangle$ 100% | B186  |
| K9365                                                       | Positive limit for the output of the PI controller              | 16384 $\triangle$ 100% | B186  |
| K9366                                                       | Positive limit for the output of the PI controller (K9365) * -1 | 16384 $\triangle$ 100% | B186  |
| K9367                                                       | Negative limit for the output of the PI controller              | 16384 $\triangle$ 100% | B186  |

| Technology software S00: PI controller 8 [SW 1.8 and later] |                                                                 |                        | FB267 |
|-------------------------------------------------------------|-----------------------------------------------------------------|------------------------|-------|
| K9370                                                       | Input quantity filtered                                         | 16384 $\triangle$ 100% | B187  |
| K9371                                                       | P component                                                     | 16384 $\triangle$ 100% | B187  |
| K9372                                                       | I component                                                     | 16384 $\triangle$ 100% | B187  |
| K9373                                                       | Output PI controller before limitation                          | 16384 $\triangle$ 100% | B187  |
| K9374                                                       | Output PI controller after limitation                           | 16384 $\triangle$ 100% | B187  |
| K9375                                                       | Positive limit for the output of the PI controller              | 16384 $\triangle$ 100% | B187  |
| K9376                                                       | Positive limit for the output of the PI controller (K9375) * -1 | 16384 $\triangle$ 100% | B187  |
| K9377                                                       | Negative limit for the output of the PI controller              | 16384 $\triangle$ 100% | B187  |

| Technology software S00: PI controller 9 [SW 1.8 and later] |                                                                 |                        | FB268 |
|-------------------------------------------------------------|-----------------------------------------------------------------|------------------------|-------|
| K9380                                                       | Input quantity filtered                                         | 16384 $\triangle$ 100% | B188  |
| K9381                                                       | P component                                                     | 16384 $\triangle$ 100% | B188  |
| K9382                                                       | I component                                                     | 16384 $\triangle$ 100% | B188  |
| K9383                                                       | Output PI controller before limitation                          | 16384 $\triangle$ 100% | B188  |
| K9384                                                       | Output PI controller after limitation                           | 16384 $\triangle$ 100% | B188  |
| K9385                                                       | Positive limit for the output of the PI controller              | 16384 $\triangle$ 100% | B188  |
| K9386                                                       | Positive limit for the output of the PI controller (K9385) * -1 | 16384 $\triangle$ 100% | B188  |
| K9387                                                       | Negative limit for the output of the PI controller              | 16384 $\triangle$ 100% | B188  |

| Technology software S00: PI controller 10 [SW 1.8 and later] |                                        |                        | FB269 |
|--------------------------------------------------------------|----------------------------------------|------------------------|-------|
| K9390                                                        | Input quantity filtered                | 16384 $\triangle$ 100% | B189  |
| K9391                                                        | P component                            | 16384 $\triangle$ 100% | B189  |
| K9392                                                        | I component                            | 16384 $\triangle$ 100% | B189  |
| K9393                                                        | Output PI controller before limitation | 16384 $\triangle$ 100% | B189  |
| K9394                                                        | Output PI controller after limitation  | 16384 $\triangle$ 100% | B189  |



| Connector | Description                                                     | Normalization          | Function diag., Sheet |
|-----------|-----------------------------------------------------------------|------------------------|-----------------------|
| K9395     | Positive limit for the output of the PI controller              | 16384 $\triangle$ 100% | B189                  |
| K9396     | Positive limit for the output of the PI controller (K9395) * -1 | 16384 $\triangle$ 100% | B189                  |
| K9397     | Negative limit for the output of the PI controller              | 16384 $\triangle$ 100% | B189                  |

**Technology software S00: Derivative/delay elements**

|       |                                    |                           |                        |      |
|-------|------------------------------------|---------------------------|------------------------|------|
| K9400 | Derivative/delay element 1 output  | [SW 1.8 and later] FB 270 | 16384 $\triangle$ 100% | B156 |
| K9401 | Derivative/delay element 2 output  | [SW 1.8 and later] FB 271 | 16384 $\triangle$ 100% | B156 |
| K9402 | Derivative/delay element 3 output  | [SW 1.8 and later] FB 272 | 16384 $\triangle$ 100% | B156 |
| K9403 | Derivative/delay element 4 output  | [SW 1.8 and later] FB 273 | 16384 $\triangle$ 100% | B156 |
| K9404 | Derivative/delay element 5 output  | [SW 1.8 and later] FB 274 | 16384 $\triangle$ 100% | B157 |
| K9405 | Derivative/delay element 6 output  | [SW 1.8 and later] FB 275 | 16384 $\triangle$ 100% | B157 |
| K9406 | Derivative/delay element 7 output  | [SW 1.8 and later] FB 276 | 16384 $\triangle$ 100% | B157 |
| K9407 | Derivative/delay element 8 output  | [SW 1.8 and later] FB 277 | 16384 $\triangle$ 100% | B157 |
| K9408 | Derivative/delay element 9 output  | [SW 1.8 and later] FB 278 | 16384 $\triangle$ 100% | B158 |
| K9409 | Derivative/delay element 10 output | [SW 1.8 and later] FB 279 | 16384 $\triangle$ 100% | B158 |

**Technology software S00: Characteristic blocks**

|       |                               |                           |                        |      |
|-------|-------------------------------|---------------------------|------------------------|------|
| K9410 | Output characteristic block 4 | [SW 1.8 and later] FB 280 | 16384 $\triangle$ 100% | B160 |
| K9411 | Output characteristic block 5 | [SW 1.8 and later] FB 281 | 16384 $\triangle$ 100% | B160 |
| K9412 | Output characteristic block 6 | [SW 1.8 and later] FB 282 | 16384 $\triangle$ 100% | B160 |
| K9413 | Output characteristic block 7 | [SW 1.8 and later] FB 283 | 16384 $\triangle$ 100% | B160 |
| K9414 | Output characteristic block 8 | [SW 1.8 and later] FB 284 | 16384 $\triangle$ 100% | B160 |
| K9415 | Output characteristic block 9 | [SW 1.8 and later] FB 285 | 16384 $\triangle$ 100% | B160 |

**Technology software S00: Multiplier**

|       |                      |                           |                        |      |
|-------|----------------------|---------------------------|------------------------|------|
| K9430 | Output multiplier 5  | [SW 1.8 and later] FB 290 | 16384 $\triangle$ 100% | B130 |
| K9431 | Output multiplier 6  | [SW 1.8 and later] FB 291 | 16384 $\triangle$ 100% | B130 |
| K9432 | Output multiplier 7  | [SW 1.8 and later] FB 292 | 16384 $\triangle$ 100% | B130 |
| K9433 | Output multiplier 8  | [SW 1.8 and later] FB 293 | 16384 $\triangle$ 100% | B130 |
| K9434 | Output multiplier 9  | [SW 1.8 and later] FB 294 | 16384 $\triangle$ 100% | B130 |
| K9435 | Output multiplier 10 | [SW 1.8 and later] FB 295 | 16384 $\triangle$ 100% | B130 |
| K9436 | Output multiplier 11 | [SW 1.8 and later] FB 296 | 16384 $\triangle$ 100% | B130 |
| K9437 | Output multiplier 12 | [SW 1.8 and later] FB 297 | 16384 $\triangle$ 100% | B130 |

**S00 technology software: Software counter**

|       |                                    |                          |                 |      |
|-------|------------------------------------|--------------------------|-----------------|------|
| K9441 | Minimum value for software counter | [SW 1.9 and later] FB 89 | 1 $\triangle$ 1 | B196 |
| K9442 | Maximum value for software counter | [SW 1.9 and later] FB 89 | 1 $\triangle$ 1 | B196 |
| K9443 | Setting value for software counter | [SW 1.9 and later] FB 89 | 1 $\triangle$ 1 | B196 |
| K9444 | Start value for software counter   | [SW 1.9 and later] FB 89 | 1 $\triangle$ 1 | B196 |
| K9445 | Software counter output            | [SW 1.9 and later] FB 89 | 1 $\triangle$ 1 | B196 |

**Technology software S00: Multiplexer**

|       |                      |                          |                        |      |
|-------|----------------------|--------------------------|------------------------|------|
| K9450 | Output multiplexer 1 | [SW 1.8 and later] FB 86 | 16384 $\triangle$ 100% | B195 |
| K9451 | Output multiplexer 2 | [SW 1.8 and later] FB 87 | 16384 $\triangle$ 100% | B195 |
| K9452 | Output multiplexer 3 | [SW 1.8 and later] FB 88 | 16384 $\triangle$ 100% | B195 |

**Technology software S00: Averagers**

|       |                   |                          |                        |      |
|-------|-------------------|--------------------------|------------------------|------|
| K9455 | Output averager 1 | [SW 1.8 and later] FB 16 | 16384 $\triangle$ 100% | B139 |
| K9456 | Output averager 2 | [SW 1.8 and later] FB 17 | 16384 $\triangle$ 100% | B139 |
| K9457 | Output averager 3 | [SW 1.8 and later] FB 18 | 16384 $\triangle$ 100% | B139 |

| Connector | Description                                | Normalization          | Function diag., Sheet |
|-----------|--------------------------------------------|------------------------|-----------------------|
| K9458     | Output averager 4 [SW 1.8 and later] FB 19 | 16384 $\triangle$ 100% | B139                  |

| Technology software S00: Minimum selections, Maximum selections |                                                      |                        |      |  |
|-----------------------------------------------------------------|------------------------------------------------------|------------------------|------|--|
| K9460                                                           | Output Maximum selection 2 [SW 1.8 and later] FB 174 | 16384 $\triangle$ 100% | B140 |  |
| K9461                                                           | Output Maximum selection 3 [SW 1.8 and later] FB 175 | 16384 $\triangle$ 100% | B140 |  |
| K9462                                                           | Output Maximum selection 4 [SW 1.8 and later] FB 176 | 16384 $\triangle$ 100% | B140 |  |
| K9463                                                           | Output Minimum selection 2 [SW 1.8 and later] FB 177 | 16384 $\triangle$ 100% | B140 |  |
| K9464                                                           | Output Minimum selection 3 [SW 1.8 and later] FB 178 | 16384 $\triangle$ 100% | B140 |  |
| K9465                                                           | Output Minimum selection 4 [SW 1.8 and later] FB 179 | 16384 $\triangle$ 100% | B140 |  |

| Technology software S00: position fixed value, position actual value, positional deviation |                                                       |                        |      |  |
|--------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------------|------|--|
| KK9471                                                                                     | Position fixed value1 [SW 2.0 and later] FB 54        | 16384 $\triangle$ 100% | B152 |  |
| KK9472                                                                                     | Position fixed value2 [SW 2.0 and later] FB 54        | 16384 $\triangle$ 100% | B152 |  |
| KK9473                                                                                     | Position fixed value3 [SW 2.0 and later] FB 54        | 16384 $\triangle$ 100% | B152 |  |
| KK9474                                                                                     | Position fixed value4 [SW 2.0 and later] FB 54        | 16384 $\triangle$ 100% | B152 |  |
| KK9481                                                                                     | Position actual value 1 [SW 2.0 and later] FB 54      | 16384 $\triangle$ 100% | B152 |  |
| KK9482                                                                                     | Position actual value 2 [SW 2.0 and later] FB 54      | 16384 $\triangle$ 100% | B152 |  |
| KK9483                                                                                     | Positional deviation [SW 2.0 and later] FB 54         | 16384 $\triangle$ 100% | B152 |  |
| KK9484                                                                                     | Positional deviation limited [SW 2.0 and later] FB 54 | 16384 $\triangle$ 100% | B152 |  |

| Technology software S00: root extractor |                                                |                        |      |  |
|-----------------------------------------|------------------------------------------------|------------------------|------|--|
| KK9485                                  | Root extractor output [SW 2.0 and later] FB 58 | 16384 $\triangle$ 100% | B153 |  |

| S00 technology software: Adders / subtractors for double-word connectors |                                                                                 |                              |      |  |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------|------|--|
| KK9490                                                                   | Output of 1 <sup>st</sup> adder / subtracter [SW 1.9 and later] FB 48           | 16384*16384 $\triangle$ 100% | B151 |  |
| K9491                                                                    | Output of 1 <sup>st</sup> adder / subtracter (limited) [SW 1.9 and later] FB 48 | 16384 $\triangle$ 100%/16384 | B151 |  |
| KK9492                                                                   | Output of 2 <sup>nd</sup> adder / subtracter [SW 1.9 and later] FB 49           | 16384*16384 $\triangle$ 100% | B151 |  |
| K9493                                                                    | Output of 2 <sup>nd</sup> adder / subtracter (limited) [SW 1.9 and later] FB 49 | 16384 $\triangle$ 100%/16384 | B151 |  |

| S00 technology software: Connector type converters |                                                                              |                              |      |  |
|----------------------------------------------------|------------------------------------------------------------------------------|------------------------------|------|--|
| KK9498                                             | Output of 1 <sup>st</sup> connector type converter [SW 1.9 and later] FB 298 | 16384*16384 $\triangle$ 100% | B151 |  |
| KK9499                                             | Output of 2 <sup>nd</sup> connector type converter [SW 1.9 and later] FB 299 | 16384*16384 $\triangle$ 100% | B151 |  |

| Technology software S00: Fixed values |                                             |                        |      | [SW 1.8 and later] |
|---------------------------------------|---------------------------------------------|------------------------|------|--------------------|
| K9501                                 | Fixed value 1 (U099.01) [SW 1.8 and later]  | 16384 $\triangle$ 100% | B110 |                    |
| K9502                                 | Fixed value 2 (U099.02) [SW 1.8 and later]  | 16384 $\triangle$ 100% | B110 |                    |
| K9503                                 | Fixed value 3 (U099.03) [SW 1.8 and later]  | 16384 $\triangle$ 100% | B110 |                    |
| K9504                                 | Fixed value 4 (U099.04) [SW 1.8 and later]  | 16384 $\triangle$ 100% | B110 |                    |
| K9505                                 | Fixed value 5 (U099.05) [SW 1.8 and later]  | 16384 $\triangle$ 100% | B110 |                    |
| K9506                                 | Fixed value 6 (U099.06) [SW 1.8 and later]  | 16384 $\triangle$ 100% | B110 |                    |
| K9507                                 | Fixed value 7 (U099.07) [SW 1.8 and later]  | 16384 $\triangle$ 100% | B110 |                    |
| K9508                                 | Fixed value 8 (U099.08) [SW 1.8 and later]  | 16384 $\triangle$ 100% | B110 |                    |
| K9509                                 | Fixed value 9 (U099.09) [SW 1.8 and later]  | 16384 $\triangle$ 100% | B110 |                    |
| K9510                                 | Fixed value 10 (U099.10) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110 |                    |
| K9511                                 | Fixed value 11 (U099.11) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110 |                    |
| K9512                                 | Fixed value 12 (U099.12) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110 |                    |
| K9513                                 | Fixed value 13 (U099.13) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110 |                    |
| K9514                                 | Fixed value 14 (U099.14) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110 |                    |
| K9515                                 | Fixed value 15 (U099.15) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110 |                    |
| K9516                                 | Fixed value 16 (U099.16) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110 |                    |

| Connector | Description                                 | Normalization          | Function<br>diag., Sheet |
|-----------|---------------------------------------------|------------------------|--------------------------|
| K9517     | Fixed value 17 (U099.17) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9518     | Fixed value 18 (U099.18) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9519     | Fixed value 19 (U099.19) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9520     | Fixed value 20 (U099.20) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9521     | Fixed value 21 (U099.21) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9522     | Fixed value 22 (U099.22) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9523     | Fixed value 23 (U099.23) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9524     | Fixed value 24 (U099.24) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9525     | Fixed value 25 (U099.25) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9526     | Fixed value 26 (U099.26) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9527     | Fixed value 27 (U099.27) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9528     | Fixed value 28 (U099.28) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9529     | Fixed value 29 (U099.29) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9530     | Fixed value 30 (U099.30) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9531     | Fixed value 31 (U099.31) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9532     | Fixed value 32 (U099.32) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9533     | Fixed value 33 (U099.33) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9534     | Fixed value 34 (U099.34) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9535     | Fixed value 35 (U099.35) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9536     | Fixed value 36 (U099.36) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9537     | Fixed value 37 (U099.37) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9538     | Fixed value 38 (U099.38) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9539     | Fixed value 39 (U099.39) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9540     | Fixed value 40 (U099.40) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9541     | Fixed value 41 (U099.41) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9542     | Fixed value 42 (U099.42) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9543     | Fixed value 43 (U099.43) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9544     | Fixed value 44 (U099.44) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9545     | Fixed value 45 (U099.45) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9546     | Fixed value 46 (U099.46) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9547     | Fixed value 47 (U099.47) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9548     | Fixed value 48 (U099.48) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9549     | Fixed value 49 (U099.49) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9550     | Fixed value 50 (U099.50) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9551     | Fixed value 51 (U099.51) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9552     | Fixed value 52 (U099.52) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9553     | Fixed value 53 (U099.53) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9554     | Fixed value 54 (U099.54) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9555     | Fixed value 55 (U099.55) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9556     | Fixed value 56 (U099.56) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9557     | Fixed value 57 (U099.57) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9558     | Fixed value 58 (U099.58) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9559     | Fixed value 59 (U099.59) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9560     | Fixed value 60 (U099.60) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9561     | Fixed value 61 (U099.61) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9562     | Fixed value 62 (U099.62) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9563     | Fixed value 63 (U099.63) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9564     | Fixed value 64 (U099.64) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |
| K9565     | Fixed value 65 (U099.65) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                     |

| Connector | Description                                   | Normalization          | Function diag., Sheet |
|-----------|-----------------------------------------------|------------------------|-----------------------|
| K9566     | Fixed value 66 (U099.66) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9567     | Fixed value 67 (U099.67) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9568     | Fixed value 68 (U099.68) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9569     | Fixed value 69 (U099.69) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9570     | Fixed value 70 (U099.70) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9571     | Fixed value 71 (U099.71) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9572     | Fixed value 72 (U099.72) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9573     | Fixed value 73 (U099.73) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9574     | Fixed value 74 (U099.74) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9575     | Fixed value 75 (U099.75) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9576     | Fixed value 76 (U099.76) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9577     | Fixed value 77 (U099.77) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9578     | Fixed value 78 (U099.78) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9579     | Fixed value 79 (U099.79) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9580     | Fixed value 80 (U099.80) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9581     | Fixed value 81 (U099.81) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9582     | Fixed value 82 (U099.82) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9583     | Fixed value 83 (U099.83) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9584     | Fixed value 84 (U099.84) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9585     | Fixed value 85 (U099.85) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9586     | Fixed value 86 (U099.86) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9587     | Fixed value 87 (U099.87) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9588     | Fixed value 88 (U099.88) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9589     | Fixed value 89 (U099.89) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9590     | Fixed value 90 (U099.90) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9591     | Fixed value 91 (U099.91) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9592     | Fixed value 92 (U099.92) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9593     | Fixed value 93 (U099.93) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9594     | Fixed value 94 (U099.94) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9595     | Fixed value 95 (U099.95) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9596     | Fixed value 96 (U099.96) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9597     | Fixed value 97 (U099.97) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9598     | Fixed value 98 (U099.98) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9599     | Fixed value 99 (U099.99) [SW 1.8 and later]   | 16384 $\triangle$ 100% | B110                  |
| K9600     | Fixed value 100 (U099.100) [SW 1.8 and later] | 16384 $\triangle$ 100% | B110                  |

| General connectors |                                                                |  |      |
|--------------------|----------------------------------------------------------------|--|------|
| K9801              | Alarm word 1 (= parameter r953)                                |  |      |
| K9802              | Alarm word 2 (= parameter r954)                                |  |      |
| K9803              | Alarm word 3 (= parameter r955)                                |  |      |
| K9804              | Alarm word 4 (= parameter r956)                                |  |      |
| K9805              | Alarm word 5 (= parameter r957)                                |  |      |
| K9806              | Alarm word 6 (= parameter r958)                                |  |      |
| K9807              | Alarm word 7 (= parameter r959)                                |  |      |
| K9808              | Alarm word 8 (= parameter r960)                                |  |      |
| K9811              | Fault number 1 (= parameter r947.01, last fault number)        |  | G189 |
| K9812              | Fault number 2 (= parameter r947.09, second last fault number) |  | G189 |
| K9813              | Fault number 3 (= parameter r947.17, third last fault number)  |  | G189 |
| K9814              | Fault number 4 (= parameter r947.25, fourth last fault number) |  | G189 |

| Connector | Description                          | Normalization | Function<br>diag., Sheet |
|-----------|--------------------------------------|---------------|--------------------------|
| K9815     | Fault number 5 (= parameter r947.33) |               | G189                     |
| K9816     | Fault number 6 (= parameter r947.41) |               | G189                     |
| K9817     | Fault number 7 (= parameter r947.49) |               | G189                     |
| K9818     | Fault number 8 (= parameter r947.57) |               | G189                     |

|       |                                                                                         |  |  |
|-------|-----------------------------------------------------------------------------------------|--|--|
| K9990 | Current total processor capacity utilization (C163)                                     |  |  |
| K9991 | Projected total processor capacity utilization (C163) for maximum line frequency (65Hz) |  |  |
| K9992 | Current total processor capacity (C163) utilized by background routines                 |  |  |
| K9993 | Current total processor capacity (C163) utilized by routines in foreground cycle 4      |  |  |
| K9994 | Current total processor capacity (C163) utilized by routines in foreground cycle 2      |  |  |
| K9995 | Current total processor capacity (C163) utilized by routines in foreground cycle 1      |  |  |

## 12.2 Binector list

The states of binectors can be displayed via parameters r045 and P046.

| Binector            | Name, description | Function diag., Sheet |
|---------------------|-------------------|-----------------------|
| <b>Fixed values</b> |                   |                       |
| <b>B0000</b>        | Fixed value 0     | G120                  |
| <b>B0001</b>        | Fixed value 1     | G120                  |

|                                          |                                 |      |
|------------------------------------------|---------------------------------|------|
| <b>Binary inputs, terminals 36 to 43</b> |                                 |      |
| <b>B0010</b>                             | Status of terminal 36           | G110 |
| <b>B0011</b>                             | Status of terminal 36, inverted | G110 |
| <b>B0012</b>                             | Status of terminal 37           | G110 |
| <b>B0013</b>                             | Status of terminal 37, inverted | G110 |
| <b>B0014</b>                             | Status of terminal 38           | G110 |
| <b>B0015</b>                             | Status of terminal 38, inverted | G110 |
| <b>B0016</b>                             | Status of terminal 39           | G110 |
| <b>B0017</b>                             | Status of terminal 39, inverted | G110 |
| <b>B0018</b>                             | Status of terminal 40           | G111 |
| <b>B0019</b>                             | Status of terminal 40, inverted | G111 |
| <b>B0020</b>                             | Status of terminal 41           | G111 |
| <b>B0021</b>                             | Status of terminal 41, inverted | G111 |
| <b>B0022</b>                             | Status of terminal 42           | G111 |
| <b>B0023</b>                             | Status of terminal 42, inverted | G111 |
| <b>B0024</b>                             | Status of terminal 43           | G111 |
| <b>B0025</b>                             | Status of terminal 43, inverted | G111 |

|                                                                     |                                       |      |
|---------------------------------------------------------------------|---------------------------------------|------|
| <b>Binary inputs, terminals 122/123 and 124/125 on module A7042</b> |                                       |      |
| <b>B0032</b>                                                        | Status of terminals 122/123           | G110 |
| <b>B0033</b>                                                        | Status of terminals 122/123, inverted | G110 |
| <b>B0034</b>                                                        | Status of terminals 124/125           | G110 |
| <b>B0035</b>                                                        | Status of terminals 124/125 inverted  | G110 |

|                                                              |                                                                       |      |
|--------------------------------------------------------------|-----------------------------------------------------------------------|------|
| <b>Binary inputs, terminals 211 to 214 / motor interface</b> |                                                                       |      |
| <b>B0040</b>                                                 | Status of terminal 211 / Brush length monitor (binary) (0=fault)      | G186 |
| <b>B0041</b>                                                 | Status of terminal 211, inverted                                      | G186 |
| <b>B0042</b>                                                 | Status of terminal 212 / Bearing condition monitor (binary) (1=fault) | G186 |
| <b>B0043</b>                                                 | Status of terminal 212, inverted                                      | G186 |
| <b>B0044</b>                                                 | Status of terminal 213 / Motor fan monitor (binary) (0=fault)         | G186 |
| <b>B0045</b>                                                 | Status of terminal 213, inverted                                      | G186 |
| <b>B0046</b>                                                 | Status of terminal 214 / Motor temperature monitor (binary) (0=fault) | G186 |
| <b>B0047</b>                                                 | Status of terminal 214, inverted                                      | G186 |

|                      |                                                             |      |
|----------------------|-------------------------------------------------------------|------|
| <b>Analog inputs</b> |                                                             |      |
| <b>B0050</b>         | Analog input, terminal 4: 1 = Open circuit ( $i \leq 2$ mA) | G113 |
| <b>B0051</b>         | Analog input, terminal 6: 1 = Open circuit ( $i \leq 2$ mA) | G113 |

|                                 |                                        |      |
|---------------------------------|----------------------------------------|------|
| <b>Pulse encoder evaluation</b> |                                        |      |
| <b>B0052</b>                    | Fault in digital speed sensing circuit | G145 |

| Binector     | Name, description                                                                                                                                                                                                                                                                                                                                                                           | Function diag., Sheet |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>B0053</b> | Underflow of actual position value [SW 1.9 and later]<br>This binector changes to 1 when connector KK0046 (actual position value extended in software to a 32-bit value) counts from value 8000 0000H (= $-2^{31}$ ) to value 7FFF FFFFH (= $+2^{31}-1$ ).<br>Binector B0053 does not change back to 0 until connector KK0046 assumes a value other than 7FFF FFFFH (= $+2^{31}-1$ ) again. | G145                  |
| <b>B0054</b> | Overflow of actual position value [SW 1.9 and later]<br>This binector changes to 1 when connector KK0046 (actual position value extended in software to a 32-bit value) counts from value 7FFF FFFFH (= $+2^{31}-1$ ) to value 8000 0000H (= $-2^{31}$ ).<br>Binector B0054 does not change back to 0 until connector KK0046 assumes a value other than 8000 0000H (= $-2^{31}$ ) again.    | G145                  |

| Evaluation of the pulse encoder board SBP |                                                           |      |
|-------------------------------------------|-----------------------------------------------------------|------|
| <b>B0055</b>                              | Position acquisition of SBP, underflow [SW 2.0 and later] | Z120 |
| <b>B0056</b>                              | Position acquisition of SBP, overflow [SW 2.0 and later]  | Z120 |

| Monitoring of the armature currents |                                                                        |      |
|-------------------------------------|------------------------------------------------------------------------|------|
| <b>B0057</b>                        | 1 = Commutation failure or overcurrent has occurred [SW 2.0 and later] | G162 |

| Status word 1 |                                                                                                       |      |
|---------------|-------------------------------------------------------------------------------------------------------|------|
| <b>B0100</b>  | Stat.word 1, bit 0: 0=not ready to switch on, 1=ready to switch on                                    | G182 |
| <b>B0101</b>  | Stat.word 1, bit 0 inverted                                                                           | G182 |
| <b>B0102</b>  | Stat.word 1, bit 1: 0=not ready, 1=ready (pulses disabled)                                            | G182 |
| <b>B0103</b>  | Stat.word 1, bit 1 inverted                                                                           | G182 |
| <b>B0104</b>  | Stat.word 1, bit 2: 0=pulses disabled, 1=Run (output terminals energized)                             | G182 |
| <b>B0105</b>  | Stat.word 1, bit 2 inverted                                                                           | G182 |
| <b>B0106</b>  | Stat.word 1, bit 3: 0=no active fault, 1=active fault (pulses disabled)                               | G182 |
| <b>B0107</b>  | Stat.word 1, bit 3 inverted                                                                           | G182 |
| <b>B0108</b>  | Stat.word 1, bit 4: 0=OFF2 active, 1=no active OFF2                                                   | G182 |
| <b>B0109</b>  | Stat.word 1, bit 4 inverted                                                                           | G182 |
| <b>B0110</b>  | Stat.word 1, bit 5: 0=OFF3 active, 1=no active OFF3                                                   | G182 |
| <b>B0111</b>  | Stat.word 1, bit 5 inverted                                                                           | G182 |
| <b>B0112</b>  | Stat.word 1, bit 6: 0=no starting lockout (unit can be switched on), 1=starting lockout active        | G182 |
| <b>B0113</b>  | Stat.word 1, bit 6 inverted                                                                           | G182 |
| <b>B0114</b>  | Stat.word 1, bit 7: 0=no active alarm, 1=alarm active                                                 | G182 |
| <b>B0115</b>  | Stat.word 1, bit 7 inverted                                                                           | G182 |
| <b>B0116</b>  | Stat.word 1, bit 8: 0=setp./act. val. deviation detected, 1=no setp./act. val. deviation              | G182 |
| <b>B0117</b>  | Stat.word 1, bit 8 inverted                                                                           | G182 |
| <b>B0120</b>  | Stat.word 1, bit 10: 0=comparison setpoint not reached, 1=comparison setpoint reached                 | G182 |
| <b>B0121</b>  | Stat.word 1, bit 10 inverted                                                                          | G182 |
| <b>B0122</b>  | Stat.word 1, bit 11: 0=undervoltage fault not active, 1=undervoltage fault active                     | G182 |
| <b>B0123</b>  | Stat.word 1, bit 11 inverted                                                                          | G182 |
| <b>B0124</b>  | Stat.word 1, bit 12: 0=main contactor request not active, 1=request to energize main contactor active | G182 |
| <b>B0125</b>  | Stat.word 1, bit 12 inverted                                                                          | G182 |
| <b>B0126</b>  | Stat.word 1, bit 13: 0=ramp-function generator not active, 1=ramp-function generator active           | G182 |
| <b>B0127</b>  | Stat.word 1, bit 13 inverted                                                                          | G182 |
| <b>B0128</b>  | Stat.word 1, bit 14: 0=negative speed setpoint, 1=positive speed setpoint                             | G182 |
| <b>B0129</b>  | Stat.word 1, bit 14 inverted                                                                          | G182 |

| Status word 2 |                                                                              |      |
|---------------|------------------------------------------------------------------------------|------|
| <b>B0136</b>  | Stat.word 2, bit 18: 0=overspeed, 1=no overspeed                             | G183 |
| <b>B0137</b>  | Stat.word 2, bit 18 inverted                                                 | G183 |
| <b>B0138</b>  | Stat.word 2, bit 19: 0=no external fault 1 active, 1=external fault 1 active | G183 |



| Binector | Name, description                                                                                  | Function diag., Sheet |
|----------|----------------------------------------------------------------------------------------------------|-----------------------|
| B0139    | Stat.word 2, bit 19 inverted                                                                       | G183                  |
| B0140    | Stat.word 2, bit 20: 0=no external fault 2 active, 1=external fault 2 active                       | G183                  |
| B0141    | Stat.word 2, bit 20 inverted                                                                       | G183                  |
| B0142    | Stat.word 2, bit 21: 0=no external alarm active, 1=external alarm active                           | G183                  |
| B0143    | Stat.word 2, bit 21 inverted                                                                       | G183                  |
| B0144    | Stat.word 2, bit 22: 0=no overload alarm active, 1=overload alarm active                           | G183                  |
| B0145    | Stat.word 2, bit 22 inverted                                                                       | G183                  |
| B0146    | Stat.word 2, bit 23: 0=no overtemperature fault active, 1=overtemperature fault active             | G183                  |
| B0147    | Stat.word 2, bit 23 inverted                                                                       | G183                  |
| B0148    | Stat.word 2, bit 24: 0=no overtemperature alarm active, 1=overtemperature alarm active             | G183                  |
| B0149    | Stat.word 2, bit 24 inverted                                                                       | G183                  |
| B0150    | Stat.word 2, bit 25: 0=no motor overtemperature alarm active, 1=motor overtemperature alarm active | G183                  |
| B0151    | Stat.word 2, bit 25 inverted                                                                       | G183                  |
| B0152    | Stat.word 2, bit 26: 0=no motor overtemperature fault active, 1=motor overtemperature fault active | G183                  |
| B0153    | Stat.word 2, bit 26 inverted                                                                       | G183                  |
| B0156    | Stat.word 2, bit 28: 0=no motor blocked fault active, 1=motor blocked fault active                 | G183                  |
| B0157    | Stat.word 2, bit 28 inverted                                                                       | G183                  |

| Messages |                                                                         |      |
|----------|-------------------------------------------------------------------------|------|
| B0160    | 0=AUS1 or AUS3 active, 1=no AUS1 and no AUS3 is pending                 | G180 |
| B0161    | B0160 inverted                                                          | G180 |
| B0164    | 1 = $n < n_{min}$                                                       | G187 |
| B0165    | B0164 inverted                                                          | G187 |
| B0166    | 1 = Voltage at power section is active                                  |      |
| B0167    | B0166 inverted                                                          |      |
| B0168    | 1 = E-Stop is active                                                    |      |
| B0169    | B0168 inverted                                                          |      |
| B0172    | Output of "Setpoint-actual value deviation 2" signal [SW 1.9 and later] | G187 |
| B0173    | B0172 inverted [SW 1.9 and later]                                       | G187 |

| Acknowledgement of fault codes |                                                         |      |
|--------------------------------|---------------------------------------------------------|------|
| B0179                          | Acknowledgement of control word or P key on PMU (pulse) | G180 |

| Motor interface |                                                                                                       |      |
|-----------------|-------------------------------------------------------------------------------------------------------|------|
| B0180           | 1 = Monitoring brush length (Terminal 211=0) has responded, condition for A025 or F025 fulfilled      | G186 |
| B0181           | 1 = Monitoring bearing state (terminal 212=1) has responded, condition for A026 or F026 fulfilled     | G186 |
| B0182           | 1 = Monitoring motor fan (terminal 213=0) has responded, condition for A027 or F027 fulfilled         | G186 |
| B0183           | 1 = Monitoring motor temperature (terminal 213=0) has responded, condition for A028 or F028 fulfilled | G186 |

| Temperature sensor inputs |                             |      |
|---------------------------|-----------------------------|------|
| B0184                     | 1=Alarm motor temperature 1 | G185 |
| B0185                     | 1=Alarm motor temperature 2 | G185 |

| Alarms |                                                 |      |
|--------|-------------------------------------------------|------|
| B0186  | 1=Alarm A037 (I2t motor) is pending             |      |
| B0187  | no meaning                                      |      |
| B0188  | 1=Alarm A067 (heat sink temperature) is pending |      |
| B0189  | 1=Alarm A067 (device fan) is pending            | G110 |



| Binector                                                                               | Name, description                                                                    | Function diag., Sheet |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------|
| <b>Torque limitation, current limitation, current controller, armature gating unit</b> |                                                                                      |                       |
| B0190                                                                                  | 0 = pulsating current, 1 = continuous current [SW 2.0 and later]                     | G162                  |
| B0192                                                                                  | Speed limitation controller: Positive speed limit reached [SW 1.8 and later]         | G160                  |
| B0193                                                                                  | Speed limitation controller: Negative speed limit reached [SW 1.8 and later]         | G160                  |
| B0194                                                                                  | Current limitation: Positive current limit reached [SW 1.8 and later]                | G161                  |
| B0195                                                                                  | Current limitation: Negative current limit reached [SW 1.8 and later]                | G161                  |
| B0196                                                                                  | $\alpha_G$ limit reached [SW 1.8 and later]                                          | G163                  |
| B0197                                                                                  | $\alpha_W$ limit reached [SW 1.8 and later]                                          | G163                  |
| B0198                                                                                  | Any positive limit (speed, torque, armature, $\alpha_G$ ) reached [SW 2.0 and later] |                       |
| B0199                                                                                  | Any positive limit (speed, torque, armature, $\alpha_W$ ) reached [SW 2.0 and later] |                       |
| B0200                                                                                  | Current limitation active                                                            | G161                  |
| B0201                                                                                  | Speed limiting controller active                                                     | G160                  |
| B0202                                                                                  | Upper torque limitation active                                                       | G160                  |
| B0203                                                                                  | Lower torque limitation active                                                       | G160                  |
| B0204                                                                                  | Torque or current limitation active or current controller at limitation              | G163                  |

|                         |                                                 |      |
|-------------------------|-------------------------------------------------|------|
| <b>Speed controller</b> |                                                 |      |
| B0205                   | Speed controller enabling by sequencing control | G152 |

|                                                     |                                                                              |      |
|-----------------------------------------------------|------------------------------------------------------------------------------|------|
| <b>Setpoint processing, ramp-function generator</b> |                                                                              |      |
| B0206                                               | Limitation after ramp-function generator (setpoint limitation) has responded | G137 |
| B0207                                               | Ramp-function generator output = 0 ( $y = 0$ )                               | G136 |
| B0208                                               | Ramp-function generator, ramp-up                                             | G136 |
| B0209                                               | Ramp-function generator, ramp-down                                           | G136 |
| B0210                                               | 1 = no direction of rotation enabled                                         | G135 |
| B0211                                               | Ramp-function generator: Enable setpoint (1 = setpoint enabled)              | G136 |

|                                              |                                                        |      |
|----------------------------------------------|--------------------------------------------------------|------|
| <b>Limit-value monitor for field current</b> |                                                        |      |
| B0215                                        | Limit-value signal $I_f < I_{f \min}$ (see P394, P395) | G188 |
| B0216                                        | Limit-value signal $I_f < I_{f x}$ (see P398, P399)    | G188 |

|                             |                                                      |      |
|-----------------------------|------------------------------------------------------|------|
| <b>Armature gating unit</b> |                                                      |      |
| B0220                       | Enabled torque direction for parallel drive          | G163 |
| B0221                       | 1 = Torque direction I active                        | G163 |
| B0222                       | 1 = Torque direction II active                       | G163 |
| B0225                       | 1 = active paralleling master [SW 2.1 and later]     | G195 |
| B0230                       | 1 = No torque direction requested [SW 2.1 and later] | G163 |
| B0231                       | 1 = Torque direction I requested [SW 2.1 and later]  | G163 |
| B0232                       | 1 = Torque direction II requested [SW 2.1 and later] | G163 |

|                                |                                                |      |
|--------------------------------|------------------------------------------------|------|
| <b>Motorized potentiometer</b> |                                                |      |
| B0240                          | Motorized potentiometer output = 0 ( $y = 0$ ) | G126 |
| B0241                          | Ramp-up/ramp-down finished ( $y = x$ )         | G126 |

|                      |                                                |              |
|----------------------|------------------------------------------------|--------------|
| <b>Brake control</b> |                                                |              |
| B0250                | Brake control (1=close brake, 0=release brake) | G140         |
| B0251                | 1=auxiliaries ON, 0=auxiliaries OFF            | s.Chap. 9.10 |
| B0252                | 1=device fan on, 0=device fan off              | G117         |
| B0255                | B0250 inverted                                 | G140         |
| B0256                | B0251 inverted                                 |              |

| Binector | Name, description | Function<br>diag., Sheet |
|----------|-------------------|--------------------------|
|----------|-------------------|--------------------------|

|                       |                                                                                                          |      |
|-----------------------|----------------------------------------------------------------------------------------------------------|------|
| <b>Field reversal</b> |                                                                                                          |      |
| <b>B0260</b>          | 1=Close field contactor 1 (control command for one contactor for connection of positive field direction) | G200 |
| <b>B0261</b>          | 1=Close field contactor 2 (control command for one contactor for connection of negative field direction) | G200 |

|                           |                      |      |
|---------------------------|----------------------|------|
| <b>Fixed control bits</b> |                      |      |
| <b>B0421</b>              | Control bit 1 (P421) | G120 |
| <b>B0422</b>              | Control bit 2 (P422) | G120 |
| <b>B0423</b>              | Control bit 3 (P423) | G120 |
| <b>B0424</b>              | Control bit 4 (P424) | G120 |
| <b>B0425</b>              | Control bit 5 (P425) | G120 |
| <b>B0426</b>              | Control bit 6 (P426) | G120 |
| <b>B0427</b>              | Control bit 7 (P427) | G120 |
| <b>B0428</b>              | Control bit 8 (P428) | G120 |

|                                            |                                                      |      |
|--------------------------------------------|------------------------------------------------------|------|
| <b>Serial interface 1 (USS1 on G-SST1)</b> |                                                      |      |
| <b>B2030</b>                               | USS1 telegram monitoring timeout - maintained signal | G170 |
| <b>B2031</b>                               | USS1 telegram monitoring timeout - 1s pulse          | G170 |

|                                            |                                   |      |
|--------------------------------------------|-----------------------------------|------|
| <b>Serial interface 1 (USS1 on G-SST1)</b> |                                   |      |
| <b>B2100</b>                               | USS1 receive data, word 1, bit 0  | G170 |
| <b>B2101</b>                               | USS1 receive data, word 1, bit 1  | G170 |
| <b>B2102</b>                               | USS1 receive data, word 1, bit 2  | G170 |
| <b>B2103</b>                               | USS1 receive data, word 1, bit 3  | G170 |
| <b>B2104</b>                               | USS1 receive data, word 1, bit 4  | G170 |
| <b>B2105</b>                               | USS1 receive data, word 1, bit 5  | G170 |
| <b>B2106</b>                               | USS1 receive data, word 1, bit 6  | G170 |
| <b>B2107</b>                               | USS1 receive data, word 1, bit 7  | G170 |
| <b>B2108</b>                               | USS1 receive data, word 1, bit 8  | G170 |
| <b>B2109</b>                               | USS1 receive data, word 1, bit 9  | G170 |
| <b>B2110</b>                               | USS1 receive data, word 1, bit 10 | G170 |
| <b>B2111</b>                               | USS1 receive data, word 1, bit 11 | G170 |
| <b>B2112</b>                               | USS1 receive data, word 1, bit 12 | G170 |
| <b>B2113</b>                               | USS1 receive data, word 1, bit 13 | G170 |
| <b>B2114</b>                               | USS1 receive data, word 1, bit 14 | G170 |
| <b>B2115</b>                               | USS1 receive data, word 1, bit 15 | G170 |
| <b>B2200</b>                               | USS1 receive data, word 2, bit 0  | G170 |
| <b>B2201</b>                               | USS1 receive data, word 2, bit 1  | G170 |
| <b>B2202</b>                               | USS1 receive data, word 2, bit 2  | G170 |
| <b>B2203</b>                               | USS1 receive data, word 2, bit 3  | G170 |
| <b>B2204</b>                               | USS1 receive data, word 2, bit 4  | G170 |
| <b>B2205</b>                               | USS1 receive data, word 2, bit 5  | G170 |
| <b>B2206</b>                               | USS1 receive data, word 2, bit 6  | G170 |
| <b>B2207</b>                               | USS1 receive data, word 2, bit 7  | G170 |
| <b>B2208</b>                               | USS1 receive data, word 2, bit 8  | G170 |
| <b>B2209</b>                               | USS1 receive data, word 2, bit 9  | G170 |
| <b>B2210</b>                               | USS1 receive data, word 2, bit 10 | G170 |
| <b>B2211</b>                               | USS1 receive data, word 2, bit 11 | G170 |
| <b>B2212</b>                               | USS1 receive data, word 2, bit 12 | G170 |
| <b>B2213</b>                               | USS1 receive data, word 2, bit 13 | G170 |

| Binector | Name, description                 | Function diag., Sheet |
|----------|-----------------------------------|-----------------------|
| B2214    | USS1 receive data, word 2, bit 14 | G170                  |
| B2215    | USS1 receive data, word 2, bit 15 | G170                  |
| B2300    | USS1 receive data, word 3, bit 0  | G170                  |
| B2301    | USS1 receive data, word 3, bit 1  | G170                  |
| B2302    | USS1 receive data, word 3, bit 2  | G170                  |
| B2303    | USS1 receive data, word 3, bit 3  | G170                  |
| B2304    | USS1 receive data, word 3, bit 4  | G170                  |
| B2305    | USS1 receive data, word 3, bit 5  | G170                  |
| B2306    | USS1 receive data, word 3, bit 6  | G170                  |
| B2307    | USS1 receive data, word 3, bit 7  | G170                  |
| B2308    | USS1 receive data, word 3, bit 8  | G170                  |
| B2309    | USS1 receive data, word 3, bit 9  | G170                  |
| B2310    | USS1 receive data, word 3, bit 10 | G170                  |
| B2311    | USS1 receive data, word 3, bit 11 | G170                  |
| B2312    | USS1 receive data, word 3, bit 12 | G170                  |
| B2313    | USS1 receive data, word 3, bit 13 | G170                  |
| B2314    | USS1 receive data, word 3, bit 14 | G170                  |
| B2315    | USS1 receive data, word 3, bit 15 | G170                  |
| B2400    | USS1 receive data, word 4, bit 0  | G170                  |
| B2401    | USS1 receive data, word 4, bit 1  | G170                  |
| B2402    | USS1 receive data, word 4, bit 2  | G170                  |
| B2403    | USS1 receive data, word 4, bit 3  | G170                  |
| B2404    | USS1 receive data, word 4, bit 4  | G170                  |
| B2405    | USS1 receive data, word 4, bit 5  | G170                  |
| B2406    | USS1 receive data, word 4, bit 6  | G170                  |
| B2407    | USS1 receive data, word 4, bit 7  | G170                  |
| B2408    | USS1 receive data, word 4, bit 8  | G170                  |
| B2409    | USS1 receive data, word 4, bit 9  | G170                  |
| B2410    | USS1 receive data, word 4, bit 10 | G170                  |
| B2411    | USS1 receive data, word 4, bit 11 | G170                  |
| B2412    | USS1 receive data, word 4, bit 12 | G170                  |
| B2413    | USS1 receive data, word 4, bit 13 | G170                  |
| B2414    | USS1 receive data, word 4, bit 14 | G170                  |
| B2415    | USS1 receive data, word 4, bit 15 | G170                  |
| B2500    | USS1 receive data, word 5, bit 0  | G170                  |
| B2501    | USS1 receive data, word 5, bit 1  | G170                  |
| B2502    | USS1 receive data, word 5, bit 2  | G170                  |
| B2503    | USS1 receive data, word 5, bit 3  | G170                  |
| B2504    | USS1 receive data, word 5, bit 4  | G170                  |
| B2505    | USS1 receive data, word 5, bit 5  | G170                  |
| B2506    | USS1 receive data, word 5, bit 6  | G170                  |
| B2507    | USS1 receive data, word 5, bit 7  | G170                  |
| B2508    | USS1 receive data, word 5, bit 8  | G170                  |
| B2509    | USS1 receive data, word 5, bit 9  | G170                  |
| B2510    | USS1 receive data, word 5, bit 10 | G170                  |
| B2511    | USS1 receive data, word 5, bit 11 | G170                  |
| B2512    | USS1 receive data, word 5, bit 12 | G170                  |
| B2513    | USS1 receive data, word 5, bit 13 | G170                  |
| B2514    | USS1 receive data, word 5, bit 14 | G170                  |

| Binector | Name, description                 | Function diag., Sheet |
|----------|-----------------------------------|-----------------------|
| B2515    | USS1 receive data, word 5, bit 15 | G170                  |
| B2600    | USS1 receive data, word 6, bit 0  | G170                  |
| B2601    | USS1 receive data, word 6, bit 1  | G170                  |
| B2602    | USS1 receive data, word 6, bit 2  | G170                  |
| B2603    | USS1 receive data, word 6, bit 3  | G170                  |
| B2604    | USS1 receive data, word 6, bit 4  | G170                  |
| B2605    | USS1 receive data, word 6, bit 5  | G170                  |
| B2606    | USS1 receive data, word 6, bit 6  | G170                  |
| B2607    | USS1 receive data, word 6, bit 7  | G170                  |
| B2608    | USS1 receive data, word 6, bit 8  | G170                  |
| B2609    | USS1 receive data, word 6, bit 9  | G170                  |
| B2610    | USS1 receive data, word 6, bit 10 | G170                  |
| B2611    | USS1 receive data, word 6, bit 11 | G170                  |
| B2612    | USS1 receive data, word 6, bit 12 | G170                  |
| B2613    | USS1 receive data, word 6, bit 13 | G170                  |
| B2614    | USS1 receive data, word 6, bit 14 | G170                  |
| B2615    | USS1 receive data, word 6, bit 15 | G170                  |
| B2700    | USS1 receive data, word 7, bit 0  | G170                  |
| B2701    | USS1 receive data, word 7, bit 1  | G170                  |
| B2702    | USS1 receive data, word 7, bit 2  | G170                  |
| B2703    | USS1 receive data, word 7, bit 3  | G170                  |
| B2704    | USS1 receive data, word 7, bit 4  | G170                  |
| B2705    | USS1 receive data, word 7, bit 5  | G170                  |
| B2706    | USS1 receive data, word 7, bit 6  | G170                  |
| B2707    | USS1 receive data, word 7, bit 7  | G170                  |
| B2708    | USS1 receive data, word 7, bit 8  | G170                  |
| B2709    | USS1 receive data, word 7, bit 9  | G170                  |
| B2710    | USS1 receive data, word 7, bit 10 | G170                  |
| B2711    | USS1 receive data, word 7, bit 11 | G170                  |
| B2712    | USS1 receive data, word 7, bit 12 | G170                  |
| B2713    | USS1 receive data, word 7, bit 13 | G170                  |
| B2714    | USS1 receive data, word 7, bit 14 | G170                  |
| B2715    | USS1 receive data, word 7, bit 15 | G170                  |
| B2800    | USS1 receive data, word 8, bit 0  | G170                  |
| B2801    | USS1 receive data, word 8, bit 1  | G170                  |
| B2802    | USS1 receive data, word 8, bit 2  | G170                  |
| B2803    | USS1 receive data, word 8, bit 3  | G170                  |
| B2804    | USS1 receive data, word 8, bit 4  | G170                  |
| B2805    | USS1 receive data, word 8, bit 5  | G170                  |
| B2806    | USS1 receive data, word 8, bit 6  | G170                  |
| B2807    | USS1 receive data, word 8, bit 7  | G170                  |
| B2808    | USS1 receive data, word 8, bit 8  | G170                  |
| B2809    | USS1 receive data, word 8, bit 9  | G170                  |
| B2810    | USS1 receive data, word 8, bit 10 | G170                  |
| B2811    | USS1 receive data, word 8, bit 11 | G170                  |
| B2812    | USS1 receive data, word 8, bit 12 | G170                  |
| B2813    | USS1 receive data, word 8, bit 13 | G170                  |
| B2814    | USS1 receive data, word 8, bit 14 | G170                  |
| B2815    | USS1 receive data, word 8, bit 15 | G170                  |

| Binector | Name, description                 | Function diag., Sheet |
|----------|-----------------------------------|-----------------------|
| B2900    | USS1 receive data, word 9, bit 0  | G170                  |
| B2901    | USS1 receive data, word 9, bit 1  | G170                  |
| B2902    | USS1 receive data, word 9, bit 2  | G170                  |
| B2903    | USS1 receive data, word 9, bit 3  | G170                  |
| B2904    | USS1 receive data, word 9, bit 4  | G170                  |
| B2905    | USS1 receive data, word 9, bit 5  | G170                  |
| B2906    | USS1 receive data, word 9, bit 6  | G170                  |
| B2907    | USS1 receive data, word 9, bit 7  | G170                  |
| B2908    | USS1 receive data, word 9, bit 8  | G170                  |
| B2909    | USS1 receive data, word 9, bit 9  | G170                  |
| B2910    | USS1 receive data, word 9, bit 10 | G170                  |
| B2911    | USS1 receive data, word 9, bit 11 | G170                  |
| B2912    | USS1 receive data, word 9, bit 12 | G170                  |
| B2913    | USS1 receive data, word 9, bit 13 | G170                  |
| B2914    | USS1 receive data, word 9, bit 14 | G170                  |
| B2915    | USS1 receive data, word 9, bit 15 | G170                  |

| Process data exchange with 1 <sup>st</sup> CB/TB |                                                                       |      |
|--------------------------------------------------|-----------------------------------------------------------------------|------|
| B3030                                            | Fault delay timeout for 1 <sup>st</sup> CB/TB - maintained signal     | Z110 |
| B3031                                            | Fault delay timeout for 1 <sup>st</sup> CB/TB - 1s pulse              | Z110 |
| B3035                                            | Telegram failure timeout for 1 <sup>st</sup> CB/TB [SW 1.9 and later] | Z110 |

| Process data exchange with 1 <sup>st</sup> CB/TB |                                                         |      |
|--------------------------------------------------|---------------------------------------------------------|------|
| B3100                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 0  | Z110 |
| B3101                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 1  | Z110 |
| B3102                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 2  | Z110 |
| B3103                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 3  | Z110 |
| B3104                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 4  | Z110 |
| B3105                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 5  | Z110 |
| B3106                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 6  | Z110 |
| B3107                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 7  | Z110 |
| B3108                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 8  | Z110 |
| B3109                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 9  | Z110 |
| B3110                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 10 | Z110 |
| B3111                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 11 | Z110 |
| B3112                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 12 | Z110 |
| B3113                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 13 | Z110 |
| B3114                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 14 | Z110 |
| B3115                                            | Receive data from 1 <sup>st</sup> CB/TB, word 1, bit 15 | Z110 |
| B3200                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 0  | Z110 |
| B3201                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 1  | Z110 |
| B3202                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 2  | Z110 |
| B3203                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 3  | Z110 |
| B3204                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 4  | Z110 |
| B3205                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 5  | Z110 |
| B3206                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 6  | Z110 |
| B3207                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 7  | Z110 |
| B3208                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 8  | Z110 |
| B3209                                            | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 9  | Z110 |

| Binector | Name, description                                       | Function diag., Sheet |
|----------|---------------------------------------------------------|-----------------------|
| B3210    | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 10 | Z110                  |
| B3211    | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 11 | Z110                  |
| B3212    | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 12 | Z110                  |
| B3213    | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 13 | Z110                  |
| B3214    | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 14 | Z110                  |
| B3215    | Receive data from 1 <sup>st</sup> CB/TB, word 2, bit 15 | Z110                  |
| B3300    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 0  | Z110                  |
| B3301    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 1  | Z110                  |
| B3302    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 2  | Z110                  |
| B3303    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 3  | Z110                  |
| B3304    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 4  | Z110                  |
| B3305    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 5  | Z110                  |
| B3306    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 6  | Z110                  |
| B3307    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 7  | Z110                  |
| B3308    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 8  | Z110                  |
| B3309    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 9  | Z110                  |
| B3310    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 10 | Z110                  |
| B3311    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 11 | Z110                  |
| B3312    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 12 | Z110                  |
| B3313    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 13 | Z110                  |
| B3314    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 14 | Z110                  |
| B3315    | Receive data from 1 <sup>st</sup> CB/TB, word 3, bit 15 | Z110                  |
| B3400    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 0  | Z110                  |
| B3401    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 1  | Z110                  |
| B3402    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 2  | Z110                  |
| B3403    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 3  | Z110                  |
| B3404    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 4  | Z110                  |
| B3405    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 5  | Z110                  |
| B3406    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 6  | Z110                  |
| B3407    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 7  | Z110                  |
| B3408    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 8  | Z110                  |
| B3409    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 9  | Z110                  |
| B3410    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 10 | Z110                  |
| B3411    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 11 | Z110                  |
| B3412    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 12 | Z110                  |
| B3413    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 13 | Z110                  |
| B3414    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 14 | Z110                  |
| B3415    | Receive data from 1 <sup>st</sup> CB/TB, word 4, bit 15 | Z110                  |
| B3500    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 0  | Z110                  |
| B3501    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 1  | Z110                  |
| B3502    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 2  | Z110                  |
| B3503    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 3  | Z110                  |
| B3504    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 4  | Z110                  |
| B3505    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 5  | Z110                  |
| B3506    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 6  | Z110                  |
| B3507    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 7  | Z110                  |
| B3508    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 8  | Z110                  |
| B3509    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 9  | Z110                  |
| B3510    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 10 | Z110                  |

| Binector | Name, description                                       | Function diag., Sheet |
|----------|---------------------------------------------------------|-----------------------|
| B3511    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 11 | Z110                  |
| B3512    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 12 | Z110                  |
| B3513    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 13 | Z110                  |
| B3514    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 14 | Z110                  |
| B3515    | Receive data from 1 <sup>st</sup> CB/TB, word 5, bit 15 | Z110                  |
| B3600    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 0  | Z110                  |
| B3601    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 1  | Z110                  |
| B3602    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 2  | Z110                  |
| B3603    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 3  | Z110                  |
| B3604    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 4  | Z110                  |
| B3605    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 5  | Z110                  |
| B3606    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 6  | Z110                  |
| B3607    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 7  | Z110                  |
| B3608    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 8  | Z110                  |
| B3609    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 9  | Z110                  |
| B3610    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 10 | Z110                  |
| B3611    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 11 | Z110                  |
| B3612    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 12 | Z110                  |
| B3613    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 13 | Z110                  |
| B3614    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 14 | Z110                  |
| B3615    | Receive data from 1 <sup>st</sup> CB/TB, word 6, bit 15 | Z110                  |
| B3700    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 0  | Z110                  |
| B3701    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 1  | Z110                  |
| B3702    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 2  | Z110                  |
| B3703    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 3  | Z110                  |
| B3704    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 4  | Z110                  |
| B3705    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 5  | Z110                  |
| B3706    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 6  | Z110                  |
| B3707    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 7  | Z110                  |
| B3708    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 8  | Z110                  |
| B3709    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 9  | Z110                  |
| B3710    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 10 | Z110                  |
| B3711    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 11 | Z110                  |
| B3712    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 12 | Z110                  |
| B3713    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 13 | Z110                  |
| B3714    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 14 | Z110                  |
| B3715    | Receive data from 1 <sup>st</sup> CB/TB, word 7, bit 15 | Z110                  |
| B3800    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 0  | Z110                  |
| B3801    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 1  | Z110                  |
| B3802    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 2  | Z110                  |
| B3803    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 3  | Z110                  |
| B3804    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 4  | Z110                  |
| B3805    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 5  | Z110                  |
| B3806    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 6  | Z110                  |
| B3807    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 7  | Z110                  |
| B3808    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 8  | Z110                  |
| B3809    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 9  | Z110                  |
| B3810    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 10 | Z110                  |
| B3811    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 11 | Z110                  |



| Binector | Name, description                                       | Function diag., Sheet |
|----------|---------------------------------------------------------|-----------------------|
| B3812    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 12 | Z110                  |
| B3813    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 13 | Z110                  |
| B3814    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 14 | Z110                  |
| B3815    | Receive data from 1 <sup>st</sup> CB/TB, word 8, bit 15 | Z110                  |
| B3900    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 0  | Z110                  |
| B3901    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 1  | Z110                  |
| B3902    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 2  | Z110                  |
| B3903    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 3  | Z110                  |
| B3904    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 4  | Z110                  |
| B3905    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 5  | Z110                  |
| B3906    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 6  | Z110                  |
| B3907    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 7  | Z110                  |
| B3908    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 8  | Z110                  |
| B3909    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 9  | Z110                  |
| B3910    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 10 | Z110                  |
| B3911    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 11 | Z110                  |
| B3912    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 12 | Z110                  |
| B3913    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 13 | Z110                  |
| B3914    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 14 | Z110                  |
| B3915    | Receive data from 1 <sup>st</sup> CB/TB, word 9, bit 15 | Z110                  |

| SCB1 with SCI |                                        |                    |            |
|---------------|----------------------------------------|--------------------|------------|
| B4100         | SCI, slave 1, binary input 1           | [SW 1.9 and later] | Z130, Z140 |
| B4101         | SCI, slave 1, binary input 2           | [SW 1.9 and later] | Z130, Z140 |
| B4102         | SCI, slave 1, binary input 3           | [SW 1.9 and later] | Z130, Z140 |
| B4103         | SCI, slave 1, binary input 4           | [SW 1.9 and later] | Z130, Z140 |
| B4104         | SCI, slave 1, binary input 5           | [SW 1.9 and later] | Z130, Z140 |
| B4105         | SCI, slave 1, binary input 6           | [SW 1.9 and later] | Z130, Z140 |
| B4106         | SCI, slave 1, binary input 7           | [SW 1.9 and later] | Z130, Z140 |
| B4107         | SCI, slave 1, binary input 8           | [SW 1.9 and later] | Z130, Z140 |
| B4108         | SCI, slave 1, binary input 9           | [SW 1.9 and later] | Z130, Z140 |
| B4109         | SCI, slave 1, binary input 10          | [SW 1.9 and later] | Z140       |
| B4110         | SCI, slave 1, binary input 11          | [SW 1.9 and later] | Z140       |
| B4111         | SCI, slave 1, binary input 12          | [SW 1.9 and later] | Z140       |
| B4112         | SCI, slave 1, binary input 13          | [SW 1.9 and later] | Z140       |
| B4113         | SCI, slave 1, binary input 14          | [SW 1.9 and later] | Z140       |
| B4114         | SCI, slave 1, binary input 15          | [SW 1.9 and later] | Z140       |
| B4115         | SCI, slave 1, binary input 16          | [SW 1.9 and later] | Z140       |
| B4120         | SCI, slave 1, binary input 1 inverted  | [SW 1.9 and later] | Z130, Z140 |
| B4121         | SCI, slave 1, binary input 2 inverted  | [SW 1.9 and later] | Z130, Z140 |
| B4122         | SCI, slave 1, binary input 3 inverted  | [SW 1.9 and later] | Z130, Z140 |
| B4123         | SCI, slave 1, binary input 4 inverted  | [SW 1.9 and later] | Z130, Z140 |
| B4124         | SCI, slave 1, binary input 5 inverted  | [SW 1.9 and later] | Z130, Z140 |
| B4125         | SCI, slave 1, binary input 6 inverted  | [SW 1.9 and later] | Z130, Z140 |
| B4126         | SCI, slave 1, binary input 7 inverted  | [SW 1.9 and later] | Z130, Z140 |
| B4127         | SCI, slave 1, binary input 8 inverted  | [SW 1.9 and later] | Z130, Z140 |
| B4128         | SCI, slave 1, binary input 9 inverted  | [SW 1.9 and later] | Z130, Z140 |
| B4129         | SCI, slave 1, binary input 10 inverted | [SW 1.9 and later] | Z140       |
| B4130         | SCI, slave 1, binary input 11 inverted | [SW 1.9 and later] | Z140       |



| Binector | Name, description                                         | Function diag., Sheet |
|----------|-----------------------------------------------------------|-----------------------|
| B4131    | SCI, slave 1, binary input 12 inverted [SW 1.9 and later] | Z140                  |
| B4132    | SCI, slave 1, binary input 13 inverted [SW 1.9 and later] | Z140                  |
| B4133    | SCI, slave 1, binary input 14 inverted [SW 1.9 and later] | Z140                  |
| B4134    | SCI, slave 1, binary input 15 inverted [SW 1.9 and later] | Z140                  |
| B4135    | SCI, slave 1, binary input 16 inverted [SW 1.9 and later] | Z140                  |
| B4200    | SCI, slave 2, binary input 1 [SW 1.9 and later]           | Z131, Z141            |
| B4201    | SCI, slave 2, binary input 2 [SW 1.9 and later]           | Z131, Z141            |
| B4202    | SCI, slave 2, binary input 3 [SW 1.9 and later]           | Z131, Z141            |
| B4203    | SCI, slave 2, binary input 4 [SW 1.9 and later]           | Z131, Z141            |
| B4204    | SCI, slave 2, binary input 5 [SW 1.9 and later]           | Z131, Z141            |
| B4205    | SCI, slave 2, binary input 6 [SW 1.9 and later]           | Z131, Z141            |
| B4206    | SCI, slave 2, binary input 7 [SW 1.9 and later]           | Z131, Z141            |
| B4207    | SCI, slave 2, binary input 8 [SW 1.9 and later]           | Z131, Z141            |
| B4208    | SCI, slave 2, binary input 9 [SW 1.9 and later]           | Z131, Z141            |
| B4209    | SCI, slave 2, binary input 10 [SW 1.9 and later]          | Z141                  |
| B4210    | SCI, slave 2, binary input 11 [SW 1.9 and later]          | Z141                  |
| B4211    | SCI, slave 2, binary input 12 [SW 1.9 and later]          | Z141                  |
| B4212    | SCI, slave 2, binary input 13 [SW 1.9 and later]          | Z141                  |
| B4213    | SCI, slave 2, binary input 14 [SW 1.9 and later]          | Z141                  |
| B4214    | SCI, slave 2, binary input 15 [SW 1.9 and later]          | Z141                  |
| B4215    | SCI, slave 2, binary input 16 [SW 1.9 and later]          | Z141                  |
| B4220    | SCI, slave 2, binary input 1 inverted [SW 1.9 and later]  | Z131, Z141            |
| B4221    | SCI, slave 2, binary input 2 inverted [SW 1.9 and later]  | Z131, Z141            |
| B4222    | SCI, slave 2, binary input 3 inverted [SW 1.9 and later]  | Z131, Z141            |
| B4223    | SCI, slave 2, binary input 4 inverted [SW 1.9 and later]  | Z131, Z141            |
| B4224    | SCI, slave 2, binary input 5 inverted [SW 1.9 and later]  | Z131, Z141            |
| B4225    | SCI, slave 2, binary input 6 inverted [SW 1.9 and later]  | Z131, Z141            |
| B4226    | SCI, slave 2, binary input 7 inverted [SW 1.9 and later]  | Z131, Z141            |
| B4227    | SCI, slave 2, binary input 8 inverted [SW 1.9 and later]  | Z131, Z141            |
| B4228    | SCI, slave 2, binary input 9 inverted [SW 1.9 and later]  | Z131, Z141            |
| B4229    | SCI, slave 2, binary input 10 inverted [SW 1.9 and later] | Z141                  |
| B4230    | SCI, slave 2, binary input 11 inverted [SW 1.9 and later] | Z141                  |
| B4231    | SCI, slave 2, binary input 12 inverted [SW 1.9 and later] | Z141                  |
| B4232    | SCI, slave 2, binary input 13 inverted [SW 1.9 and later] | Z141                  |
| B4233    | SCI, slave 2, binary input 14 inverted [SW 1.9 and later] | Z141                  |
| B4234    | SCI, slave 2, binary input 15 inverted [SW 1.9 and later] | Z141                  |
| B4235    | SCI, slave 2, binary input 16 inverted [SW 1.9 and later] | Z141                  |

| Optional supplementary boards: 1st expansion board EB1 |                                                                                      |      |
|--------------------------------------------------------|--------------------------------------------------------------------------------------|------|
| B5101                                                  | Analog input terminal 50 / 51: 1 = wire break ( $i \leq 2$ mA)                       | Z112 |
| B5102                                                  | Analog input terminal 52 (use as digital input): 1 = input voltage is > 8V (log "1") | Z112 |
| B5103                                                  | Analog input terminal 53 (use as digital input): 1 = input voltage is > 8V (log "1") | Z112 |
| B5104                                                  | State terminal 43 (bidirectional input/output) inverted                              | Z114 |
| B5105                                                  | State terminal 43 (bidirectional input/output)                                       | Z114 |
| B5106                                                  | State terminal 44 (bidirectional input/output) inverted                              | Z114 |
| B5107                                                  | State terminal 44 (bidirectional input/output)                                       | Z114 |
| B5108                                                  | State terminal 45 (bidirectional input/output) inverted                              | Z114 |
| B5109                                                  | State terminal 45 (bidirectional input/output)                                       | Z114 |
| B5110                                                  | State terminal 46 (bidirectional input/output) inverted                              | Z114 |

| Binector | Name, description                              | Function diag., Sheet |
|----------|------------------------------------------------|-----------------------|
| B5111    | State terminal 46 (bidirectional Input/output) | Z114                  |
| B5112    | State terminal 40 (digital input) inverted     | Z114                  |
| B5113    | State terminal 40 (digital input)              | Z114                  |
| B5114    | State terminal 41 (digital input) inverted     | Z114                  |
| B5115    | State terminal 41 (digital input)              | Z114                  |
| B5116    | State terminal 42 (digital input) inverted     | Z114                  |
| B5117    | State terminal 42 (digital input)              | Z114                  |

| Optional supplementary boards: 1st Expansion board EB2 |                                                                |      |
|--------------------------------------------------------|----------------------------------------------------------------|------|
| B5121                                                  | Analog input terminal 49 / 50: 1 = wire break ( $i \leq 2$ mA) | Z118 |
| B5122                                                  | State terminal 53 (digital input) inverted                     | Z118 |
| B5123                                                  | State terminal 53 (digital input)                              | Z118 |
| B5124                                                  | State terminal 54 (digital input) inverted                     | Z118 |
| B5125                                                  | State terminal 54 (digital input)                              | Z118 |

| Optional supplementary boards: 2 <sup>nd</sup> expansion board EB1 |                                                                                      |      |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------|------|
| B5201                                                              | Analog input terminal 50 / 51: 1 = wire break ( $i \leq 2$ mA)                       | Z115 |
| B5202                                                              | Analog input terminal 52 (use as digital input): 1 = input voltage is > 8V (log "1") | Z115 |
| B5203                                                              | Analog input terminal 53 (use as digital input): 1 = input voltage is > 8V (log "1") | Z115 |
| B5204                                                              | State terminal 43 (bidirectional input/output) inverted                              | Z117 |
| B5205                                                              | State terminal 43 (bidirectional input/output)                                       | Z117 |
| B5206                                                              | State terminal 44 (bidirectional input/output) inverted                              | Z117 |
| B5207                                                              | State terminal 44 (bidirectional input/output)                                       | Z117 |
| B5208                                                              | State terminal 45 (bidirectional Input/output) inverted                              | Z117 |
| B5209                                                              | State terminal 45 (bidirectional input/output)                                       | Z117 |
| B5210                                                              | State terminal 46 (bidirectional input/output) inverted                              | Z117 |
| B5211                                                              | State terminal 46 (bidirectional Input/output)                                       | Z117 |
| B5212                                                              | State terminal 40 (digital input) inverted                                           | Z117 |
| B5213                                                              | State terminal 40 (digital input)                                                    | Z117 |
| B5214                                                              | State terminal 41 (digital input) inverted                                           | Z117 |
| B5215                                                              | State terminal 41 (digital input)                                                    | Z117 |
| B5216                                                              | State terminal 42 (digital input) inverted                                           | Z117 |
| B5217                                                              | State terminal 42 (digital input)                                                    | Z117 |

| Optional supplementary boards: 2 <sup>nd</sup> Expansion board EB2 |                                                                |      |
|--------------------------------------------------------------------|----------------------------------------------------------------|------|
| B5221                                                              | Analog input terminal 49 / 50: 1 = wire break ( $i \leq 2$ mA) | Z119 |
| B5222                                                              | State terminal 53 (digital input) inverted                     | Z119 |
| B5223                                                              | State terminal 53 (digital input)                              | Z119 |
| B5224                                                              | State terminal 54 (digital input) inverted                     | Z119 |
| B5225                                                              | State terminal 54 (digital input)                              | Z119 |

| Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2) |                                                                |            |
|------------------------------------------------------|----------------------------------------------------------------|------------|
| B6030                                                | USS2 / Peer2 - Telegram monitoring timeout - maintained signal | G171, G173 |
| B6031                                                | USS2 / Peer2 - Telegram monitoring timeout - 1s pulse          | G171, G173 |

| Paralleling interface |                                                 |      |
|-----------------------|-------------------------------------------------|------|
| B6040                 | Telegram monitoring timeout - maintained signal | G195 |
| B6041                 | Telegram monitoring timeout - 1s pulse          | G195 |

| Binector                                                    | Name, description                         | Function<br>diag., Sheet |
|-------------------------------------------------------------|-------------------------------------------|--------------------------|
| <b>Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)</b> |                                           |                          |
| <b>B6100</b>                                                | USS2 / Peer2 receive data, word 1, bit 0  | G171, G173               |
| <b>B6101</b>                                                | USS2 / Peer2 receive data, word 1, bit 1  | G171, G173               |
| <b>B6102</b>                                                | USS2 / Peer2 receive data, word 1, bit 2  | G171, G173               |
| <b>B6103</b>                                                | USS2 / Peer2 receive data, word 1, bit 3  | G171, G173               |
| <b>B6104</b>                                                | USS2 / Peer2 receive data, word 1, bit 4  | G171, G173               |
| <b>B6105</b>                                                | USS2 / Peer2 receive data, word 1, bit 5  | G171, G173               |
| <b>B6106</b>                                                | USS2 / Peer2 receive data, word 1, bit 6  | G171, G173               |
| <b>B6107</b>                                                | USS2 / Peer2 receive data, word 1, bit 7  | G171, G173               |
| <b>B6108</b>                                                | USS2 / Peer2 receive data, word 1, bit 8  | G171, G173               |
| <b>B6109</b>                                                | USS2 / Peer2 receive data, word 1, bit 9  | G171, G173               |
| <b>B6110</b>                                                | USS2 / Peer2 receive data, word 1, bit 10 | G171, G173               |
| <b>B6111</b>                                                | USS2 / Peer2 receive data, word 1, bit 11 | G171, G173               |
| <b>B6112</b>                                                | USS2 / Peer2 receive data, word 1, bit 12 | G171, G173               |
| <b>B6113</b>                                                | USS2 / Peer2 receive data, word 1, bit 13 | G171, G173               |
| <b>B6114</b>                                                | USS2 / Peer2 receive data, word 1, bit 14 | G171, G173               |
| <b>B6115</b>                                                | USS2 / Peer2 receive data, word 1, bit 15 | G171, G173               |
| <b>B6200</b>                                                | USS2 / Peer2 receive data, word 2, bit 0  | G171, G173               |
| <b>B6201</b>                                                | USS2 / Peer2 receive data, word 2, bit 1  | G171, G173               |
| <b>B6202</b>                                                | USS2 / Peer2 receive data, word 2, bit 2  | G171, G173               |
| <b>B6203</b>                                                | USS2 / Peer2 receive data, word 2, bit 3  | G171, G173               |
| <b>B6204</b>                                                | USS2 / Peer2 receive data, word 2, bit 4  | G171, G173               |
| <b>B6205</b>                                                | USS2 / Peer2 receive data, word 2, bit 5  | G171, G173               |
| <b>B6206</b>                                                | USS2 / Peer2 receive data, word 2, bit 6  | G171, G173               |
| <b>B6207</b>                                                | USS2 / Peer2 receive data, word 2, bit 7  | G171, G173               |
| <b>B6208</b>                                                | USS2 / Peer2 receive data, word 2, bit 8  | G171, G173               |
| <b>B6209</b>                                                | USS2 / Peer2 receive data, word 2, bit 9  | G171, G173               |
| <b>B6210</b>                                                | USS2 / Peer2 receive data, word 2, bit 10 | G171, G173               |
| <b>B6211</b>                                                | USS2 / Peer2 receive data, word 2, bit 11 | G171, G173               |
| <b>B6212</b>                                                | USS2 / Peer2 receive data, word 2, bit 12 | G171, G173               |
| <b>B6213</b>                                                | USS2 / Peer2 receive data, word 2, bit 13 | G171, G173               |
| <b>B6214</b>                                                | USS2 / Peer2 receive data, word 2, bit 14 | G171, G173               |
| <b>B6215</b>                                                | USS2 / Peer2 receive data, word 2, bit 15 | G171, G173               |

|                              |                                                               |      |
|------------------------------|---------------------------------------------------------------|------|
| <b>Paralleling interface</b> |                                                               |      |
| <b>B6220</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 0  | G195 |
| <b>B6221</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 1  | G195 |
| <b>B6222</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 2  | G195 |
| <b>B6223</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 3  | G195 |
| <b>B6224</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 4  | G195 |
| <b>B6225</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 5  | G195 |
| <b>B6226</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 6  | G195 |
| <b>B6227</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 7  | G195 |
| <b>B6228</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 8  | G195 |
| <b>B6229</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 9  | G195 |
| <b>B6230</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 10 | G195 |
| <b>B6231</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 11 | G195 |
| <b>B6232</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 12 | G195 |
| <b>B6233</b>                 | Word 1 from master / Word 1 from slave with address 2, bit 13 | G195 |

| Binector     | Name, description                                             | Function<br>diag., Sheet |
|--------------|---------------------------------------------------------------|--------------------------|
| <b>B6234</b> | Word 1 from master / Word 1 from slave with address 2, bit 14 | G195                     |
| <b>B6235</b> | Word 1 from master / Word 1 from slave with address 2, bit 15 | G195                     |

| Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2) |                                           |            |
|------------------------------------------------------|-------------------------------------------|------------|
| <b>B6300</b>                                         | USS2 / Peer2 receive data, word 3, bit 0  | G171, G173 |
| <b>B6301</b>                                         | USS2 / Peer2 receive data, word 3, bit 1  | G171, G173 |
| <b>B6302</b>                                         | USS2 / Peer2 receive data, word 3, bit 2  | G171, G173 |
| <b>B6303</b>                                         | USS2 / Peer2 receive data, word 3, bit 3  | G171, G173 |
| <b>B6304</b>                                         | USS2 / Peer2 receive data, word 3, bit 4  | G171, G173 |
| <b>B6305</b>                                         | USS2 / Peer2 receive data, word 3, bit 5  | G171, G173 |
| <b>B6306</b>                                         | USS2 / Peer2 receive data, word 3, bit 6  | G171, G173 |
| <b>B6307</b>                                         | USS2 / Peer2 receive data, word 3, bit 7  | G171, G173 |
| <b>B6308</b>                                         | USS2 / Peer2 receive data, word 3, bit 8  | G171, G173 |
| <b>B6309</b>                                         | USS2 / Peer2 receive data, word 3, bit 9  | G171, G173 |
| <b>B6310</b>                                         | USS2 / Peer2 receive data, word 3, bit 10 | G171, G173 |
| <b>B6311</b>                                         | USS2 / Peer2 receive data, word 3, bit 11 | G171, G173 |
| <b>B6312</b>                                         | USS2 / Peer2 receive data, word 3, bit 12 | G171, G173 |
| <b>B6313</b>                                         | USS2 / Peer2 receive data, word 3, bit 13 | G171, G173 |
| <b>B6314</b>                                         | USS2 / Peer2 receive data, word 3, bit 14 | G171, G173 |
| <b>B6315</b>                                         | USS2 / Peer2 receive data, word 3, bit 15 | G171, G173 |

| Paralleling interface |                                          |      |
|-----------------------|------------------------------------------|------|
| <b>B6320</b>          | Word 1 from slave with address 3, bit 0  | G195 |
| <b>B6321</b>          | Word 1 from slave with address 3, bit 1  | G195 |
| <b>B6322</b>          | Word 1 from slave with address 3, bit 2  | G195 |
| <b>B6323</b>          | Word 1 from slave with address 3, bit 3  | G195 |
| <b>B6324</b>          | Word 1 from slave with address 3, bit 4  | G195 |
| <b>B6325</b>          | Word 1 from slave with address 3, bit 5  | G195 |
| <b>B6326</b>          | Word 1 from slave with address 3, bit 6  | G195 |
| <b>B6327</b>          | Word 1 from slave with address 3, bit 7  | G195 |
| <b>B6328</b>          | Word 1 from slave with address 3, bit 8  | G195 |
| <b>B6329</b>          | Word 1 from slave with address 3, bit 9  | G195 |
| <b>B6330</b>          | Word 1 from slave with address 3, bit 10 | G195 |
| <b>B6331</b>          | Word 1 from slave with address 3, bit 11 | G195 |
| <b>B6332</b>          | Word 1 from slave with address 3, bit 12 | G195 |
| <b>B6333</b>          | Word 1 from slave with address 3, bit 13 | G195 |
| <b>B6334</b>          | Word 1 from slave with address 3, bit 14 | G195 |
| <b>B6335</b>          | Word 1 from slave with address 3, bit 15 | G195 |

| Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2) |                                          |            |
|------------------------------------------------------|------------------------------------------|------------|
| <b>B6400</b>                                         | USS2 / Peer2 receive data, word 4, bit 0 | G171, G173 |
| <b>B6401</b>                                         | USS2 / Peer2 receive data, word 4, bit 1 | G171, G173 |
| <b>B6402</b>                                         | USS2 / Peer2 receive data, word 4, bit 2 | G171, G173 |
| <b>B6403</b>                                         | USS2 / Peer2 receive data, word 4, bit 3 | G171, G173 |
| <b>B6404</b>                                         | USS2 / Peer2 receive data, word 4, bit 4 | G171, G173 |
| <b>B6405</b>                                         | USS2 / Peer2 receive data, word 4, bit 5 | G171, G173 |
| <b>B6406</b>                                         | USS2 / Peer2 receive data, word 4, bit 6 | G171, G173 |
| <b>B6407</b>                                         | USS2 / Peer2 receive data, word 4, bit 7 | G171, G173 |
| <b>B6408</b>                                         | USS2 / Peer2 receive data, word 4, bit 8 | G171, G173 |
| <b>B6409</b>                                         | USS2 / Peer2 receive data, word 4, bit 9 | G171, G173 |

| Binector     | Name, description                         | Function diag., Sheet |
|--------------|-------------------------------------------|-----------------------|
| <b>B6410</b> | USS2 / Peer2 receive data, word 4, bit 10 | G171, G173            |
| <b>B6411</b> | USS2 / Peer2 receive data, word 4, bit 11 | G171, G173            |
| <b>B6412</b> | USS2 / Peer2 receive data, word 4, bit 12 | G171, G173            |
| <b>B6413</b> | USS2 / Peer2 receive data, word 4, bit 13 | G171, G173            |
| <b>B6414</b> | USS2 / Peer2 receive data, word 4, bit 14 | G171, G173            |
| <b>B6415</b> | USS2 / Peer2 receive data, word 4, bit 15 | G171, G173            |

| Paralleling interface |                                          |      |
|-----------------------|------------------------------------------|------|
| <b>B6420</b>          | Word 1 from slave with address 4, bit 0  | G195 |
| <b>B6421</b>          | Word 1 from slave with address 4, bit 1  | G195 |
| <b>B6422</b>          | Word 1 from slave with address 4, bit 2  | G195 |
| <b>B6423</b>          | Word 1 from slave with address 4, bit 3  | G195 |
| <b>B6424</b>          | Word 1 from slave with address 4, bit 4  | G195 |
| <b>B6425</b>          | Word 1 from slave with address 4, bit 5  | G195 |
| <b>B6426</b>          | Word 1 from slave with address 4, bit 6  | G195 |
| <b>B6427</b>          | Word 1 from slave with address 4, bit 7  | G195 |
| <b>B6428</b>          | Word 1 from slave with address 4, bit 8  | G195 |
| <b>B6429</b>          | Word 1 from slave with address 4, bit 9  | G195 |
| <b>B6430</b>          | Word 1 from slave with address 4, bit 10 | G195 |
| <b>B6431</b>          | Word 1 from slave with address 4, bit 11 | G195 |
| <b>B6432</b>          | Word 1 from slave with address 4, bit 12 | G195 |
| <b>B6433</b>          | Word 1 from slave with address 4, bit 13 | G195 |
| <b>B6434</b>          | Word 1 from slave with address 4, bit 14 | G195 |
| <b>B6435</b>          | Word 1 from slave with address 4, bit 15 | G195 |

| Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2) |                                           |            |
|------------------------------------------------------|-------------------------------------------|------------|
| <b>B6500</b>                                         | USS2 / Peer2 receive data, word 5, bit 0  | G171, G173 |
| <b>B6501</b>                                         | USS2 / Peer2 receive data, word 5, bit 1  | G171, G173 |
| <b>B6502</b>                                         | USS2 / Peer2 receive data, word 5, bit 2  | G171, G173 |
| <b>B6503</b>                                         | USS2 / Peer2 receive data, word 5, bit 3  | G171, G173 |
| <b>B6504</b>                                         | USS2 / Peer2 receive data, word 5, bit 4  | G171, G173 |
| <b>B6505</b>                                         | USS2 / Peer2 receive data, word 5, bit 5  | G171, G173 |
| <b>B6506</b>                                         | USS2 / Peer2 receive data, word 5, bit 6  | G171, G173 |
| <b>B6507</b>                                         | USS2 / Peer2 receive data, word 5, bit 7  | G171, G173 |
| <b>B6508</b>                                         | USS2 / Peer2 receive data, word 5, bit 8  | G171, G173 |
| <b>B6509</b>                                         | USS2 / Peer2 receive data, word 5, bit 9  | G171, G173 |
| <b>B6510</b>                                         | USS2 / Peer2 receive data, word 5, bit 10 | G171, G173 |
| <b>B6511</b>                                         | USS2 / Peer2 receive data, word 5, bit 11 | G171, G173 |
| <b>B6512</b>                                         | USS2 / Peer2 receive data, word 5, bit 12 | G171, G173 |
| <b>B6513</b>                                         | USS2 / Peer2 receive data, word 5, bit 13 | G171, G173 |
| <b>B6514</b>                                         | USS2 / Peer2 receive data, word 5, bit 14 | G171, G173 |
| <b>B6515</b>                                         | USS2 / Peer2 receive data, word 5, bit 15 | G171, G173 |

| Paralleling interface |                                         |      |
|-----------------------|-----------------------------------------|------|
| <b>B6520</b>          | Word 1 from slave with address 5, bit 0 | G195 |
| <b>B6521</b>          | Word 1 from slave with address 5, bit 1 | G195 |
| <b>B6522</b>          | Word 1 from slave with address 5, bit 2 | G195 |
| <b>B6523</b>          | Word 1 from slave with address 5, bit 3 | G195 |
| <b>B6524</b>          | Word 1 from slave with address 5, bit 4 | G195 |
| <b>B6525</b>          | Word 1 from slave with address 5, bit 5 | G195 |

| Binector | Name, description                        | Function diag., Sheet |
|----------|------------------------------------------|-----------------------|
| B6526    | Word 1 from slave with address 5, bit 6  | G195                  |
| B6527    | Word 1 from slave with address 5, bit 7  | G195                  |
| B6528    | Word 1 from slave with address 5, bit 8  | G195                  |
| B6529    | Word 1 from slave with address 5, bit 9  | G195                  |
| B6530    | Word 1 from slave with address 5, bit 10 | G195                  |
| B6531    | Word 1 from slave with address 5, bit 11 | G195                  |
| B6532    | Word 1 from slave with address 5, bit 12 | G195                  |
| B6533    | Word 1 from slave with address 5, bit 13 | G195                  |
| B6534    | Word 1 from slave with address 5, bit 14 | G195                  |
| B6535    | Word 1 from slave with address 5, bit 15 | G195                  |

| Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2) |                                   |      |
|------------------------------------------------------|-----------------------------------|------|
| B6600                                                | USS2 receive data, word 6, bit 0  | G171 |
| B6601                                                | USS2 receive data, word 6, bit 1  | G171 |
| B6602                                                | USS2 receive data, word 6, bit 2  | G171 |
| B6603                                                | USS2 receive data, word 6, bit 3  | G171 |
| B6604                                                | USS2 receive data, word 6, bit 4  | G171 |
| B6605                                                | USS2 receive data, word 6, bit 5  | G171 |
| B6606                                                | USS2 receive data, word 6, bit 6  | G171 |
| B6607                                                | USS2 receive data, word 6, bit 7  | G171 |
| B6608                                                | USS2 receive data, word 6, bit 8  | G171 |
| B6609                                                | USS2 receive data, word 6, bit 9  | G171 |
| B6610                                                | USS2 receive data, word 6, bit 10 | G171 |
| B6611                                                | USS2 receive data, word 6, bit 11 | G171 |
| B6612                                                | USS2 receive data, word 6, bit 12 | G171 |
| B6613                                                | USS2 receive data, word 6, bit 13 | G171 |
| B6614                                                | USS2 receive data, word 6, bit 14 | G171 |
| B6615                                                | USS2 receive data, word 6, bit 15 | G171 |

| Paralleling interface |                                          |      |
|-----------------------|------------------------------------------|------|
| B6620                 | Word 1 from slave with address 6, bit 0  | G195 |
| B6621                 | Word 1 from slave with address 6, bit 1  | G195 |
| B6622                 | Word 1 from slave with address 6, bit 2  | G195 |
| B6623                 | Word 1 from slave with address 6, bit 3  | G195 |
| B6624                 | Word 1 from slave with address 6, bit 4  | G195 |
| B6625                 | Word 1 from slave with address 6, bit 5  | G195 |
| B6626                 | Word 1 from slave with address 6, bit 6  | G195 |
| B6627                 | Word 1 from slave with address 6, bit 7  | G195 |
| B6628                 | Word 1 from slave with address 6, bit 8  | G195 |
| B6629                 | Word 1 from slave with address 6, bit 9  | G195 |
| B6630                 | Word 1 from slave with address 6, bit 10 | G195 |
| B6631                 | Word 1 from slave with address 6, bit 11 | G195 |
| B6632                 | Word 1 from slave with address 6, bit 12 | G195 |
| B6633                 | Word 1 from slave with address 6, bit 13 | G195 |
| B6634                 | Word 1 from slave with address 6, bit 14 | G195 |
| B6635                 | Word 1 from slave with address 6, bit 15 | G195 |

| Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2) |                                  |      |
|------------------------------------------------------|----------------------------------|------|
| B6700                                                | USS2 receive data, word 7, bit 0 | G171 |
| B6701                                                | USS2 receive data, word 7, bit 1 | G171 |

| Binector | Name, description                 | Function diag., Sheet |
|----------|-----------------------------------|-----------------------|
| B6702    | USS2 receive data, word 7, bit 2  | G171                  |
| B6703    | USS2 receive data, word 7, bit 3  | G171                  |
| B6704    | USS2 receive data, word 7, bit 4  | G171                  |
| B6705    | USS2 receive data, word 7, bit 5  | G171                  |
| B6706    | USS2 receive data, word 7, bit 6  | G171                  |
| B6707    | USS2 receive data, word 7, bit 7  | G171                  |
| B6708    | USS2 receive data, word 7, bit 8  | G171                  |
| B6709    | USS2 receive data, word 7, bit 9  | G171                  |
| B6710    | USS2 receive data, word 7, bit 10 | G171                  |
| B6711    | USS2 receive data, word 7, bit 11 | G171                  |
| B6712    | USS2 receive data, word 7, bit 12 | G171                  |
| B6713    | USS2 receive data, word 7, bit 13 | G171                  |
| B6714    | USS2 receive data, word 7, bit 14 | G171                  |
| B6715    | USS2 receive data, word 7, bit 15 | G171                  |
| B6800    | USS2 receive data, word 8, bit 0  | G171                  |
| B6801    | USS2 receive data, word 8, bit 1  | G171                  |
| B6802    | USS2 receive data, word 8, bit 2  | G171                  |
| B6803    | USS2 receive data, word 8, bit 3  | G171                  |
| B6804    | USS2 receive data, word 8, bit 4  | G171                  |
| B6805    | USS2 receive data, word 8, bit 5  | G171                  |
| B6806    | USS2 receive data, word 8, bit 6  | G171                  |
| B6807    | USS2 receive data, word 8, bit 7  | G171                  |
| B6808    | USS2 receive data, word 8, bit 8  | G171                  |
| B6809    | USS2 receive data, word 8, bit 9  | G171                  |
| B6810    | USS2 receive data, word 8, bit 10 | G171                  |
| B6811    | USS2 receive data, word 8, bit 11 | G171                  |
| B6812    | USS2 receive data, word 8, bit 12 | G171                  |
| B6813    | USS2 receive data, word 8, bit 13 | G171                  |
| B6814    | USS2 receive data, word 8, bit 14 | G171                  |
| B6815    | USS2 receive data, word 8, bit 15 | G171                  |
| B6900    | USS2 receive data, word 9, bit 0  | G171                  |
| B6901    | USS2 receive data, word 9, bit 1  | G171                  |
| B6902    | USS2 receive data, word 9, bit 2  | G171                  |
| B6903    | USS2 receive data, word 9, bit 3  | G171                  |
| B6904    | USS2 receive data, word 9, bit 4  | G171                  |
| B6905    | USS2 receive data, word 9, bit 5  | G171                  |
| B6906    | USS2 receive data, word 9, bit 6  | G171                  |
| B6907    | USS2 receive data, word 9, bit 7  | G171                  |
| B6908    | USS2 receive data, word 9, bit 8  | G171                  |
| B6909    | USS2 receive data, word 9, bit 9  | G171                  |
| B6910    | USS2 receive data, word 9, bit 10 | G171                  |
| B6911    | USS2 receive data, word 9, bit 11 | G171                  |
| B6912    | USS2 receive data, word 9, bit 12 | G171                  |
| B6913    | USS2 receive data, word 9, bit 13 | G171                  |
| B6914    | USS2 receive data, word 9, bit 14 | G171                  |
| B6915    | USS2 receive data, word 9, bit 15 | G171                  |

**Optional supplementary boards: SBP pulse encoder evaluation**

|       |                                      |      |
|-------|--------------------------------------|------|
| B7000 | State terminal 74 / 75 (check track) | Z120 |
|-------|--------------------------------------|------|



| Binector | Name, description                  | Function diag., Sheet |
|----------|------------------------------------|-----------------------|
| B7001    | State terminal 65 (coarse pulse 1) | Z120                  |
| B7002    | State terminal 66 (coarse pulse 2) | Z120                  |
| B7003    | State terminal 67 (fine pulse 2)   | Z120                  |

| Optional supplementary boards: SIMOLINK board |                                                     |      |
|-----------------------------------------------|-----------------------------------------------------|------|
| B7030                                         | 1 = Telegram failure                                | Z121 |
| B7040                                         | 1 = Time out                                        | Z121 |
| B7050                                         | 1 = Alarm start-up                                  | Z121 |
| B7100                                         | Receive data from the SIMOLINK board, word 1 bit 0  | Z122 |
| B7101                                         | Receive data from the SIMOLINK board, word 1 bit 1  | Z122 |
| B7102                                         | Receive data from the SIMOLINK board, word 1 bit 2  | Z122 |
| B7103                                         | Receive data from the SIMOLINK board, word 1 bit 3  | Z122 |
| B7104                                         | Receive data from the SIMOLINK board, word 1 bit 4  | Z122 |
| B7105                                         | Receive data from the SIMOLINK board, word 1 bit 5  | Z122 |
| B7106                                         | Receive data from the SIMOLINK board, word 1 bit 6  | Z122 |
| B7107                                         | Receive data from the SIMOLINK board, word 1 bit 7  | Z122 |
| B7108                                         | Receive data from the SIMOLINK board, word 1 bit 8  | Z122 |
| B7109                                         | Receive data from the SIMOLINK board, word 1 bit 9  | Z122 |
| B7110                                         | Receive data from the SIMOLINK board, word 1 bit 10 | Z122 |
| B7111                                         | Receive data from the SIMOLINK board, word 1 bit 11 | Z122 |
| B7112                                         | Receive data from the SIMOLINK board, word 1 bit 12 | Z122 |
| B7113                                         | Receive data from the SIMOLINK board, word 1 bit 13 | Z122 |
| B7114                                         | Receive data from the SIMOLINK board, word 1 bit 14 | Z122 |
| B7115                                         | Receive data from the SIMOLINK board, word 1 bit 15 | Z122 |
| B7200                                         | Receive data from the SIMOLINK board, word 2 bit 0  | Z122 |
| B7201                                         | Receive data from the SIMOLINK board, word 2 bit 1  | Z122 |
| B7202                                         | Receive data from the SIMOLINK board, word 2 bit 2  | Z122 |
| B7203                                         | Receive data from the SIMOLINK board, word 2 bit 3  | Z122 |
| B7204                                         | Receive data from the SIMOLINK board, word 2 bit 4  | Z122 |
| B7205                                         | Receive data from the SIMOLINK board, word 2 bit 5  | Z122 |
| B7206                                         | Receive data from the SIMOLINK board, word 2 bit 6  | Z122 |
| B7207                                         | Receive data from the SIMOLINK board, word 2 bit 7  | Z122 |
| B7208                                         | Receive data from the SIMOLINK board, word 2 bit 8  | Z122 |
| B7209                                         | Receive data from the SIMOLINK board, word 2 bit 9  | Z122 |
| B7210                                         | Receive data from the SIMOLINK board, word 2 bit 10 | Z122 |
| B7211                                         | Receive data from the SIMOLINK board, word 2 bit 11 | Z122 |
| B7212                                         | Receive data from the SIMOLINK board, word 2 bit 12 | Z122 |
| B7213                                         | Receive data from the SIMOLINK board, word 2 bit 13 | Z122 |
| B7214                                         | Receive data from the SIMOLINK board, word 2 bit 14 | Z122 |
| B7215                                         | Receive data from the SIMOLINK board, word 2 bit 15 | Z122 |
| B7300                                         | Receive data from the SIMOLINK board, word 3 bit 0  | Z122 |
| B7301                                         | Receive data from the SIMOLINK board, word 3 bit 1  | Z122 |
| B7302                                         | Receive data from the SIMOLINK board, word 3 bit 2  | Z122 |
| B7303                                         | Receive data from the SIMOLINK board, word 3 bit 3  | Z122 |
| B7304                                         | Receive data from the SIMOLINK board, word 3 bit 4  | Z122 |
| B7305                                         | Receive data from the SIMOLINK board, word 3 bit 5  | Z122 |
| B7306                                         | Receive data from the SIMOLINK board, word 3 bit 6  | Z122 |
| B7307                                         | Receive data from the SIMOLINK board, word 3 bit 7  | Z122 |
| B7308                                         | Receive data from the SIMOLINK board, word 3 bit 8  | Z122 |



| Binector | Name, description                                   | Function diag., Sheet |
|----------|-----------------------------------------------------|-----------------------|
| B7309    | Receive data from the SIMOLINK board, word 3 bit 9  | Z122                  |
| B7310    | Receive data from the SIMOLINK board, word 3 bit 10 | Z122                  |
| B7311    | Receive data from the SIMOLINK board, word 3 bit 11 | Z122                  |
| B7312    | Receive data from the SIMOLINK board, word 3 bit 12 | Z122                  |
| B7313    | Receive data from the SIMOLINK board, word 3 bit 13 | Z122                  |
| B7314    | Receive data from the SIMOLINK board, word 3 bit 14 | Z122                  |
| B7315    | Receive data from the SIMOLINK board, word 3 bit 15 | Z122                  |
| B7400    | Receive data from the SIMOLINK board, word 4 bit 0  | Z122                  |
| B7401    | Receive data from the SIMOLINK board, word 4 bit 1  | Z122                  |
| B7402    | Receive data from the SIMOLINK board, word 4 bit 2  | Z122                  |
| B7403    | Receive data from the SIMOLINK board, word 4 bit 3  | Z122                  |
| B7404    | Receive data from the SIMOLINK board, word 4 bit 4  | Z122                  |
| B7405    | Receive data from the SIMOLINK board, word 4 bit 5  | Z122                  |
| B7406    | Receive data from the SIMOLINK board, word 4 bit 6  | Z122                  |
| B7407    | Receive data from the SIMOLINK board, word 4 bit 7  | Z122                  |
| B7408    | Receive data from the SIMOLINK board, word 4 bit 8  | Z122                  |
| B7409    | Receive data from the SIMOLINK board, word 4 bit 9  | Z122                  |
| B7410    | Receive data from the SIMOLINK board, word 4 bit 10 | Z122                  |
| B7411    | Receive data from the SIMOLINK board, word 4 bit 11 | Z122                  |
| B7412    | Receive data from the SIMOLINK board, word 4 bit 12 | Z122                  |
| B7413    | Receive data from the SIMOLINK board, word 4 bit 13 | Z122                  |
| B7414    | Receive data from the SIMOLINK board, word 4 bit 14 | Z122                  |
| B7415    | Receive data from the SIMOLINK board, word 4 bit 15 | Z122                  |
| B7500    | Receive data from the SIMOLINK board, word 5 bit 0  | Z122                  |
| B7501    | Receive data from the SIMOLINK board, word 5 bit 1  | Z122                  |
| B7502    | Receive data from the SIMOLINK board, word 5 bit 2  | Z122                  |
| B7503    | Receive data from the SIMOLINK board, word 5 bit 3  | Z122                  |
| B7504    | Receive data from the SIMOLINK board, word 5 bit 4  | Z122                  |
| B7505    | Receive data from the SIMOLINK board, word 5 bit 5  | Z122                  |
| B7506    | Receive data from the SIMOLINK board, word 5 bit 6  | Z122                  |
| B7507    | Receive data from the SIMOLINK board, word 5 bit 7  | Z122                  |
| B7508    | Receive data from the SIMOLINK board, word 5 bit 8  | Z122                  |
| B7509    | Receive data from the SIMOLINK board, word 5 bit 9  | Z122                  |
| B7510    | Receive data from the SIMOLINK board, word 5 bit 10 | Z122                  |
| B7511    | Receive data from the SIMOLINK board, word 5 bit 11 | Z122                  |
| B7512    | Receive data from the SIMOLINK board, word 5 bit 12 | Z122                  |
| B7513    | Receive data from the SIMOLINK board, word 5 bit 13 | Z122                  |
| B7514    | Receive data from the SIMOLINK board, word 5 bit 14 | Z122                  |
| B7515    | Receive data from the SIMOLINK board, word 5 bit 15 | Z122                  |
| B7600    | Receive data from the SIMOLINK board, word 6 bit 0  | Z122                  |
| B7601    | Receive data from the SIMOLINK board, word 6 bit 1  | Z122                  |
| B7602    | Receive data from the SIMOLINK board, word 6 bit 2  | Z122                  |
| B7603    | Receive data from the SIMOLINK board, word 6 bit 3  | Z122                  |
| B7604    | Receive data from the SIMOLINK board, word 6 bit 4  | Z122                  |
| B7605    | Receive data from the SIMOLINK board, word 6 bit 5  | Z122                  |
| B7606    | Receive data from the SIMOLINK board, word 6 bit 6  | Z122                  |
| B7607    | Receive data from the SIMOLINK board, word 6 bit 7  | Z122                  |
| B7608    | Receive data from the SIMOLINK board, word 6 bit 8  | Z122                  |
| B7609    | Receive data from the SIMOLINK board, word 6 bit 9  | Z122                  |

| Binector | Name, description                                   | Function diag., Sheet |
|----------|-----------------------------------------------------|-----------------------|
| B7610    | Receive data from the SIMOLINK board, word 6 bit 10 | Z122                  |
| B7611    | Receive data from the SIMOLINK board, word 6 bit 11 | Z122                  |
| B7612    | Receive data from the SIMOLINK board, word 6 bit 12 | Z122                  |
| B7613    | Receive data from the SIMOLINK board, word 6 bit 13 | Z122                  |
| B7614    | Receive data from the SIMOLINK board, word 6 bit 14 | Z122                  |
| B7615    | Receive data from the SIMOLINK board, word 6 bit 15 | Z122                  |
| B7700    | Receive data from the SIMOLINK board, word 7 bit 0  | Z122                  |
| B7701    | Receive data from the SIMOLINK board, word 7 bit 1  | Z122                  |
| B7702    | Receive data from the SIMOLINK board, word 7 bit 2  | Z122                  |
| B7703    | Receive data from the SIMOLINK board, word 7 bit 3  | Z122                  |
| B7704    | Receive data from the SIMOLINK board, word 7 bit 4  | Z122                  |
| B7705    | Receive data from the SIMOLINK board, word 7 bit 5  | Z122                  |
| B7706    | Receive data from the SIMOLINK board, word 7 bit 6  | Z122                  |
| B7707    | Receive data from the SIMOLINK board, word 7 bit 7  | Z122                  |
| B7708    | Receive data from the SIMOLINK board, word 7 bit 8  | Z122                  |
| B7709    | Receive data from the SIMOLINK board, word 7 bit 9  | Z122                  |
| B7710    | Receive data from the SIMOLINK board, word 7 bit 10 | Z122                  |
| B7711    | Receive data from the SIMOLINK board, word 7 bit 11 | Z122                  |
| B7712    | Receive data from the SIMOLINK board, word 7 bit 12 | Z122                  |
| B7713    | Receive data from the SIMOLINK board, word 7 bit 13 | Z122                  |
| B7714    | Receive data from the SIMOLINK board, word 7 bit 14 | Z122                  |
| B7715    | Receive data from the SIMOLINK board, word 7 bit 15 | Z122                  |
| B7800    | Receive data from the SIMOLINK board, word 8 bit 0  | Z122                  |
| B7801    | Receive data from the SIMOLINK board, word 8 bit 1  | Z122                  |
| B7802    | Receive data from the SIMOLINK board, word 8 bit 2  | Z122                  |
| B7803    | Receive data from the SIMOLINK board, word 8 bit 3  | Z122                  |
| B7804    | Receive data from the SIMOLINK board, word 8 bit 4  | Z122                  |
| B7805    | Receive data from the SIMOLINK board, word 8 bit 5  | Z122                  |
| B7806    | Receive data from the SIMOLINK board, word 8 bit 6  | Z122                  |
| B7807    | Receive data from the SIMOLINK board, word 8 bit 7  | Z122                  |
| B7808    | Receive data from the SIMOLINK board, word 8 bit 8  | Z122                  |
| B7809    | Receive data from the SIMOLINK board, word 8 bit 9  | Z122                  |
| B7810    | Receive data from the SIMOLINK board, word 8 bit 10 | Z122                  |
| B7811    | Receive data from the SIMOLINK board, word 8 bit 11 | Z122                  |
| B7812    | Receive data from the SIMOLINK board, word 8 bit 12 | Z122                  |
| B7813    | Receive data from the SIMOLINK board, word 8 bit 13 | Z122                  |
| B7814    | Receive data from the SIMOLINK board, word 8 bit 14 | Z122                  |
| B7815    | Receive data from the SIMOLINK board, word 8 bit 15 | Z122                  |
| B7900    | Receive data from the SIMOLINK board, word 9 bit 0  | Z122                  |
| B7901    | Receive data from the SIMOLINK board, word 9 bit 1  | Z122                  |
| B7902    | Receive data from the SIMOLINK board, word 9 bit 2  | Z122                  |
| B7903    | Receive data from the SIMOLINK board, word 9 bit 3  | Z122                  |
| B7904    | Receive data from the SIMOLINK board, word 9 bit 4  | Z122                  |
| B7905    | Receive data from the SIMOLINK board, word 9 bit 5  | Z122                  |
| B7906    | Receive data from the SIMOLINK board, word 9 bit 6  | Z122                  |
| B7907    | Receive data from the SIMOLINK board, word 9 bit 7  | Z122                  |
| B7908    | Receive data from the SIMOLINK board, word 9 bit 8  | Z122                  |
| B7909    | Receive data from the SIMOLINK board, word 9 bit 9  | Z122                  |
| B7910    | Receive data from the SIMOLINK board, word 9 bit 10 | Z122                  |

| Binector | Name, description                                   | Function diag., Sheet |
|----------|-----------------------------------------------------|-----------------------|
| B7911    | Receive data from the SIMOLINK board, word 9 bit 11 | Z122                  |
| B7912    | Receive data from the SIMOLINK board, word 9 bit 12 | Z122                  |
| B7913    | Receive data from the SIMOLINK board, word 9 bit 13 | Z122                  |
| B7914    | Receive data from the SIMOLINK board, word 9 bit 14 | Z122                  |
| B7915    | Receive data from the SIMOLINK board, word 9 bit 15 | Z122                  |

| Process data exchange with 2 <sup>nd</sup> CB |                                                                    |      |
|-----------------------------------------------|--------------------------------------------------------------------|------|
| B8030                                         | Fault delay timeout for 2 <sup>nd</sup> CB - maintained signal     | Z111 |
| B8031                                         | Fault delay timeout for 2 <sup>nd</sup> CB - 1s pulse              | Z111 |
| B8035                                         | Telegram failure timeout for 2 <sup>nd</sup> CB [SW 1.9 and later] | Z111 |

| Process data exchange with 2 <sup>nd</sup> CB |                                                      |      |
|-----------------------------------------------|------------------------------------------------------|------|
| B8100                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 0  | Z111 |
| B8101                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 1  | Z111 |
| B8102                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 2  | Z111 |
| B8103                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 3  | Z111 |
| B8104                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 4  | Z111 |
| B8105                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 5  | Z111 |
| B8106                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 6  | Z111 |
| B8107                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 7  | Z111 |
| B8108                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 8  | Z111 |
| B8109                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 9  | Z111 |
| B8110                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 10 | Z111 |
| B8111                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 11 | Z111 |
| B8112                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 12 | Z111 |
| B8113                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 13 | Z111 |
| B8114                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 14 | Z111 |
| B8115                                         | Receive data from 2 <sup>nd</sup> CB, word 1, bit 15 | Z111 |
| B8200                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 0  | Z111 |
| B8201                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 1  | Z111 |
| B8202                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 2  | Z111 |
| B8203                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 3  | Z111 |
| B8204                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 4  | Z111 |
| B8205                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 5  | Z111 |
| B8206                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 6  | Z111 |
| B8207                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 7  | Z111 |
| B8208                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 8  | Z111 |
| B8209                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 9  | Z111 |
| B8210                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 10 | Z111 |
| B8211                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 11 | Z111 |
| B8212                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 12 | Z111 |
| B8213                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 13 | Z111 |
| B8214                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 14 | Z111 |
| B8215                                         | Receive data from 2 <sup>nd</sup> CB, word 2, bit 15 | Z111 |
| B8300                                         | Receive data from 2 <sup>nd</sup> CB, word 3, bit 0  | Z111 |
| B8301                                         | Receive data from 2 <sup>nd</sup> CB, word 3, bit 1  | Z111 |
| B8302                                         | Receive data from 2 <sup>nd</sup> CB, word 3, bit 2  | Z111 |
| B8303                                         | Receive data from 2 <sup>nd</sup> CB, word 3, bit 3  | Z111 |
| B8304                                         | Receive data from 2 <sup>nd</sup> CB, word 3, bit 4  | Z111 |

| Binector | Name, description                                    | Function diag., Sheet |
|----------|------------------------------------------------------|-----------------------|
| B8305    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 5  | Z111                  |
| B8306    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 6  | Z111                  |
| B8307    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 7  | Z111                  |
| B8308    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 8  | Z111                  |
| B8309    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 9  | Z111                  |
| B8310    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 10 | Z111                  |
| B8311    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 11 | Z111                  |
| B8312    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 12 | Z111                  |
| B8313    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 13 | Z111                  |
| B8314    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 14 | Z111                  |
| B8315    | Receive data from 2 <sup>nd</sup> CB, word 3, bit 15 | Z111                  |
| B8400    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 0  | Z111                  |
| B8401    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 1  | Z111                  |
| B8402    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 2  | Z111                  |
| B8403    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 3  | Z111                  |
| B8404    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 4  | Z111                  |
| B8405    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 5  | Z111                  |
| B8406    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 6  | Z111                  |
| B8407    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 7  | Z111                  |
| B8408    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 8  | Z111                  |
| B8409    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 9  | Z111                  |
| B8410    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 10 | Z111                  |
| B8411    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 11 | Z111                  |
| B8412    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 12 | Z111                  |
| B8413    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 13 | Z111                  |
| B8414    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 14 | Z111                  |
| B8415    | Receive data from 2 <sup>nd</sup> CB, word 4, bit 15 | Z111                  |
| B8500    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 0  | Z111                  |
| B8501    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 1  | Z111                  |
| B8502    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 2  | Z111                  |
| B8503    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 3  | Z111                  |
| B8504    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 4  | Z111                  |
| B8505    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 5  | Z111                  |
| B8506    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 6  | Z111                  |
| B8507    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 7  | Z111                  |
| B8508    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 8  | Z111                  |
| B8509    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 9  | Z111                  |
| B8510    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 10 | Z111                  |
| B8511    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 11 | Z111                  |
| B8512    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 12 | Z111                  |
| B8513    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 13 | Z111                  |
| B8514    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 14 | Z111                  |
| B8515    | Receive data from 2 <sup>nd</sup> CB, word 5, bit 15 | Z111                  |
| B8600    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 0  | Z111                  |
| B8601    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 1  | Z111                  |
| B8602    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 2  | Z111                  |
| B8603    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 3  | Z111                  |
| B8604    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 4  | Z111                  |
| B8605    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 5  | Z111                  |

| Binector | Name, description                                    | Function diag., Sheet |
|----------|------------------------------------------------------|-----------------------|
| B8606    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 6  | Z111                  |
| B8607    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 7  | Z111                  |
| B8608    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 8  | Z111                  |
| B8609    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 9  | Z111                  |
| B8610    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 10 | Z111                  |
| B8611    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 11 | Z111                  |
| B8612    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 12 | Z111                  |
| B8613    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 13 | Z111                  |
| B8614    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 14 | Z111                  |
| B8615    | Receive data from 2 <sup>nd</sup> CB, word 6, bit 15 | Z111                  |
| B8700    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 0  | Z111                  |
| B8701    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 1  | Z111                  |
| B8702    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 2  | Z111                  |
| B8703    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 3  | Z111                  |
| B8704    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 4  | Z111                  |
| B8705    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 5  | Z111                  |
| B8706    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 6  | Z111                  |
| B8707    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 7  | Z111                  |
| B8708    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 8  | Z111                  |
| B8709    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 9  | Z111                  |
| B8710    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 10 | Z111                  |
| B8711    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 11 | Z111                  |
| B8712    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 12 | Z111                  |
| B8713    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 13 | Z111                  |
| B8714    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 14 | Z111                  |
| B8715    | Receive data from 2 <sup>nd</sup> CB, word 7, bit 15 | Z111                  |
| B8800    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 0  | Z111                  |
| B8801    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 1  | Z111                  |
| B8802    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 2  | Z111                  |
| B8803    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 3  | Z111                  |
| B8804    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 4  | Z111                  |
| B8805    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 5  | Z111                  |
| B8806    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 6  | Z111                  |
| B8807    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 7  | Z111                  |
| B8808    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 8  | Z111                  |
| B8809    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 9  | Z111                  |
| B8810    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 10 | Z111                  |
| B8811    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 11 | Z111                  |
| B8812    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 12 | Z111                  |
| B8813    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 13 | Z111                  |
| B8814    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 14 | Z111                  |
| B8815    | Receive data from 2 <sup>nd</sup> CB, word 8, bit 15 | Z111                  |
| B8900    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 0  | Z111                  |
| B8901    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 1  | Z111                  |
| B8902    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 2  | Z111                  |
| B8903    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 3  | Z111                  |
| B8904    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 4  | Z111                  |
| B8905    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 5  | Z111                  |
| B8906    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 6  | Z111                  |

| Binector | Name, description                                    | Function diag., Sheet |
|----------|------------------------------------------------------|-----------------------|
| B8907    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 7  | Z111                  |
| B8908    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 8  | Z111                  |
| B8909    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 9  | Z111                  |
| B8910    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 10 | Z111                  |
| B8911    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 11 | Z111                  |
| B8912    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 12 | Z111                  |
| B8913    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 13 | Z111                  |
| B8914    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 14 | Z111                  |
| B8915    | Receive data from 2 <sup>nd</sup> CB, word 9, bit 15 | Z111                  |

| Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3) |                                                                |            |
|------------------------------------------------------|----------------------------------------------------------------|------------|
| B9030                                                | USS3 / Peer3 - Telegram monitoring timeout - maintained signal | G172, G174 |
| B9031                                                | USS3 / Peer3 - Telegram monitoring timeout - 1s pulse          | G172, G174 |

| Technology software S00: Voltage monitor for electronics power supply |                                                    |      |
|-----------------------------------------------------------------------|----------------------------------------------------|------|
| B9050                                                                 | Power ON (100ms pulse on connection of voltage)    | B110 |
| B9051                                                                 | Power OFF (10ms pulse on disconnection of voltage) | B110 |

| Technology software S00: Connector/binector converters |                                        |       |      |
|--------------------------------------------------------|----------------------------------------|-------|------|
| B9052                                                  | Connector/binector converter 1, bit 0  | FB 10 | B120 |
| B9053                                                  | Connector/binector converter 1, bit 1  | FB 10 | B120 |
| B9054                                                  | Connector/binector converter 1, bit 2  | FB 10 | B120 |
| B9055                                                  | Connector/binector converter 1, bit 3  | FB 10 | B120 |
| B9056                                                  | Connector/binector converter 1, bit 4  | FB 10 | B120 |
| B9057                                                  | Connector/binector converter 1, bit 5  | FB 10 | B120 |
| B9058                                                  | Connector/binector converter 1, bit 6  | FB 10 | B120 |
| B9059                                                  | Connector/binector converter 1, bit 7  | FB 10 | B120 |
| B9060                                                  | Connector/binector converter 1, bit 8  | FB 10 | B120 |
| B9061                                                  | Connector/binector converter 1, bit 9  | FB 10 | B120 |
| B9062                                                  | Connector/binector converter 1, bit 10 | FB 10 | B120 |
| B9063                                                  | Connector/binector converter 1, bit 11 | FB 10 | B120 |
| B9064                                                  | Connector/binector converter 1, bit 12 | FB 10 | B120 |
| B9065                                                  | Connector/binector converter 1, bit 13 | FB 10 | B120 |
| B9066                                                  | Connector/binector converter 1, bit 14 | FB 10 | B120 |
| B9067                                                  | Connector/binector converter 1, bit 15 | FB 10 | B120 |
| B9068                                                  | Connector/binector converter 2, bit 0  | FB 11 | B120 |
| B9069                                                  | Connector/binector converter 2, bit 1  | FB 11 | B120 |
| B9070                                                  | Connector/binector converter 2, bit 2  | FB 11 | B120 |
| B9071                                                  | Connector/binector converter 2, bit 3  | FB 11 | B120 |
| B9072                                                  | Connector/binector converter 2, bit 4  | FB 11 | B120 |
| B9073                                                  | Connector/binector converter 2, bit 5  | FB 11 | B120 |
| B9074                                                  | Connector/binector converter 2, bit 6  | FB 11 | B120 |
| B9075                                                  | Connector/binector converter 2, bit 7  | FB 11 | B120 |
| B9076                                                  | Connector/binector converter 2, bit 8  | FB 11 | B120 |
| B9077                                                  | Connector/binector converter 2, bit 9  | FB 11 | B120 |
| B9078                                                  | Connector/binector converter 2, bit 10 | FB 11 | B120 |
| B9079                                                  | Connector/binector converter 2, bit 11 | FB 11 | B120 |
| B9080                                                  | Connector/binector converter 2, bit 12 | FB 11 | B120 |
| B9081                                                  | Connector/binector converter 2, bit 13 | FB 11 | B120 |
| B9082                                                  | Connector/binector converter 2, bit 14 | FB 11 | B120 |



| Binector | Name, description                      | Function diag., Sheet |
|----------|----------------------------------------|-----------------------|
| B9083    | Connector/binector converter 2, bit 15 | FB 11 B120            |
| B9084    | Connector/binector converter 3, bit 0  | FB 12 B120            |
| B9085    | Connector/binector converter 3, bit 1  | FB 12 B120            |
| B9086    | Connector/binector converter 3, bit 2  | FB 12 B120            |
| B9087    | Connector/binector converter 3, bit 3  | FB 12 B120            |
| B9088    | Connector/binector converter 3, bit 4  | FB 12 B120            |
| B9089    | Connector/binector converter 3, bit 5  | FB 12 B120            |
| B9090    | Connector/binector converter 3, bit 6  | FB 12 B120            |
| B9091    | Connector/binector converter 3, bit 7  | FB 12 B120            |
| B9092    | Connector/binector converter 3, bit 8  | FB 12 B120            |
| B9093    | Connector/binector converter 3, bit 9  | FB 12 B120            |
| B9094    | Connector/binector converter 3, bit 10 | FB 12 B120            |
| B9095    | Connector/binector converter 3, bit 11 | FB 12 B120            |
| B9096    | Connector/binector converter 3, bit 12 | FB 12 B120            |
| B9097    | Connector/binector converter 3, bit 13 | FB 12 B120            |
| B9098    | Connector/binector converter 3, bit 14 | FB 12 B120            |
| B9099    | Connector/binector converter 3, bit 15 | FB 12 B120            |

| Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3) |                                           |            |
|------------------------------------------------------|-------------------------------------------|------------|
| B9100                                                | USS3 / Peer3 receive data, word 1, bit 0  | G172, G174 |
| B9101                                                | USS3 / Peer3 receive data, word 1, bit 1  | G172, G174 |
| B9102                                                | USS3 / Peer3 receive data, word 1, bit 2  | G172, G174 |
| B9103                                                | USS3 / Peer3 receive data, word 1, bit 3  | G172, G174 |
| B9104                                                | USS3 / Peer3 receive data, word 1, bit 4  | G172, G174 |
| B9105                                                | USS3 / Peer3 receive data, word 1, bit 5  | G172, G174 |
| B9106                                                | USS3 / Peer3 receive data, word 1, bit 6  | G172, G174 |
| B9107                                                | USS3 / Peer3 receive data, word 1, bit 7  | G172, G174 |
| B9108                                                | USS3 / Peer3 receive data, word 1, bit 8  | G172, G174 |
| B9109                                                | USS3 / Peer3 receive data, word 1, bit 9  | G172, G174 |
| B9110                                                | USS3 / Peer3 receive data, word 1, bit 10 | G172, G174 |
| B9111                                                | USS3 / Peer3 receive data, word 1, bit 11 | G172, G174 |
| B9112                                                | USS3 / Peer3 receive data, word 1, bit 12 | G172, G174 |
| B9113                                                | USS3 / Peer3 receive data, word 1, bit 13 | G172, G174 |
| B9114                                                | USS3 / Peer3 receive data, word 1, bit 14 | G172, G174 |
| B9115                                                | USS3 / Peer3 receive data, word 1, bit 15 | G172, G174 |

| Technology software S00: Limiters |                                              |                                |
|-----------------------------------|----------------------------------------------|--------------------------------|
| B9150                             | Limiter 1: Positive limitation has responded | FB 65 B135                     |
| B9151                             | Limiter 1: Negative limitation has responded | FB 65 B135                     |
| B9152                             | Limiter 2: Positive limitation has responded | FB 66 B135                     |
| B9153                             | Limiter 2: Negative limitation has responded | FB 66 B135                     |
| B9154                             | Limiter 3: Positive limitation has responded | FB 67 B135                     |
| B9155                             | Limiter 3: Negative limitation has responded | FB 67 B135                     |
| B9156                             | Limiter 4: Positive limitation has responded | [SW 2.0 and later] FB 212 B134 |
| B9157                             | Limiter 4: Negative limitation has responded | [SW 2.0 and later] FB 212 B134 |
| B9158                             | Limiter 5: Positive limitation has responded | [SW 2.0 and later] FB 213 B134 |
| B9159                             | Limiter 5: Negative limitation has responded | [SW 2.0 and later] FB 213 B134 |

| Technology software S00: Limit-value monitor with filter |                                                            |            |
|----------------------------------------------------------|------------------------------------------------------------|------------|
| B9160                                                    | Limit-value monitor with filter 1: $ A  < B$ has responded | FB 70 B136 |

| Binector | Name, description                                        | Function diag., Sheet |
|----------|----------------------------------------------------------|-----------------------|
| B9161    | Limit-value monitor with filter 1: A < B has responded   | FB 70 B136            |
| B9162    | Limit-value monitor with filter 1: A = B has responded   | FB 70 B136            |
| B9163    | Limit-value monitor with filter 2:  A  < B has responded | FB 71 B136            |
| B9164    | Limit-value monitor with filter 2: A < B has responded   | FB 71 B136            |
| B9165    | Limit-value monitor with filter 2: A = B has responded   | FB 71 B136            |
| B9166    | Limit-value monitor with filter 3:  A  < B has responded | FB 72 B136            |
| B9167    | Limit-value monitor with filter 3: A < B has responded   | FB 72 B136            |
| B9168    | Limit-value monitor with filter 3: A = B has responded   | FB 72 B136            |

| Technology software S00: Limit-value monitor without filter |                                                             |            |
|-------------------------------------------------------------|-------------------------------------------------------------|------------|
| B9169                                                       | Limit-value monitor without filter 1:  A  < B has responded | FB 73 B137 |
| B9170                                                       | Limit-value monitor without filter 1: A < B has responded   | FB 73 B137 |
| B9171                                                       | Limit-value monitor without filter 1: A = B has responded   | FB 73 B137 |
| B9172                                                       | Limit-value monitor without filter 2:  A  < B has responded | FB 74 B137 |
| B9173                                                       | Limit-value monitor without filter 2: A < B has responded   | FB 74 B137 |
| B9174                                                       | Limit-value monitor without filter 2: A = B has responded   | FB 74 B137 |
| B9175                                                       | Limit-value monitor without filter 3:  A  < B has responded | FB 75 B137 |
| B9176                                                       | Limit-value monitor without filter 3: A < B has responded   | FB 75 B137 |
| B9177                                                       | Limit-value monitor without filter 3: A = B has responded   | FB 75 B137 |
| B9178                                                       | Limit-value monitor without filter 4:  A  < B has responded | FB 76 B137 |
| B9179                                                       | Limit-value monitor without filter 4: A < B has responded   | FB 76 B137 |
| B9180                                                       | Limit-value monitor without filter 4: A = B has responded   | FB 76 B137 |
| B9181                                                       | Limit-value monitor without filter 5:  A  < B has responded | FB 77 B138 |
| B9182                                                       | Limit-value monitor without filter 5: A < B has responded   | FB 77 B138 |
| B9183                                                       | Limit-value monitor without filter 5: A = B has responded   | FB 77 B138 |
| B9184                                                       | Limit-value monitor without filter 6:  A  < B has responded | FB 78 B138 |
| B9185                                                       | Limit-value monitor without filter 6: A < B has responded   | FB 78 B138 |
| B9186                                                       | Limit-value monitor without filter 6: A = B has responded   | FB 78 B138 |
| B9187                                                       | Limit-value monitor without filter 7:  A  < B has responded | FB 79 B138 |
| B9188                                                       | Limit-value monitor without filter 7: A < B has responded   | FB 79 B138 |
| B9189                                                       | Limit-value monitor without filter 7: A = B has responded   | FB 79 B138 |

| Technology software S00: Simple ramp-function generator |                                                                        |             |
|---------------------------------------------------------|------------------------------------------------------------------------|-------------|
| B9190                                                   | Ramp-function generator output = ramp-function generator input (y = x) | FB 113 B165 |
| B9191                                                   | 0 = ramp-function generator initial run                                | FB 113 B165 |

| Technology software S00: EXCLUSIVE OR elements with 2 inputs each |                                  |             |
|-------------------------------------------------------------------|----------------------------------|-------------|
| B9195                                                             | Output of EXCLUSIVE OR element 1 | FB 170 B206 |
| B9196                                                             | Output of EXCLUSIVE OR element 2 | FB 171 B206 |
| B9197                                                             | Output of EXCLUSIVE OR element 3 | FB 172 B206 |
| B9198                                                             | Output of EXCLUSIVE OR element 4 | FB 173 B206 |

| Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3) |                                          |            |
|------------------------------------------------------|------------------------------------------|------------|
| B9200                                                | USS3 / Peer3 receive data, word 2, bit 0 | G172, G174 |
| B9201                                                | USS3 / Peer3 receive data, word 2, bit 1 | G172, G174 |
| B9202                                                | USS3 / Peer3 receive data, word 2, bit 2 | G172, G174 |
| B9203                                                | USS3 / Peer3 receive data, word 2, bit 3 | G172, G174 |
| B9204                                                | USS3 / Peer3 receive data, word 2, bit 4 | G172, G174 |
| B9205                                                | USS3 / Peer3 receive data, word 2, bit 5 | G172, G174 |
| B9206                                                | USS3 / Peer3 receive data, word 2, bit 6 | G172, G174 |



| Binector | Name, description                         | Function diag., Sheet |
|----------|-------------------------------------------|-----------------------|
| B9207    | USS3 / Peer3 receive data, word 2, bit 7  | G172, G174            |
| B9208    | USS3 / Peer3 receive data, word 2, bit 8  | G172, G174            |
| B9209    | USS3 / Peer3 receive data, word 2, bit 9  | G172, G174            |
| B9210    | USS3 / Peer3 receive data, word 2, bit 10 | G172, G174            |
| B9211    | USS3 / Peer3 receive data, word 2, bit 11 | G172, G174            |
| B9212    | USS3 / Peer3 receive data, word 2, bit 12 | G172, G174            |
| B9213    | USS3 / Peer3 receive data, word 2, bit 13 | G172, G174            |
| B9214    | USS3 / Peer3 receive data, word 2, bit 14 | G172, G174            |
| B9215    | USS3 / Peer3 receive data, word 2, bit 15 | G172, G174            |

| Technology software S00: Decoders / demultiplexers, binary to 1 of 8 |                                |        |      |
|----------------------------------------------------------------------|--------------------------------|--------|------|
| B9250                                                                | Decoder / demultiplexer 1: Q0  | FB 118 | B200 |
| B9251                                                                | Decoder / demultiplexer 1: Q1  | FB 118 | B200 |
| B9252                                                                | Decoder / demultiplexer 1: Q2  | FB 118 | B200 |
| B9253                                                                | Decoder / demultiplexer 1: Q3  | FB 118 | B200 |
| B9254                                                                | Decoder / demultiplexer 1: Q4  | FB 118 | B200 |
| B9255                                                                | Decoder / demultiplexer 1: Q5  | FB 118 | B200 |
| B9256                                                                | Decoder / demultiplexer 1: Q6  | FB 118 | B200 |
| B9257                                                                | Decoder / demultiplexer 1: Q7  | FB 118 | B200 |
| B9260                                                                | Decoder / demultiplexer 1: /Q0 | FB 118 | B200 |
| B9261                                                                | Decoder / demultiplexer 1: /Q1 | FB 118 | B200 |
| B9262                                                                | Decoder / demultiplexer 1: /Q2 | FB 118 | B200 |
| B9263                                                                | Decoder / demultiplexer 1: /Q3 | FB 118 | B200 |
| B9264                                                                | Decoder / demultiplexer 1: /Q4 | FB 118 | B200 |
| B9265                                                                | Decoder / demultiplexer 1: /Q5 | FB 118 | B200 |
| B9266                                                                | Decoder / demultiplexer 1: /Q6 | FB 118 | B200 |
| B9267                                                                | Decoder / demultiplexer 1: /Q7 | FB 118 | B200 |
| B9270                                                                | Decoder / demultiplexer 2: Q0  | FB 119 | B200 |
| B9271                                                                | Decoder / demultiplexer 2: Q1  | FB 119 | B200 |
| B9272                                                                | Decoder / demultiplexer 2: Q2  | FB 119 | B200 |
| B9273                                                                | Decoder / demultiplexer 2: Q3  | FB 119 | B200 |
| B9274                                                                | Decoder / demultiplexer 2: Q4  | FB 119 | B200 |
| B9275                                                                | Decoder / demultiplexer 2: Q5  | FB 119 | B200 |
| B9276                                                                | Decoder / demultiplexer 2: Q6  | FB 119 | B200 |
| B9277                                                                | Decoder / demultiplexer 2: Q7  | FB 119 | B200 |
| B9280                                                                | Decoder / demultiplexer 2: /Q0 | FB 119 | B200 |
| B9281                                                                | Decoder / demultiplexer 2: /Q1 | FB 119 | B200 |
| B9282                                                                | Decoder / demultiplexer 2: /Q2 | FB 119 | B200 |
| B9283                                                                | Decoder / demultiplexer 2: /Q3 | FB 119 | B200 |
| B9284                                                                | Decoder / demultiplexer 2: /Q4 | FB 119 | B200 |
| B9285                                                                | Decoder / demultiplexer 2: /Q5 | FB 119 | B200 |
| B9286                                                                | Decoder / demultiplexer 2: /Q6 | FB 119 | B200 |
| B9287                                                                | Decoder / demultiplexer 2: /Q7 | FB 119 | B200 |

| S00 technology software: Software counter |                                   |                          |      |
|-------------------------------------------|-----------------------------------|--------------------------|------|
| B9290                                     | Output overflow software counter  | [SW 1.9 and later] FB 89 | B196 |
| B9291                                     | Output underflow software counter | [SW 1.9 and later] FB 89 | B196 |

| Technology software S00: Limiters |                                              |                           |      |
|-----------------------------------|----------------------------------------------|---------------------------|------|
| B9295                             | Limiter 6: Positive limitation has responded | [SW 2.0 and later] FB 214 | B134 |

| Binector     | Name, description                                                      | Function<br>diag., Sheet |
|--------------|------------------------------------------------------------------------|--------------------------|
| <b>B9296</b> | Limiter 6: Negative limitation has responded [SW 2.0 and later] FB 214 | B134                     |

| Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3) |                                           |            |
|------------------------------------------------------|-------------------------------------------|------------|
| <b>B9300</b>                                         | USS3 / Peer3 receive data, word 3, bit 0  | G172, G174 |
| <b>B9301</b>                                         | USS3 / Peer3 receive data, word 3, bit 1  | G172, G174 |
| <b>B9302</b>                                         | USS3 / Peer3 receive data, word 3, bit 2  | G172, G174 |
| <b>B9303</b>                                         | USS3 / Peer3 receive data, word 3, bit 3  | G172, G174 |
| <b>B9304</b>                                         | USS3 / Peer3 receive data, word 3, bit 4  | G172, G174 |
| <b>B9305</b>                                         | USS3 / Peer3 receive data, word 3, bit 5  | G172, G174 |
| <b>B9306</b>                                         | USS3 / Peer3 receive data, word 3, bit 6  | G172, G174 |
| <b>B9307</b>                                         | USS3 / Peer3 receive data, word 3, bit 7  | G172, G174 |
| <b>B9308</b>                                         | USS3 / Peer3 receive data, word 3, bit 8  | G172, G174 |
| <b>B9309</b>                                         | USS3 / Peer3 receive data, word 3, bit 9  | G172, G174 |
| <b>B9310</b>                                         | USS3 / Peer3 receive data, word 3, bit 10 | G172, G174 |
| <b>B9311</b>                                         | USS3 / Peer3 receive data, word 3, bit 11 | G172, G174 |
| <b>B9312</b>                                         | USS3 / Peer3 receive data, word 3, bit 12 | G172, G174 |
| <b>B9313</b>                                         | USS3 / Peer3 receive data, word 3, bit 13 | G172, G174 |
| <b>B9314</b>                                         | USS3 / Peer3 receive data, word 3, bit 14 | G172, G174 |
| <b>B9315</b>                                         | USS3 / Peer3 receive data, word 3, bit 15 | G172, G174 |

| Technology software S00: AND elements with 3 inputs each |                          |        |      |
|----------------------------------------------------------|--------------------------|--------|------|
| <b>B9350</b>                                             | Output of AND element 1  | FB 120 | B205 |
| <b>B9351</b>                                             | Output of AND element 2  | FB 121 | B205 |
| <b>B9352</b>                                             | Output of AND element 3  | FB 122 | B205 |
| <b>B9353</b>                                             | Output of AND element 4  | FB 123 | B205 |
| <b>B9354</b>                                             | Output of AND element 5  | FB 124 | B205 |
| <b>B9355</b>                                             | Output of AND element 6  | FB 125 | B205 |
| <b>B9356</b>                                             | Output of AND element 7  | FB 126 | B205 |
| <b>B9357</b>                                             | Output of AND element 8  | FB 127 | B205 |
| <b>B9358</b>                                             | Output of AND element 9  | FB 128 | B205 |
| <b>B9359</b>                                             | Output of AND element 10 | FB 129 | B205 |
| <b>B9360</b>                                             | Output of AND element 11 | FB 130 | B205 |
| <b>B9361</b>                                             | Output of AND element 12 | FB 131 | B205 |
| <b>B9362</b>                                             | Output of AND element 13 | FB 132 | B205 |
| <b>B9363</b>                                             | Output of AND element 14 | FB 133 | B205 |
| <b>B9364</b>                                             | Output of AND element 15 | FB 134 | B205 |
| <b>B9365</b>                                             | Output of AND element 16 | FB 135 | B205 |
| <b>B9366</b>                                             | Output of AND element 17 | FB 136 | B205 |
| <b>B9367</b>                                             | Output of AND element 18 | FB 137 | B205 |
| <b>B9368</b>                                             | Output of AND element 19 | FB 138 | B205 |
| <b>B9369</b>                                             | Output of AND element 20 | FB 139 | B205 |
| <b>B9370</b>                                             | Output of AND element 21 | FB 140 | B205 |
| <b>B9371</b>                                             | Output of AND element 22 | FB 141 | B205 |
| <b>B9372</b>                                             | Output of AND element 23 | FB 142 | B205 |
| <b>B9373</b>                                             | Output of AND element 24 | FB 143 | B205 |
| <b>B9374</b>                                             | Output of AND element 25 | FB 144 | B205 |
| <b>B9375</b>                                             | Output of AND element 26 | FB 145 | B205 |
| <b>B9376</b>                                             | Output of AND element 27 | FB 146 | B205 |
| <b>B9377</b>                                             | Output of AND element 28 | FB 147 | B205 |

| Binector                                                       | Name, description       | Function<br>diag., Sheet |
|----------------------------------------------------------------|-------------------------|--------------------------|
| <b>Technology software S00: OR elements with 3 inputs each</b> |                         |                          |
| <b>B9380</b>                                                   | Output of OR element 1  | FB 150 B206              |
| <b>B9381</b>                                                   | Output of OR element 2  | FB 151 B206              |
| <b>B9382</b>                                                   | Output of OR element 3  | FB 152 B206              |
| <b>B9383</b>                                                   | Output of OR element 4  | FB 153 B206              |
| <b>B9384</b>                                                   | Output of OR element 5  | FB 154 B206              |
| <b>B9385</b>                                                   | Output of OR element 6  | FB 155 B206              |
| <b>B9386</b>                                                   | Output of OR element 7  | FB 156 B206              |
| <b>B9387</b>                                                   | Output of OR element 8  | FB 157 B206              |
| <b>B9388</b>                                                   | Output of OR element 9  | FB 158 B206              |
| <b>B9389</b>                                                   | Output of OR element 10 | FB 159 B206              |
| <b>B9390</b>                                                   | Output of OR element 11 | FB 160 B206              |
| <b>B9391</b>                                                   | Output of OR element 12 | FB 161 B206              |
| <b>B9392</b>                                                   | Output of OR element 13 | FB 162 B206              |
| <b>B9393</b>                                                   | Output of OR element 14 | FB 163 B206              |
| <b>B9394</b>                                                   | Output of OR element 15 | FB 164 B206              |
| <b>B9395</b>                                                   | Output of OR element 16 | FB 165 B206              |
| <b>B9396</b>                                                   | Output of OR element 17 | FB 166 B206              |
| <b>B9397</b>                                                   | Output of OR element 18 | FB 167 B206              |
| <b>B9398</b>                                                   | Output of OR element 19 | FB 168 B206              |
| <b>B9399</b>                                                   | Output of OR element 20 | FB 169 B206              |

|                                                             |                                           |            |
|-------------------------------------------------------------|-------------------------------------------|------------|
| <b>Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3)</b> |                                           |            |
| <b>B9400</b>                                                | USS3 / Peer3 receive data, word 4, bit 0  | G172, G174 |
| <b>B9401</b>                                                | USS3 / Peer3 receive data, word 4, bit 1  | G172, G174 |
| <b>B9402</b>                                                | USS3 / Peer3 receive data, word 4, bit 2  | G172, G174 |
| <b>B9403</b>                                                | USS3 / Peer3 receive data, word 4, bit 3  | G172, G174 |
| <b>B9404</b>                                                | USS3 / Peer3 receive data, word 4, bit 4  | G172, G174 |
| <b>B9405</b>                                                | USS3 / Peer3 receive data, word 4, bit 5  | G172, G174 |
| <b>B9406</b>                                                | USS3 / Peer3 receive data, word 4, bit 6  | G172, G174 |
| <b>B9407</b>                                                | USS3 / Peer3 receive data, word 4, bit 7  | G172, G174 |
| <b>B9408</b>                                                | USS3 / Peer3 receive data, word 4, bit 8  | G172, G174 |
| <b>B9409</b>                                                | USS3 / Peer3 receive data, word 4, bit 9  | G172, G174 |
| <b>B9410</b>                                                | USS3 / Peer3 receive data, word 4, bit 10 | G172, G174 |
| <b>B9411</b>                                                | USS3 / Peer3 receive data, word 4, bit 11 | G172, G174 |
| <b>B9412</b>                                                | USS3 / Peer3 receive data, word 4, bit 12 | G172, G174 |
| <b>B9413</b>                                                | USS3 / Peer3 receive data, word 4, bit 13 | G172, G174 |
| <b>B9414</b>                                                | USS3 / Peer3 receive data, word 4, bit 14 | G172, G174 |
| <b>B9415</b>                                                | USS3 / Peer3 receive data, word 4, bit 15 | G172, G174 |

|                                           |                      |             |
|-------------------------------------------|----------------------|-------------|
| <b>Technology software S00: Inverters</b> |                      |             |
| <b>B9450</b>                              | Output of inverter 1 | FB 180 B207 |
| <b>B9451</b>                              | Output of inverter 2 | FB 181 B207 |
| <b>B9452</b>                              | Output of inverter 3 | FB 182 B207 |
| <b>B9453</b>                              | Output of inverter 4 | FB 183 B207 |
| <b>B9454</b>                              | Output of inverter 5 | FB 184 B207 |
| <b>B9455</b>                              | Output of inverter 6 | FB 185 B207 |
| <b>B9456</b>                              | Output of inverter 7 | FB 186 B207 |
| <b>B9457</b>                              | Output of inverter 8 | FB 187 B207 |

| Binector | Name, description     | Function diag., Sheet |
|----------|-----------------------|-----------------------|
| B9458    | Output of inverter 9  | FB 188 B207           |
| B9459    | Output of inverter 10 | FB 189 B207           |
| B9460    | Output of inverter 11 | FB 190 B207           |
| B9461    | Output of inverter 12 | FB 191 B207           |
| B9462    | Output of inverter 13 | FB 192 B207           |
| B9463    | Output of inverter 14 | FB 193 B207           |
| B9464    | Output of inverter 15 | FB 194 B207           |
| B9465    | Output of inverter 16 | FB 195 B207           |

| Technology software S00: NAND elements with 3 inputs each |                           |             |
|-----------------------------------------------------------|---------------------------|-------------|
| B9470                                                     | Output of NAND element 1  | FB 200 B207 |
| B9471                                                     | Output of NAND element 2  | FB 201 B207 |
| B9472                                                     | Output of NAND element 3  | FB 202 B207 |
| B9473                                                     | Output of NAND element 4  | FB 203 B207 |
| B9474                                                     | Output of NAND element 5  | FB 204 B207 |
| B9475                                                     | Output of NAND element 6  | FB 205 B207 |
| B9476                                                     | Output of NAND element 7  | FB 206 B207 |
| B9477                                                     | Output of NAND element 8  | FB 207 B207 |
| B9478                                                     | Output of NAND element 9  | FB 208 B207 |
| B9479                                                     | Output of NAND element 10 | FB 209 B207 |
| B9480                                                     | Output of NAND element 11 | FB 210 B207 |
| B9481                                                     | Output of NAND element 12 | FB 211 B207 |

| Technology software S00: Binary signal selector switches |                                           |             |
|----------------------------------------------------------|-------------------------------------------|-------------|
| B9482                                                    | Output of binary signal selector switch 1 | FB 250 B216 |
| B9483                                                    | Output of binary signal selector switch 2 | FB 251 B216 |
| B9484                                                    | Output of binary signal selector switch 3 | FB 252 B216 |
| B9485                                                    | Output of binary signal selector switch 4 | FB 253 B216 |
| B9486                                                    | Output of binary signal selector switch 5 | FB 254 B216 |

| Technology software S00: D flipflops |                         |             |
|--------------------------------------|-------------------------|-------------|
| B9490                                | D flipflop 1: Output Q  | FB 230 B211 |
| B9491                                | D flipflop 1: Output /Q | FB 230 B211 |
| B9492                                | D flipflop 2: Output Q  | FB 231 B211 |
| B9493                                | D flipflop 2: Output /Q | FB 231 B211 |
| B9494                                | D flipflop 3: Output Q  | FB 232 B211 |
| B9495                                | D flipflop 3: Output /Q | FB 232 B211 |
| B9496                                | D flipflop 4: Output Q  | FB 233 B211 |
| B9497                                | D flipflop 4: Output /Q | FB 233 B211 |

| Technology software S00: Technology controller |                                                                            |             |
|------------------------------------------------|----------------------------------------------------------------------------|-------------|
| B9499                                          | Ramp-function generator output = ramp-function generator input ( $y = x$ ) | FB 113 B170 |

| Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3) |                                          |            |
|------------------------------------------------------|------------------------------------------|------------|
| B9500                                                | USS3 / Peer3 receive data, word 5, bit 0 | G172, G174 |
| B9501                                                | USS3 / Peer3 receive data, word 5, bit 1 | G172, G174 |
| B9502                                                | USS3 / Peer3 receive data, word 5, bit 2 | G172, G174 |
| B9503                                                | USS3 / Peer3 receive data, word 5, bit 3 | G172, G174 |
| B9504                                                | USS3 / Peer3 receive data, word 5, bit 4 | G172, G174 |
| B9505                                                | USS3 / Peer3 receive data, word 5, bit 5 | G172, G174 |

| Binector | Name, description                         | Function diag., Sheet |
|----------|-------------------------------------------|-----------------------|
| B9506    | USS3 / Peer3 receive data, word 5, bit 6  | G172, G174            |
| B9507    | USS3 / Peer3 receive data, word 5, bit 7  | G172, G174            |
| B9508    | USS3 / Peer3 receive data, word 5, bit 8  | G172, G174            |
| B9509    | USS3 / Peer3 receive data, word 5, bit 9  | G172, G174            |
| B9510    | USS3 / Peer3 receive data, word 5, bit 10 | G172, G174            |
| B9511    | USS3 / Peer3 receive data, word 5, bit 11 | G172, G174            |
| B9512    | USS3 / Peer3 receive data, word 5, bit 12 | G172, G174            |
| B9513    | USS3 / Peer3 receive data, word 5, bit 13 | G172, G174            |
| B9514    | USS3 / Peer3 receive data, word 5, bit 14 | G172, G174            |
| B9515    | USS3 / Peer3 receive data, word 5, bit 15 | G172, G174            |

| Technology software S00: RS flipflops |                           |        |      |
|---------------------------------------|---------------------------|--------|------|
| B9550                                 | RS flipflop 1: Output Q   | FB 215 | B210 |
| B9551                                 | RS flipflop 1: Output /Q  | FB 215 | B210 |
| B9552                                 | RS flipflop 2: Output Q   | FB 216 | B210 |
| B9553                                 | RS flipflop 2: Output /Q  | FB 216 | B210 |
| B9554                                 | RS flipflop 3: Output Q   | FB 217 | B210 |
| B9555                                 | RS flipflop 3: Output /Q  | FB 217 | B210 |
| B9556                                 | RS flipflop 4: Output Q   | FB 218 | B210 |
| B9557                                 | RS flipflop 4: Output /Q  | FB 218 | B210 |
| B9558                                 | RS flipflop 5: Output Q   | FB 219 | B210 |
| B9559                                 | RS flipflop 5: Output /Q  | FB 219 | B210 |
| B9560                                 | RS flipflop 6: Output Q   | FB 220 | B210 |
| B9561                                 | RS flipflop 6: Output /Q  | FB 220 | B210 |
| B9562                                 | RS flipflop 7: Output Q   | FB 221 | B210 |
| B9563                                 | RS flipflop 7: Output /Q  | FB 221 | B210 |
| B9564                                 | RS flipflop 8: Output Q   | FB 222 | B210 |
| B9565                                 | RS flipflop 8: Output /Q  | FB 222 | B210 |
| B9566                                 | RS flipflop 9: Output Q   | FB 223 | B210 |
| B9567                                 | RS flipflop 9: Output /Q  | FB 223 | B210 |
| B9568                                 | RS flipflop 10: Output Q  | FB 224 | B210 |
| B9569                                 | RS flipflop 10: Output /Q | FB 224 | B210 |
| B9570                                 | RS flipflop 11: Output Q  | FB 225 | B210 |
| B9571                                 | RS flipflop 11: Output /Q | FB 225 | B210 |
| B9572                                 | RS flipflop 12: Output Q  | FB 226 | B210 |
| B9573                                 | RS flipflop 12: Output /Q | FB 226 | B210 |
| B9574                                 | RS flipflop 13: Output Q  | FB 227 | B210 |
| B9575                                 | RS flipflop 13: Output /Q | FB 227 | B210 |
| B9576                                 | RS flipflop 14: Output Q  | FB 228 | B210 |
| B9577                                 | RS flipflop 14: Output /Q | FB 228 | B210 |

| Technology software S00: Timers |                          |        |      |
|---------------------------------|--------------------------|--------|------|
| B9580                           | Timer 1: Output          | FB 240 | B215 |
| B9581                           | Timer 1: Output inverted | FB 240 | B215 |
| B9582                           | Timer 2: Output          | FB 241 | B215 |
| B9583                           | Timer 2: Output inverted | FB 241 | B215 |
| B9584                           | Timer 3: Output          | FB 242 | B215 |
| B9585                           | Timer 3: Output inverted | FB 242 | B215 |
| B9586                           | Timer 4: Output          | FB 243 | B215 |

| Binector | Name, description         | Function diag., Sheet |
|----------|---------------------------|-----------------------|
| B9587    | Timer 4: Output inverted  | FB 243 B215           |
| B9588    | Timer 5: Output           | FB 244 B215           |
| B9589    | Timer 5: Output inverted  | FB 244 B215           |
| B9590    | Timer 6: Output           | FB 245 B215           |
| B9591    | Timer 6: Output inverted  | FB 245 B215           |
| B9592    | Timer 7: Output           | FB 246 B216           |
| B9593    | Timer 7: Output inverted  | FB 246 B216           |
| B9594    | Timer 8: Output           | FB 247 B216           |
| B9595    | Timer 8: Output inverted  | FB 247 B216           |
| B9596    | Timer 9: Output           | FB 248 B216           |
| B9597    | Timer 9: Output inverted  | FB 248 B216           |
| B9598    | Timer 10: Output          | FB 249 B216           |
| B9599    | Timer 10: Output inverted | FB 249 B216           |

| Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3) |                                   |      |
|------------------------------------------------------|-----------------------------------|------|
| B9600                                                | USS3 receive data, word 6, bit 0  | G172 |
| B9601                                                | USS3 receive data, word 6, bit 1  | G172 |
| B9602                                                | USS3 receive data, word 6, bit 2  | G172 |
| B9603                                                | USS3 receive data, word 6, bit 3  | G172 |
| B9604                                                | USS3 receive data, word 6, bit 4  | G172 |
| B9605                                                | USS3 receive data, word 6, bit 5  | G172 |
| B9606                                                | USS3 receive data, word 6, bit 6  | G172 |
| B9607                                                | USS3 receive data, word 6, bit 7  | G172 |
| B9608                                                | USS3 receive data, word 6, bit 8  | G172 |
| B9609                                                | USS3 receive data, word 6, bit 9  | G172 |
| B9610                                                | USS3 receive data, word 6, bit 10 | G172 |
| B9611                                                | USS3 receive data, word 6, bit 11 | G172 |
| B9612                                                | USS3 receive data, word 6, bit 12 | G172 |
| B9613                                                | USS3 receive data, word 6, bit 13 | G172 |
| B9614                                                | USS3 receive data, word 6, bit 14 | G172 |
| B9615                                                | USS3 receive data, word 6, bit 15 | G172 |

| Technology software S00: PI controller |                                                           | [SW 1.8 and later] |
|----------------------------------------|-----------------------------------------------------------|--------------------|
| B9650                                  | PI controller 1: Controller at output limitation          | FB 260 B180        |
| B9652                                  | PI controller 3: Controller at output limitation          | FB 262 B182        |
| B9653                                  | PI controller 4: Controller at output limitation          | FB 263 B183        |
| B9654                                  | PI controller 5: Controller at output limitation          | FB 264 B184        |
| B9655                                  | PI controller 6: Controller at output limitation          | FB 265 B185        |
| B9656                                  | PI controller 7: Controller at output limitation          | FB 266 B186        |
| B9657                                  | PI controller 8: Controller at output limitation          | FB 267 B187        |
| B9658                                  | PI controller 9: Controller at output limitation          | FB 268 B188        |
| B9659                                  | PI controller 10: Controller at output limitation         | FB 269 B189        |
| B9660                                  | PI controller 1: Controller at positive output limitation | FB 260 B180        |
| B9661                                  | PI controller 2: Controller at positive output limitation | FB 261 B181        |
| B9662                                  | PI controller 3: Controller at positive output limitation | FB 262 B182        |
| B9663                                  | PI controller 4: Controller at positive output limitation | FB 263 B183        |
| B9664                                  | PI controller 5: Controller at positive output limitation | FB 264 B184        |
| B9665                                  | PI controller 6: Controller at positive output limitation | FB 265 B185        |
| B9666                                  | PI controller 7: Controller at positive output limitation | FB 266 B186        |

| Binector | Name, description                                          | Function diag., Sheet |
|----------|------------------------------------------------------------|-----------------------|
| B9667    | PI controller 8: Controller at positive output limitation  | FB 267 B187           |
| B9668    | PI controller 9: Controller at positive output limitation  | FB 268 B188           |
| B9669    | PI controller 10: Controller at positive output limitation | FB 269 B189           |
| B9670    | PI controller 1: Controller at negative output limitation  | FB 260 B180           |
| B9671    | PI controller 2: Controller at negative output limitation  | FB 261 B181           |
| B9672    | PI controller 3: Controller at negative output limitation  | FB 262 B182           |
| B9673    | PI controller 4: Controller at negative output limitation  | FB 263 B183           |
| B9674    | PI controller 5: Controller at negative output limitation  | FB 264 B184           |
| B9675    | PI controller 6: Controller at negative output limitation  | FB 265 B185           |
| B9676    | PI controller 7: Controller at negative output limitation  | FB 266 B186           |
| B9677    | PI controller 8: Controller at negative output limitation  | FB 267 B187           |
| B9678    | PI controller 9: Controller at negative output limitation  | FB 268 B188           |
| B9679    | PI controller 10: Controller at negative output limitation | FB 269 B189           |

| S00 technology software: Limit-value monitors for double-word connectors |                                                |                    |       |      |
|--------------------------------------------------------------------------|------------------------------------------------|--------------------|-------|------|
| B9680                                                                    | Limit-value monitor 1: $ A  < B$ has responded | [SW 1.9 and later] | FB 68 | B151 |
| B9681                                                                    | Limit-value monitor 1: $A < B$ has responded   | [SW 1.9 and later] | FB 68 | B151 |
| B9682                                                                    | Limit-value monitor 1: $A = B$ has responded   | [SW 1.9 and later] | FB 68 | B151 |
| B9683                                                                    | Limit-value monitor 2: $ A  < B$ has responded | [SW 1.9 and later] | FB 69 | B151 |
| B9684                                                                    | Limit-value monitor 2: $A < B$ has responded   | [SW 1.9 and later] | FB 69 | B151 |
| B9685                                                                    | Limit-value monitor 2: $A = B$ has responded   | [SW 1.9 and later] | FB 69 | B151 |

| Technology software S00: root extractor |                                                        |                    |       |      |
|-----------------------------------------|--------------------------------------------------------|--------------------|-------|------|
| B9686                                   | root extractor input  < threshold responded            | [SW 2.0 and later] | FB 58 | B153 |
| B9687                                   | root extractor input  < threshold responded (inverted) | [SW 2.0 and later] | FB 58 | B153 |

| Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3) |                                   |      |
|------------------------------------------------------|-----------------------------------|------|
| B9700                                                | USS3 receive data, word 7, bit 0  | G172 |
| B9701                                                | USS3 receive data, word 7, bit 1  | G172 |
| B9702                                                | USS3 receive data, word 7, bit 2  | G172 |
| B9703                                                | USS3 receive data, word 7, bit 3  | G172 |
| B9704                                                | USS3 receive data, word 7, bit 4  | G172 |
| B9705                                                | USS3 receive data, word 7, bit 5  | G172 |
| B9706                                                | USS3 receive data, word 7, bit 6  | G172 |
| B9707                                                | USS3 receive data, word 7, bit 7  | G172 |
| B9708                                                | USS3 receive data, word 7, bit 8  | G172 |
| B9709                                                | USS3 receive data, word 7, bit 9  | G172 |
| B9710                                                | USS3 receive data, word 7, bit 10 | G172 |
| B9711                                                | USS3 receive data, word 7, bit 11 | G172 |
| B9712                                                | USS3 receive data, word 7, bit 12 | G172 |
| B9713                                                | USS3 receive data, word 7, bit 13 | G172 |
| B9714                                                | USS3 receive data, word 7, bit 14 | G172 |
| B9715                                                | USS3 receive data, word 7, bit 15 | G172 |
| B9800                                                | USS3 receive data, word 8, bit 0  | G172 |
| B9801                                                | USS3 receive data, word 8, bit 1  | G172 |
| B9802                                                | USS3 receive data, word 8, bit 2  | G172 |
| B9803                                                | USS3 receive data, word 8, bit 3  | G172 |
| B9804                                                | USS3 receive data, word 8, bit 4  | G172 |
| B9805                                                | USS3 receive data, word 8, bit 5  | G172 |
| B9806                                                | USS3 receive data, word 8, bit 6  | G172 |



| Binector | Name, description                 | Function diag., Sheet |
|----------|-----------------------------------|-----------------------|
| B9807    | USS3 receive data, word 8, bit 7  | G172                  |
| B9808    | USS3 receive data, word 8, bit 8  | G172                  |
| B9809    | USS3 receive data, word 8, bit 9  | G172                  |
| B9810    | USS3 receive data, word 8, bit 10 | G172                  |
| B9811    | USS3 receive data, word 8, bit 11 | G172                  |
| B9812    | USS3 receive data, word 8, bit 12 | G172                  |
| B9813    | USS3 receive data, word 8, bit 13 | G172                  |
| B9814    | USS3 receive data, word 8, bit 14 | G172                  |
| B9815    | USS3 receive data, word 8, bit 15 | G172                  |
| B9900    | USS3 receive data, word 9, bit 0  | G172                  |
| B9901    | USS3 receive data, word 9, bit 1  | G172                  |
| B9902    | USS3 receive data, word 9, bit 2  | G172                  |
| B9903    | USS3 receive data, word 9, bit 3  | G172                  |
| B9904    | USS3 receive data, word 9, bit 4  | G172                  |
| B9905    | USS3 receive data, word 9, bit 5  | G172                  |
| B9906    | USS3 receive data, word 9, bit 6  | G172                  |
| B9907    | USS3 receive data, word 9, bit 7  | G172                  |
| B9908    | USS3 receive data, word 9, bit 8  | G172                  |
| B9909    | USS3 receive data, word 9, bit 9  | G172                  |
| B9910    | USS3 receive data, word 9, bit 10 | G172                  |
| B9911    | USS3 receive data, word 9, bit 11 | G172                  |
| B9912    | USS3 receive data, word 9, bit 12 | G172                  |
| B9913    | USS3 receive data, word 9, bit 13 | G172                  |
| B9914    | USS3 receive data, word 9, bit 14 | G172                  |
| B9915    | USS3 receive data, word 9, bit 15 | G172                  |

| Trace function |                                                  |                    |
|----------------|--------------------------------------------------|--------------------|
| B9999          | Trigger condition of trace function is fulfilled | [SW 1.8 and later] |





## 13 Maintenance



### WARNING

Hazardous voltage are present in this electrical equipment during operation.

A hazardous voltage may be present at the signalling relays in the customer installation.

Non-observance of the safety instructions can result in death, severe personal injury or substantial property damage.

When carrying out maintenance work on this converter, please read all safety instructions included in this section and attached to the product itself.

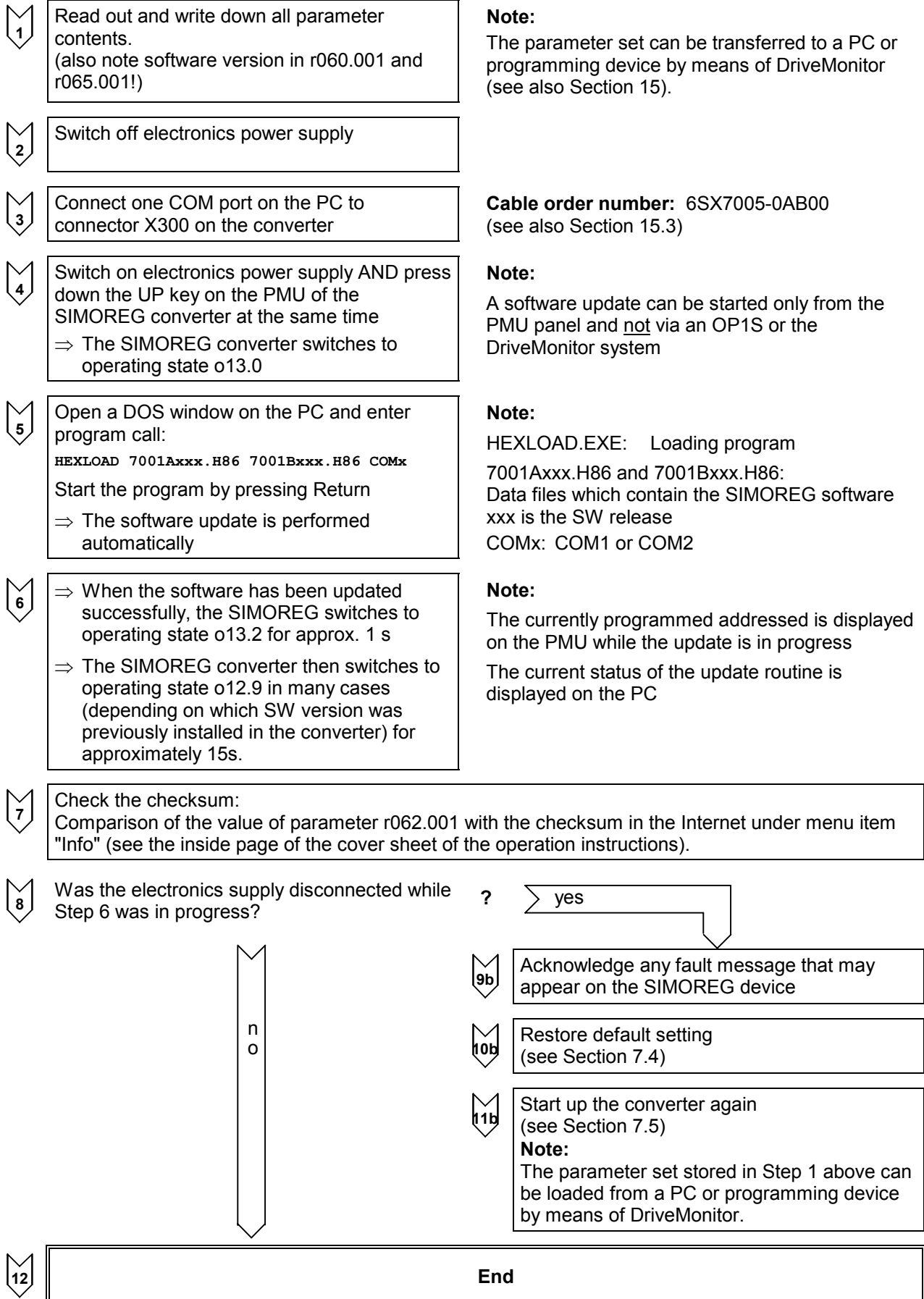


- Maintenance work on the converter may be carried out only by qualified personnel who are thoroughly familiar with all safety notices in this manual and with the installation, operating and maintenance instructions.
- Before carrying out visual checks and maintenance work, ensure that the AC power supply is disconnected and locked out and that the converter is grounded. Before the AC supply is disconnected, both converters and motors are at hazardous voltage levels. Even when the converter contactor is open, hazardous voltages are still present.
- The snubber capacitors might still be carrying hazardous voltage after isolation from the supply. For this reason, the converter must not be opened for at least two minutes after switch-off.

Only spare parts authorized by the manufacturer may be used.

The SIMOREG CM must be thoroughly protected against the ingress of dirt so as to prevent voltage flashovers and this irreparable damage. Dust and foreign bodies, and especially contamination drawn in through the cooling air flow, must be carefully removed at regular intervals depending on the degree of pollution, but at least once every 12 months. The converter must be cleaned with dry, compressed air, max. 1 bar, or with a vacuum cleaner.

## 13.1 Procedure for updating software



## 13.2 Replacement of components

### 13.2.1 Replacement of PCBs



#### WARNING



PCBs may be replaced only by properly qualified personnel.

PCBs must not be removed or inserted when the power supply is connected.

Non-observance of the safety instructions can result in death, severe personal injury or substantial property damage.



#### CAUTION

PCBs contains electrostatically sensitive devices. Before touching a PCB, the person carrying out the work must himself be electrostatically discharged. The simplest way of doing this is to touch an electrically conductive earthed object, e.g. socket outlet earth contact.

### 13.2.2 Replacement of thyristor and diode modules (field)

The modules are mounted by means of self-tapping screws. When a module is replaced, the support surfaces on the heatsink must be cleaned and a new layer of thermo-lubricant applied to the module. To fix the modules always used screws with a metric thread of the same length as the original screws and fixing elements (washer and spring lock washer). When screwing the modules to the busbars and boards, also use screws with a metric thread and the same length as the original screws and fixing elements (washer and spring lock washer).

#### NOTICE

The layer of thermo-lubricant (silicone-free, type H-T-C made by Electrolube) applied to the modules must be so thin and even that the baseplate is still clearly visible underneath!

Tightening torque on module: 3,5 Nm

Tightening torque of current terminals: 3 Nm



## 14 Servicing

Siemens supplies thoroughly tried and tested products and systems of the highest quality. To ensure maximum availability of our products and systems in your plant, we offer extensive after-sales services and support.

For further information about our services and **your regional Siemens contacts**, please go to our Internet website:

[www.siemens.de/automation/csi\\_en/service](http://www.siemens.de/automation/csi_en/service)

### 14.1 Technical Support

You can obtain technical assistance with our products, systems and solutions from our Technical Support service. Whether you have a simple query, or need help in solving a more difficult, complex task, our Central Technical Support specialists will be pleased to advise you. Our Central Technical Support service is available in English and German.

#### 14.1.1 Time zone Europe and Africa

Tel.: +49 180 5050 222

Fax: +49 180 5050 223

<mailto:ad.support@siemens.com>

7:00 to 17:00 (CET)

#### 14.1.2 Time zone America

**24 Hour Hotline: +1 800 333 7421**

Tel.: +1 423 262 2522

Fax: +1 423 262 2200

<mailto:solutions.support@sea.siemens.com>

8:00 to 17:00 (local time: Eastern Standard Time)

#### 14.1.3 Time zone Asia / Australia

Tel.: +86 1064 757575

Fax: +86 1064 747474

<mailto:adsupport.asia@siemens.com>

7:30 to 17:30 (local time: Beijing)

## 14.2 Spare parts

Information about spare parts can be found in Catalog DA 21.1 E. You will find this catalog on the CD-ROM (order separately under order number: 6RX1700-0AD64, or with product order by specifying Z option –Z-D64) and via Internet website:

<http://www4.ad.siemens.de/view/cs/en/9260805>

## 14.3 Repairs

If you wish to have a part or unit repaired, please call or write to your **regional Siemens contact** for repairs.

## 14.4 On-site servicing

Qualified specialists can offer an on-site repair and maintenance service to increase the availability of your plant. Repair and/or maintenance support can be charged according to time and cost or provided within the scope of a service contract at a flat rate. Services charged on a time/cost basis will be available within the normal working hours of the relevant region subject to an appropriate call-out period.

For on-site servicing, please call your **regional Siemens contact**.

### NOTE

If you contact us with a query, please specify the following converter data:

- Converter order number and serial number
- Software version
- Hardware version of basic electronics board (screen printing on component side)
- Hardware version and software version of supplementary boards (if installed)

## 15 DriveMonitor

The DriveMonitor software tool is available to assist the start-up, parameterization and diagnosis of SIMOREG 6RA70 units via a PC.

### 15.1 Scope of delivery

DriveMonitor is supplied on a CD-ROM together with the operating manual and sample applications.

#### Order No. 6RX1700-0AD64

It can also be ordered as an **option** in conjunction 6RA70 units. The relevant **short code** for this option is **D64**.

### 15.2 Installing the software

You can find a brief overview of the CD contents in START.HTM. If you have installed an HTML browser (e.g. Internet Explorer or Netscape Navigator) on your PC, you can open the overview by double clicking on START.HTM. If you do not have an HTML browser, you can find similar information in text format in file README.TXT.

After you have chosen an installation language by selecting links [DriveMonitor – Installation of DriveMonitor- Start Installation](#), you can call the DriveMonitor installation routine.

Some Internet Browsers are not capable of starting programs directly. If this is the case on your PC, a "Setup.exe - Save as" dialog appears after you select [Start Installation](#).

You can then start the Setup program manually in sub-catalog

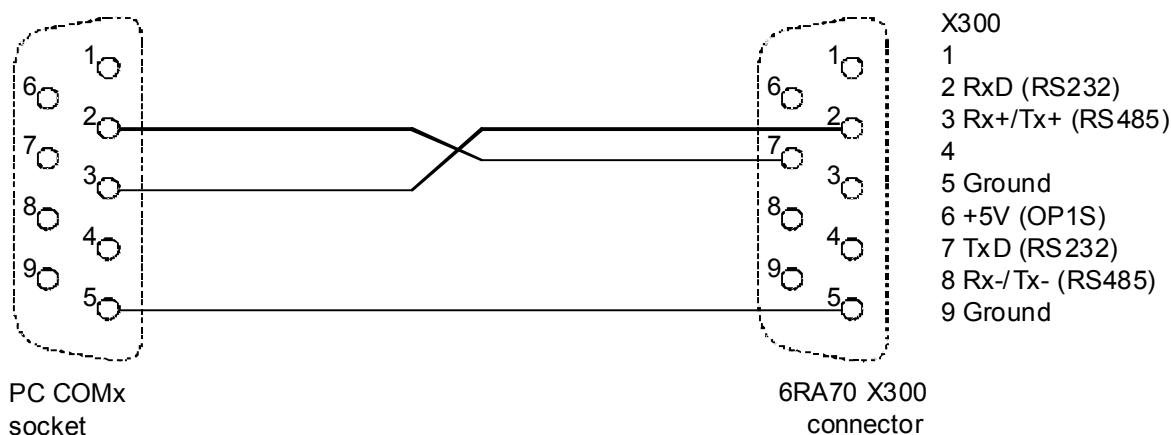
DriveMonitor\setup\setup.exe

Then follow the instructions displayed by the installation routine.

The default installation path for DriveMonitor is C:\DriveMon\P7VRVISX\System. A "DriveMonitor" icon is also placed on your desktop.

### 15.3 Connecting the SIMOREG to the PC

The simplest method is to link connector X300 in the front panel of the SIMOREG unit to a COM port on the PC using the connecting cable available under order no. 6SX7005-0AB00.





## 15.4 Setting up an online link to the SIMOREG

DriveMonitor always starts in offline mode. For this reason, you must open or create an offline file which has been set up specifically for the device and software version:

To open an existing offline file:

- File - Open <select parameter file>  
(if the parameter file has been created in DriveMonitor, the drive type SIMOREG DC Master and the software version used must then be set. If you want to set up an online link to the drive, you must click the ONLINE button and enter the bus address set in the device)

To create a new offline file:

- File - New - Based on Factory Setting <select drive type and software version> . (If you want to set up an online link to the drive, you must click the ONLINE button and enter the bus address set in the device)  
<enter file name>
- File - New - Empty Parameter Set <select drive type and software version> (If you want to set up an online link to the drive, you must click the ONLINE button and enter the bus address set in the device) <enter file name>

The data regarding drive type and software version are stored in the DNL file. You can then start the program in future by the normal Windows method, i.e. by double clicking on a DNL file, without further system queries.

You can open the ONLINE Settings screen under Options to check, and if necessary change, the interface parameters such as COM port and baud rate.

You can set the bus address and number of transmitted process data under File - Drive Settings.

To switch to online mode, select View - Online or the appropriate button on the toolbar. If the message "Device is not networked" then appears, then "Offline mode" is currently selected. You can switch to online mode under File - Drive Settings.

## 15.5 Further information

The engineering tool Drive ES is available for the diagnosis of complex installations containing several drives as well as Profibus-based drive communication.

Several different packages of Drive ES are available:

- Drive ES Basic      Data management in Step 7 projects, drive communications via Profibus or USS  
Order No.: 6SW1700-5JA00-1AA0
- Drive ES Graphic    Interconnection of Option S00 free functions blocks using the CFC interconnection editor  
Order No.: 6SW1700-5JB00-1AA0
- Drive ES Simatic    Provides function blocks for SIMATIC CPUs and sample projects for communication with the SIMOREG unit  
Order No.: 6SW1700-5JC00-1AA0

### NOTICE

DriveMonitor will run under Windows95/98/Me/XP or Windows NT4 / Windows 2000, but not under Windows 3.x.

## 16 Environmental compatibility

### Environmental aspects of development

The number of parts has been greatly reduced through the use of highly integrated components and a modular design of the entire converter series. As a consequence, the power consumed in the production process is significantly lower.

Particular importance has been attached to reducing the volume, mass and diversity of metal and plastic parts.

|                                  |                            |                   |             |
|----------------------------------|----------------------------|-------------------|-------------|
| Front components:                | PC + ABS                   | Cycloy            | GE-Plastics |
|                                  | ABS                        | Novodur           | Bayer       |
| Plastic components in converter: | PC                         | Lexan 141-R       |             |
|                                  | PA 6.6                     |                   |             |
|                                  | SE1-GFN1                   | Noryl             |             |
| Insulation:                      | PC (FR) fl                 | Makrolon or Lexan |             |
| Keyboard membrane:               | Polyester membrane 0.15 mm |                   |             |
| Rating plate:                    | Polyester membrane         |                   |             |

Flame arresters containing halogen and insulating materials containing silicone have been replaced by pollutant-free materials on all major components.

Environmental compatibility was an important criterion in the selection of supplied parts.

### Environmental aspects of production

Most supplied parts are shipped in reusable packaging. The packaging material itself is recyclable, consisting mainly of cardboard.

With the exception of the converter housing, surface coating materials have not been applied.

The production process is free of emissions.

### Environmental aspects of disposal

The unit features screw and snap-on connections that can be separated easily to dismantle it into recyclable mechanical components.

The printed circuit boards can be disposed of by thermal processing. The percentage of components containing dangerous substances is low.



## 17 Applications

Descriptions of applications (e.g. Winder Application, 12-Pulse Operation, Master-Slave Operation, Operation of 6RA70 as Field Supply Unit and others) can be found on the CD-ROM (order separately under order number: 6RX1700-0AD64, or with product order by specifying Z option –Z-D64) and via Internet website:

<http://www4.ad.siemens.de/view/cs/en/10804967>



# 18 Appendix

## 18.1 Further documentation

|               |                            |
|---------------|----------------------------|
| Catalog DA21  | Converters                 |
| Catalog DA21E | Spare parts                |
| Catalog DA22  | Cabinet-mounted converters |



**Comments sheet**

We have made every effort to critically edit this Instruction Manual. However, if you still come across printing errors, we should be grateful if you would let us.

We would also be grateful if you could let us have your opinion of this Instruction Manual and the converter itself!

Contact your local Siemens office for any comments - either negative or positive!

Many thanks!

SIEMENS AG Austria, SIMEA

From: Name: .....

Date:

Company: .....

Address: .....

.....

Tel.: .....

To: SIEMENS Office

Address: .....

.....

Please pass on to  
SIEMENS AG Austria  
SIMEA

Concerns: Comments for the SIMOREG CM Instruction Manual, Edition .....







The following versions have appeared so far:

| Version   | Internal Part No.       |
|-----------|-------------------------|
| 01        | C98130-A7040-A1-01-7619 |
| 02        | C98130-A7040-A1-02-7619 |
| 03        | C98130-A7040-A1-03-7619 |
| <b>04</b> | C98130-A7040-A1-04-7619 |
|           |                         |

Version **04** consists of the following sections

| Section                             | Pages | Date of edition |
|-------------------------------------|-------|-----------------|
| 0 Contents                          | 6     | 01.04           |
| 1 Safety information                | 4     | 01.04           |
| 2 Ordering Information              | 6     | 01.04           |
| 3 Description                       | 4     | 01.04           |
| 4 Shipment, unpacking               | 2     | 01.04           |
| 5 Installation                      | 12    | 01.04           |
| 6 Connections                       | 74    | 01.04           |
| 7 Start-up                          | 60    | 01.04           |
| 8 Function diagrams                 | 138   | 01.04           |
| 9 Function descriptions             | 42    | 01.04           |
| 10 Faults / Alarms                  | 28    | 01.04           |
| 11 Parameter list                   | 180   | 01.04           |
| 12 List of connectors and binectors | 62    | 01.04           |
| 13 Maintenance                      | 4     | 01.04           |
| 14 Servicing                        | 2     | 01.04           |
| 15 DriveMonitor                     | 2     | 01.04           |
| 16 Environmental compatibility      | 2     | 01.04           |
| 17 Applications                     | 2     | 01.04           |
| 18 Appendix                         | 4     | 01.04           |