SIEMENS

SIMOREG DC Master

Operating Instructions

6RA70 Series

Microprocessor-Based Converters from 6kW to 1900kW
for Variable-Speed DC Drives

Edition 09

Order-No.: 6RX1700-0AD76

These Operating Insructions are available in the following languages:

Language	German	French	Spanish	Italian
Order No.	6RX1700-0AD00	6RX1700-0AD77	6RX1700-0AD78	6RX1700-0AD72

Converter software version:

As these Operating Instructions went to print, SIMOREG DC Master converters were being delivered from the factory with software version **2.0** 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 DC Master (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 DC Master 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/8467834

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1 Safety information

⚠ 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.

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 undesireable 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 jewelry 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

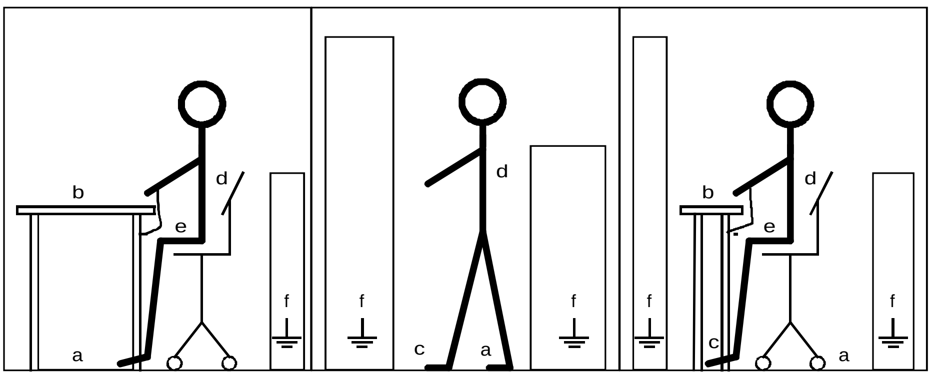
Electrostatically sensitive devices

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 fibers –
- 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 Type spectrum

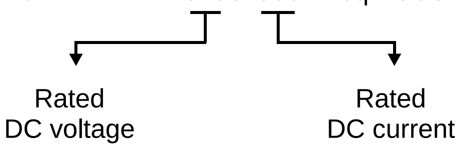
600A converters 1200A converter 2200A converter 850A converters

60A converters

Converter order no.	**Type designation**
6RA7018 - 6DS22 - 0	D485 / 30 Mre - GeE6S22
6RA7025 - 6DS22 - 0	D485 / 60 Mre - GeE6S22
6RA7028 - 6DS22 - 0	D485 / 90 Mre - GeE6S22
6RA7031 - 6DS22 - 0	D485 / 125 Mre - GeE6S22
6RA7075 - 6DS22 - 0	D485 / 210 Mre - GeEF6S22
6RA7078 - 6DS22 - 0	D485 / 280 Mre - GeEF6S22
6RA7081 - 6DS22 - 0	D485 / 400 Mre - GeEF6S22
6RA7085 - 6DS22 - 0	D485 / 600 Mre - GeEF6S22
6RA7087 - 6DS22 - 0	D485 / 850 Mre - GeEF6S22
6RA7091 - 6DS22 - 0	D485 / 1200 Mre - GeEF6S22
6RA7093 - 4DS22 - 0	D485 / 1600 Mre - GeEF4S22
6RA7095 - 4DS22 - 0	D485 / 2000 Mre - GeEF4S22
6RA7018 - 6FS22 - 0	D550 / 30 Mre - GeE6S22
6RA7025 - 6FS22 - 0	D550 / 60 Mre - GeE6S22
6RA7028 - 6FS22 - 0	D550 / 90 Mre - GeE6S22
6RA7031 - 6FS22 - 0	D550 / 125 Mre - GeE6S22
6RA7075 - 6FS22 - 0	D550 / 210 Mre - GeEF6S22
6RA7078 - 6FS22 - 0	D550 / 280 Mre - GeEF6S22
6RA7082 - 6FS22 - 0	D550 / 450 Mre - GeEF6S22
6RA7085 - 6FS22 - 0	D550 / 600 Mre - GeEF6S22
6RA7087 - 6FS22 - 0	D550 / 850 Mre - GeEF6S22
6RA7091 - 6FS22 - 0	D550 / 1200 Mre - GeEF6S22
6RA7025 - 6GS22 - 0	D690 / 60 Mre - GeE6S22
6RA7031 - 6GS22 - 0	D690 / 125 Mre - GeE6S22
6RA7075 - 6GS22 - 0	D690 / 210 Mre - GeEF6S22
6RA7081 - 6GS22 - 0	D690 / 400 Mre - GeEF6S22
6RA7085 - 6GS22 - 0	D690 / 600 Mre - GeEF6S22
6RA7087 - 6GS22 - 0	D690 / 800 Mre - GeEF6S22
6RA7090 - 6GS22 - 0	D690 / 1000 Mre - GeEF6S22
6RA7093 - 4GS22 - 0	D690 / 1600 Mre - GeEF4S22
6RA7095 - 4GS22 - 0	D690 / 2000 Mre - GeEF4S22
6RA7096 - 4GS22 - 0	D690 / 2200 Mre - GeEF4S22
6RA7086 - 6KS22 - 0	D830 / 720 Mre - GeEF6S22
6RA7088 - 6KS22 - 0	D830 / 950 Mre - GeEF6S22
6RA7093 - 4KS22 - 0	D830 / 1500 Mre - GeEF4S22
6RA7095 - 4KS22 - 0	D830 / 2000 Mre - GeEF4S22
6RA7088 - 6LS22 - 0	D1000 / 900 Mre - GeEF6S22
6RA7093 - 4LS22 - 0	D1000 /1500 Mre - GeEF4S22
6RA7095 - 4LS22 - 0	D1000 /1900 Mre - GeEF4S22

Rated DC voltage　　Rated DC current

Converter order no.	Type designation
6RA7013 - 6DV62 - 0	D420 / 15 Mreq - GeG6V62
6RA7018 - 6DV62 - 0	D420 / 30 Mreq - GeG6V62
6RA7025 - 6DV62 - 0	D420 / 60 Mreq - GeG6V62
6RA7028 - 6DV62 - 0	D420 / 90 Mreq - GeG6V62
6RA7031 - 6DV62 - 0	D420 / 125 Mreq - GeG6V62
6RA7075 - 6DV62 - 0	D420 / 210 Mreq - GeGF6V62
6RA7078 - 6DV62 - 0	D420 / 280 Mreq - GeGF6V62
6RA7081 - 6DV62 - 0	D420 / 400 Mreq - GeGF6V62
6RA7085 - 6DV62 - 0	D420 / 600 Mreq - GeGF6V62
6RA7087 - 6DV62 - 0	D420 / 850 Mreq - GeGF6V62
6RA7091 - 6DV62 - 0	D420 / 1200 Mreq - GeGF6V62
6RA7093 - 4DV62 - 0	D420 / 1600 Mreq - GeGF4V62
6RA7095 - 4DV62 - 0	D420 / 2000 Mreq - GeGF4V62
6RA7018 - 6FV62 - 0	D480 / 30 Mreq - GeG6V62
6RA7025 - 6FV62 - 0	D480 / 60 Mreq - GeG6V62
6RA7028 - 6FV62 - 0	D480 / 90 Mreq - GeG6V62
6RA7031 - 6FV62 - 0	D480 / 125 Mreq - GeG6V62
6RA7075 - 6FV62 - 0	D480 / 210 Mreq - GeGF6V62
6RA7078 - 6FV62 - 0	D480 / 280 Mreq - GeGF6V62
6RA7082 - 6FV62 - 0	D480 / 450 Mreq - GeGF6V62
6RA7085 - 6FV62 - 0	D480 / 600 Mreq - GeGF6V62
6RA7087 - 6FV62 - 0	D480 / 850 Mreq - GeGF6V62
6RA7091 - 6FV62 - 0	D480 / 1200 Mreq - GeGF6V62
6RA7025 - 6GV62 - 0	D600 / 60 Mreq - GeG6V62
6RA7031 - 6GV62 - 0	D600 / 125 Mreq - GeG6V62
6RA7075 - 6GV62 - 0	D600 / 210 Mreq - GeGF6V62
6RA7081 - 6GV62 - 0	D600 / 400 Mreq - GeGF6V62
6RA7085 - 6GV62 - 0	D600 / 600 Mreq - GeGF6V62
6RA7087 - 6GV62 - 0	D600 / 850 Mreq - GeGF6V62
6RA7090 - 6GV62 - 0	D600 / 1100 Mreq - GeGF6V62
6RA7093 - 4GV62 - 0	D600 / 1600 Mreq - GeGF4V62
6RA7095 - 4GV62 - 0	D600 / 2000 Mreq - GeGF4V62
6RA7096 - 4GV62 - 0	D600 / 2200 Mreq - GeGF4V62
6RA7086 - 6KV62 - 0	D725 / 760 Mreq - GeGF6V62
6RA7090 - 6KV62 - 0	D725 / 1000 Mreq - GeGF6V62
6RA7093 - 4KV62 - 0	D725 / 1500 Mreq - GeGF4V62
6RA7095 - 4KV62 - 0	D725 / 2000 Mreq - GeGF4V62
6RA7088 - 6LV62 - 0	D875 / 950 Mreq - GeGF6V62
6RA7093 - 4LV62 - 0	D875 /1500 Mreq - GeGF4V62
6RA7095 - 4LV62 - 0	D875 /1900 Mreq - GeGF4V62



2.1 Converter order number code

6 R A _ _ _ _ - _ _ _ _ _ - 0 - _

Code letters defined acc. to general MLFB guidelines:

Converter model:
23: SIMOREG Comp. 4th Gen.
24: SIMOREG Comp. 4th Gen. Digital
70: SIMOREG DC Master

Rated DC currents and cooling:

Natural cooling: Ambient temp. +45°C	Separate cooling Ambient temp. +35°C / +40°C on 6RA70
00:	50
01: ≥3.6.......<4.1	51
02: ≥4.1.......<4.65	52
03: ≥4.65.....<5.25	53
04: ≥5.25.....<6.0	54
05: ≥6.0.......<6.8	55
06: ≥6.8.......<7.75	56
07: ≥7.75.....<8.8	57
08: ≥8.8.......<10.0	58
09:	59
10: ≥10.0.....<11.5	60: ≥31.5.....<36.0
11: ≥11.5.....<13.0	61: ≥36.0.....<41.0
12: ≥13.0.....<14.5	62: ≥41.0.....<46.5
13: ≥14.5.....<16.5	63: ≥46.5.....<52.5
14: ≥16.5.....<19.0	64: ≥52.5.....<60.0
15: ≥19.0.....<21.5	65: ≥60.0.....<68.0
16: ≥21.5.....<24.5	66: ≥68.0.....<77.5
17: ≥24.5.....<28.0	67: ≥77.5.....<88.0
18: ≥28.0.....<31.5	68: ≥88.0.....<100
19:	69:
20: ≥31.5.....<36.0	70: ≥100......<115
21: ≥36.0.....<41.0	71: ≥115......<130
22: ≥41.0.....<46.5	72: ≥130......<145
23: ≥46.5.....<52.5	73: ≥145......<165
24: ≥52.5.....<60.0	74: ≥165......<190
25: ≥60.0.....<68.0	75: ≥190......<215
26: ≥68.0.....<77.5	76: ≥215......<245
27: ≥77.5.....<88.0	77: ≥245......<280
28: ≥88.0.....<100	78: ≥280......<315
29:	79:
30: ≥100......<115	80: ≥315.......<360
31: ≥115......<130	81: ≥360.......<410
32: ≥130......<145	82: ≥410...... <465
33: ≥145......<165	83: ≥465...... <525
34: ≥165......<190	84: ≥525...... <600
35: ≥190......<215	85: ≥600...... <680
36: ≥215......<245	86: ≥680...... <775
37: ≥245......<280	87: ≥775...... <880
38: ≥280......<315	88: ≥880...... <1000
39:	89:
40:	90: ≥1000..... <1150
41:	91: ≥1150..... <1300
42:	92: ≥1300..... <1450
43:	93: ≥1450..... <1650
44:	94::≥1650..... <1900
45:	95: ≥1900..... <2150
	96: ≥2150..... <2400

Thyristor construction and fuse assembly:

0: Control units without power section
1: USA Power
2: USA Base
3: Disk thyristors, produced in China
4: Disk thyristors with fuse assembly
5: Thyristor modules, produced in China
6: Thyristor modules
7:
8: ANL
9:

Rated supply voltage:

A:
B: 230V
C:
D: 400V
E:
F: 440V - 480V
G: 500V - 575V
H: 660V
K: 690V - 750V
L: 830V

Converter connection:

A:
B:
C:
D: B2HZ (1Q)
.
.
K: (B2) A (B2) C (4Q)
.
.
S: B6C (1Q)
T:
U:
V: (B6) A (B6) C (4Q)

Closed-loop control:
1: 1Q analog
2: 1Q digital

7: 4Q analog
6: 4Q digital

Closed-loop control:
1: Uncontrolled field
2: Controlled field

Innovation

Options:
Z: With option

2.2 Rating plate

SIMOREG

S **DC - CONVERTER**

1)

Order No. / Type **1P 6RA70 . . - . . . . . . - 0** **2)**

3)

4)

Serial No. **S Q6 . . . .**

ARMATURE

Input 3AC . . . V . . . A 50/60Hz

Suitable for use on a circuit capable of delivering not more than . . . kA rms symmetrical amperes , . . . V maximum.

Output (DC-Rating) DC . . . V . . . A

Output (US-Rating) DC . . . V . . . A

FIELD SUPPLY

Input 2AC . . . V . . . A 50/60Hz

Output DC . . . V . . . A

Prod. State **5)**

Cooling

c UL US LISTED POW.CONV.EQ. 94UA **6)** CE EN 60146

Made in Austria

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
6) Space for other symbol

   e.g.: CSA

2.3 Packaging label

DC - CONVERTER S

Stromrichter
Static Converter
Variateur

D . . . / . . . . M . . . -GeE 2

6RA70 . . - . . . . . . - 0

c UL US LISTED POW.CONV.EQ. 94UA **1)** CE EN 60146

1P 6RA70 . . - . . . . . . - 0 . . . , . . . , . . . , . . . , . . . , . . . **2)**

S Q6 . . . .

QTY 1

Q . . . . . .

SW - STAND (Version) - - -

E - STAND (Version) - - -

Made in Austria

1) Space for other symbol

   e.g.: CSA

2) 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 using codes

6 R A 7 0 □ □ – □ □ □ □ □ – 0 – Z
□ □ □ + □ □ □ + □ □ □
□

SIMOREG converter order no. with suffix Z and
codes (several codes together) and/or
plaintext (if required)

Options	Codes	Order No.
Technology software in the basic converter ("Free function blocks")	S00	6RX1700-0AS00
Module terminal expansion (CUD2)	K00	6RX1700-0AK00
SIMOVIS PC - PMU (RS232) connecting cable, 3m SU1 RS232 - RS485 iInterface converter, including mounting accessories, main connection: 1CA 115V / 230V		6SX7005-0AB00 6SX7005-0AA00
User-friendly operator control panel (OP1S) AOP1 adapter for mounting OP1A in cubicle door, including 5 m connecting cable PMU-OP1S connecting cable, 3m PMU-OP1S connecting cable, 5m		6SE7090-0XX84-2FK0 6SX7010-0AA00 6SX7010-0AB03 6SX7010-0AB05
LBA Local bus adapter for the electronics box LBA is always needed to install supplementary boards (see Section 5.3.2)	K11	6SE7090-0XX84-4HA0
ADB Adapter board ADB is always needed to install CBC, CBP, EB1, EB2, SBP and SLB boards	K01, K02 [5)]	6SE7090-0XX84-0KA0
SBP Pulse encoder evaluation board [1) 2) 3)] (miniature-format board; ADB required)	C14, C15 C16, C17 [5)]	6SX7010-0FA00
EB1 Terminal expansion board [3)] (miniature-format board; ADB required)	G64, G65 G66, G67 [5)]	6SE7090-0XX84-0KB0
EB2 Terminal expansion board [3)] (miniature-format board; ADB required)	G74, G75 G76, G77 [5)]	6SE7090-0XX84-0KC0
SLB SIMOLINK board [1) 3)] (miniature-format board; ADB required)	G44, G45 G46, G47 [5)]	6SX7010-0FJ00
CBP2 Communications board with interface for SINEC- L2-DP, (PROFIBUS) [1) 3)] (miniature-format board; ADB required)	G94, G95 G96, G97 [5)]	6SX7010-0FF05
CBC Communications board with interface for CAN protocol [1) 3)] (miniature-format board; ADB required)	G24, G25 G26, G27 [5)]	6SX7010-0FG00
CBD Communications board with interface for DeviceNet protocol [1) 3)] (miniature-format board; ADB required)	G54, G55 G56, G57 [5)]	6SX7010-0FK00
SCB1 Serial Communication Board 1 (Master for SCI1 and SCI2 with FO link) [3) 4)]		6SE7090-0XX84-0BC0
SCI1 Serial Communication Interface 1 (terminal expansion with FO link to SCB1) for attachment to DIN EN 50022 rail [4)]		6SE7090-0XX84-3EA0

Options	Codes	Order No.
SCI2 Serial Communication Interface 2 (terminal expansion with FO link to SCB1) for attachment to DIN EN 50022 rail 4)		6SE7090-0XX84-3EF0
T100 module incl. hardware operating instructions without software module) 3)		6SE7090-0XX87-0BB0
Hardware operating instructions for T100		6SE7080-0CX87-0BB0
MS100 "Universal Drive" software module for T100 (EPROM) without manual		6SE7098-0XX84-0BB0
Manual for MS100 "Universal Drive" software module		
German		6SE7080-0CX84-0BB1
English		6SE7087-6CX84-0BB1
French		6SE7087-7CX84-0BB1
Spanish		6SE7087-8CX84-0BB1
Italian		6SE7087-2CX84-0BB1
T300 technology board with 2 connecting leads, SC58 and SC60, terminal block SE300 and hardware operating instructions 3)		6SE7090-0XX84-0AH0
T400 technology board (incl. short description) 3)		6DD1606-0AD0
T400 hardware and configuring manual		6DD1903-0EA0
Operating instructions for SIMOREG DC Master		
Operating instructions in German	D00	6RX1700-0AD00
Operating instructions in Italian	D72	6RX1700-0AD72
Operating instructions in English	D76	6RX1700-0AD76
Operating instructions in French	D77	6RX1700-0AD77
Operating instructions in Spanish	D78	6RX1700-0AD78
Operating Instructions and SIMOVIS in all the above languages available on CD-ROM	D64	6RX1700-0AD64
No description	D99	

1) This 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

3 Description

3.1 Applications

Series 6RA70 SIMOREG DC MASTER converters are fully digital, compact units for three-phase supply which supply the armature and field of variable-speed DC drives with rated armature currents of between 15A and 2200A. The compact converters can be connected in parallel to supply currents of up to 12000A. The field circuit can be supplied with currents of up to 85A (current levels depend on the armature rated current).

3.2 Design

Series 6RA70 SIMOREG DC MASTER converters are characterized by their 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.

All SIMOREG DC MASTER units 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 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.

On single-quadrant converters, the armature is supplied via a fully controlled three-phase bridge B6C and, on four-quadrant devices, via two fully controlled three-phase bridges in circulating-current-free, inverse-parallel connection (B6)A(B6)C.
The field is supplied via a single-phase, branch-pair half-controlled 2-pulse bridge connection B2HZ.
The frequencies of the armature and field supply voltages may be different (in a range from 45 to 65 Hz). Operation in the extended frequency range between 23 Hz and 110 Hz is available on request. The armature circuit supply phase sequence is insignificant.

For converters with 15A to 850A (1200A at 400V supply voltage) rated DC current, the power section for armature and field is constructed of isolated thyristor modules. The heat sink is thus electrically isolated. On devices with a higher rated DC current, the power section for the armature circuit is constructed of disk thyristors and heat sinks (thyristor assemblies) at voltage potential. The housing and terminal covers on power connections provide protection against accidental contact for operators working in the vicinity. All connecting terminals are accessible from the front.

The power section cooling system is monitored by means of temperature sensors.

3.2.1 Special features of devices with 460V rated connection voltage

- This device series is available with rated direct currents of 30A to 1200A.
- Devices with rated direct currents of 450A to 1200A are equipped with a 1-phase fan.
- On devices with rated direct currents of 60A to 850A, the power terminals are located on the underside and on the top of the device.

3.2.2 Installation of SIMOREG devices in cabinets in accordance with UL 508 C standards

- When the drive is provided in a panel (enclosure), the panel is ventilated and designated "Type 1".
- The minimum size panel (enclosure) to be used with the drive is 600 mm length, 600 mm width, 2200 mm hight.

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.

The rated DC currents (continuous DC currents), load class I, specified on the rated plate can be exceeded by 180%, the permissible overload during being dependent on individual converters. The microprocessor calculates the current I^2t value of the power section cyclically to ensure that the thyristors are not damaged in overload operation.

A selection table for overload operation can be found in Section 9 ”Description of functions".

Converters self-adapt to the frequency of the available supply voltage in the range from 45 to 65 Hz (armature and field are independent).

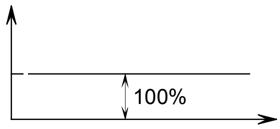
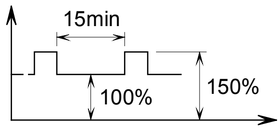
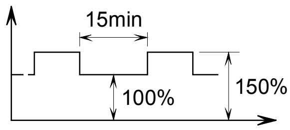
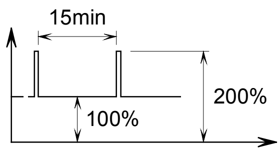
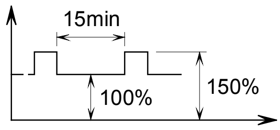
Operation in the extended frequency range between 23 Hz and 110 Hz is available on request.

3.4 Technical data

3.4.1 Load types

To adapt the SIMOREG DC Master to the load profile of the working machine as efficiently as possible, you can dimension it using the load cycle.

The setting on the SIMOREG DC Master is made in parameter P067.

Load class	Load for converter	Load cycle
DC I (P067=1)	$I_{DC\ I}$ continuous (I_{dN})	
DC II (P067=2)	$I_{DC\ II}$ for 15 min and 1.5 x $I_{DC\ II}$ for 60 s	
DC III (P067=3)	$I_{DC\ III}$ for 15 min and 1.5 x $I_{DC\ III}$ for 120 s	
DC IV (P067=4)	$I_{DC\ IV}$ for 15 min and 2 x $I_{DC\ IV}$ for 10 s	
US rating (P067=5)	I_{US} for 15 min and 1.5 x I_{US} for 60 s Note: In this setting, an ambient or coolant temperature of 45°C is permissible for all device types.	

NOTICE

If you set a value of > 1 in P067, you must ensure that the "Dynamic overload capability of power module“ is enabled, i.e. a value of > 0 must be set in parameter P075.

The SIMOREG DC Master does not monitor for compliance with the criteria of the load class set in parameter P067. If permitted by the power module, the unit can operate for overload periods in excess of those defined by the load class. The actual permissible overload period for the installed power module is always longer than the overload period defined for the load class. The SIMOREG DC Master does monitor the actual permissible overload period for the power module. See Section 9.15.

3.4.1.1 Load cycles for 1Q applications

Recommended SIMOREG DC Master	Load cycles									
	Tu	DC I	DC II		DC III		DC IV		US rating Tu=45°C	
		continuous	15min 100%	60sec 150%	15min 100%	120 sec 150%	15min 100%	10sec 200%	15min 100%	60sec 150%
	° C	A	A	A	A	A	A	A	A	A
400V, 1Q										
6RA7018-6DS22	45	30	24,9	37,4	24,2	36,3	22,4	44,8	24,9	37,4
6RA7025-6DS22	45	60	51,4	77,1	50,2	75,3	46,4	92,8	51,4	77,1
6RA7028-6DS22	45	90	74,4	111,6	72,8	109,2	65,4	130,8	74,4	111,6
6RA7031-6DS22	45	125	106,1	159,2	103,4	155,1	96,3	192,6	106,1	159,2
6RA7075-6DS22	40	210	164,9	247,4	161,4	242,1	136,5	273,0	157,5	236,3
6RA7078-6DS22	40	280	226,8	340,2	219,3	329,0	201,0	402,0	215,8	323,7
6RA7081-6DS22	40	400	290,6	435,9	282,6	423,9	244,4	488,8	278,4	417,6
6RA7085-6DS22	40	600	462,6	693,9	446,3	669,5	413,2	826,4	443,4	665,1
6RA7087-6DS22	40	850	652,3	978,5	622,4	933,6	610,1	1220,2	620,2	930,3
6RA7091-6DS22	40	1200	879,9	1319,9	850,8	1276,2	786,6	1573,2	842,6	1263,9
6RA7093-4DS22	40	1600	1255,5	1883,3	1213,1	1819,7	1139,9	2279,8	1190,1	1785,2
6RA7095-4DS22	40	2000	1510,2	2265,3	1456,3	2184,5	1388,8	2777,6	1438,7	2158,1
460V, 1Q										
6RA7018-6FS22	45	30	24,9	37,4	24,2	36,3	22,4	44,8	15,0	22,5
6RA7025-6FS22	45	60	51,4	77,1	50,2	75,3	46,4	92,8	30,0	45,0
6RA7028-6FS22	45	90	74,4	111,6	72,8	109,2	65,4	130,8	60,0	90,0
6RA7031-6FS22	45	125	106,1	159,2	103,4	155,1	96,3	192,6	100,0	150,0
6RA7075-6FS22	40	210	164,9	247,4	161,4	242,1	136,5	273,0	140,0	210,0
6RA7078-6FS22	40	280	226,8	340,2	219,3	329,0	201,0	402,0	210,0	315,0
6RA7082-6FS22	40	450	320,6	480,9	311,2	466,8	274,3	548,6	255,0	382,5
6RA7085-6FS22	40	600	462,6	693,9	446,3	669,5	413,2	826,4	430,0	645,0
6RA7087-6FS22	40	850	652,3	978,5	622,4	933,6	610,1	1220,2	510,0	765,0
6RA7091-6FS22	40	1200	879,9	1319,9	850,8	1276,2	786,6	1573,2	850,0	1275,0
575V, 1Q										
6RA7025-6GS22	45	60	51,4	77,1	50,2	75,3	46,4	92,8	51,4	77,1
6RA7031-6GS22	45	125	106,1	159,2	103,4	155,1	96,3	192,6	106,1	159,2
6RA7075-6GS22	40	210	164,9	247,4	161,4	242,1	136,5	273,0	157,5	236,3
6RA7081-6GS22	40	400	290,6	435,9	282,6	423,9	244,4	488,8	278,4	417,6
6RA7085-6GS22	40	600	462,6	693,9	446,3	669,5	413,2	826,4	443,4	665,1
6RA7087-6GS22	40	800	607,7	911,6	581,5	872,3	559,3	1118,6	578,0	867,0
6RA7090-6GS22	40	1000	735,8	1103,7	713,4	1070,1	648,0	1296,0	700,4	1050,6
6RA7093-4GS22	40	1600	1255,5	1883,3	1213,1	1819,7	1139,9	2279,8	1190,1	1785,2
6RA7095-4GS22	40	2000	1663,0	2494,5	1591,2	2386,8	1568,4	3136,8	1569,5	2354,3
6RA7096-4GS22	40	2200	1779,6	2669,4	1699,9	2549,9	1697,2	3394,4	1678,0	2517,0

Recommended SIMOREG DC Master	Load cycles									
	Tu	DC I	DC II		DC III		DC IV		US rating Tu=45°C	
		continuous	15min 100%	60sec 150%	15min 100%	120 sec 150%	15min 100%	10sec 200%	15min 100%	60sec 150%
	° C	A	A	A	A	A	A	A	A	A
690V, 1Q										
6RA7086-6KS22	40	720	553,1	829,7	527,9	791,9	515,8	1031,6	525,9	788,9
6RA7088-6KS22	40	950	700,1	1050,2	677,1	1015,7	624,4	1248,8	668,1	1002,2
6RA7093-4KS22	40	1500	1156,9	1735,4	1118,2	1677,3	1047,0	2094,0	1101,9	1652,9
6RA7095-4KS22	40	2000	1589,3	2384,0	1522,2	2283,3	1505,5	3011,0	1503,9	2255,9
830V, 1Q										
6RA7088-6LS22	40	900	663,8	995,7	642,0	963,0	592,1	1184,2	633,5	950,3
6RA7093-4LS22	40	1500	1156,9	1735,4	1118,2	1677,3	1047,0	2094,0	1101,9	1652,9
6RA7095-4LS22	40	1900	1485,4	2228,1	1421,6	2132,4	1396,9	2793,8	1414,2	2121,3

3.4.1.2 Load cycles for 4Q applications

Recommended SIMOREG DC Master	Load cycles									
	Tu	DC I	DC II		DC III		DC IV		US rating Tu=45°C	
		continuous	15min 100%	60sec 150%	15min 100%	120 sec 150%	15min 100%	10sec 200%	15min 100%	60sec 150%
	° C	A	A	A	A	A	A	A	A	A
400V, 4Q										
6RA7013-6DV62	45	15	13,9	20,9	13,5	20,3	12,6	25,2	13,9	20,9
6RA7018-6DV62	45	30	24,9	37,4	24,2	36,3	22,4	44,8	24,9	37,4
6RA7025-6DV62	45	60	53,1	79,7	51,8	77,7	47,2	94,4	53,1	79,7
6RA7028-6DV62	45	90	78,2	117,3	76,0	114,0	72,2	144,4	78,2	117,3
6RA7031-6DV62	45	125	106,1	159,2	103,6	155,4	95,4	190,8	106,1	159,2
6RA7075-6DV62	40	210	164,9	247,4	161,4	242,1	136,5	273,0	157,5	236,3
6RA7078-6DV62	40	280	226,8	340,2	219,3	329,0	201,0	402,0	215,8	323,7
6RA7081-6DV62	40	400	300,1	450,2	292,4	438,6	247,4	494,8	285,5	428,3
6RA7085-6DV62	40	600	470,8	706,2	453,9	680,9	410,4	820,8	450,1	675,2
6RA7087-6DV62	40	850	658,3	987,5	634,2	951,3	579,6	1159,2	626,4	939,6
6RA7091-6DV62	40	1200	884,1	1326,2	857,5	1286,3	768,8	1537,6	842,3	1263,5
6RA7093-4DV62	40	1600	1255,5	1883,3	1213,1	1819,7	1139,9	2279,8	1190,1	1785,2
6RA7095-4DV62	40	2000	1477,7	2216,6	1435,3	2153,0	1326,7	2653,4	1404,6	2106,9

Recommended SIMOREG DC Master	Load cycles									
	Tu	DC I	DC II		DC III		DC IV		US rating Tu=45°C	
		continuous	15min 100%	60sec 150%	15min 100%	120 sec 150%	15min 100%	10sec 200%	15min 100%	60sec 150%
	° C	A	A	A	A	A	A	A	A	A
460V, 4Q										
6RA7018-6FV62	45	30	24,9	37,4	24,2	36,3	22,4	44,8	15,0	22,5
6RA7025-6FV62	45	60	53,1	79,7	51,8	77,7	47,2	94,4	30,0	45,0
6RA7028-6FV62	45	90	78,2	117,3	76,0	114,0	72,2	144,4	60,0	90,0
6RA7031-6FV62	45	125	106,1	159,2	103,6	155,4	95,4	190,8	100,0	150,0
6RA7075-6FV62	40	210	164,9	247,4	161,4	242,1	136,5	273,0	140,0	210,0
6RA7078-6FV62	40	280	226,8	340,2	219,3	329,0	201,0	402,0	210,0	315,0
6RA7082-6FV62	40	450	320,6	480,9	311,2	466,8	274,3	548,6	255,0	382,5
6RA7085-6FV62	40	600	470,8	706,2	453,9	680,9	410,4	820,8	430,0	645,0
6RA7087-6FV62	40	850	658,3	987,5	634,2	951,3	579,6	1159,2	510,0	765,0
6RA7091-6FV62	40	1200	884,1	1326,2	857,5	1286,3	768,8	1537,6	850,0	1275,0
575V, 4Q										
6RA7025-6GV62	45	60	53,1	79,7	51,8	77,7	47,2	94,4	53,1	79,7
6RA7031-6GV62	45	125	106,1	159,2	103,6	155,4	95,4	190,8	106,1	159,2
6RA7075-6GV62	40	210	164,9	247,4	161,4	242,1	136,5	273,0	157,5	236,3
6RA7081-6GV62	40	400	300,1	450,2	292,4	438,6	247,4	494,8	285,5	428,3
6RA7085-6GV62	40	600	470,8	706,2	453,9	680,9	410,4	820,8	450,1	675,2
6RA7087-6GV62	40	850	658,3	987,5	634,2	951,3	579,6	1159,2	626,4	939,6
6RA7090-6GV62	40	1100	804,7	1207,1	782,6	1173,9	689,6	1379,2	766,8	1150,2
6RA7093-4GV62	40	1600	1255,5	1883,3	1213,1	1819,7	1139,9	2279,8	1190,1	1785,2
6RA7095-4GV62	40	2000	1663,0	2494,5	1591,2	2386,8	1568,4	3136,8	1569,5	2354,3
6RA7096-4GV62	40	2200	1779,6	2669,4	1699,9	2549,9	1697,2	3394,4	1678,0	2517,0
690V, 4Q										
6RA7086-6KV62	40	760	598,7	898,1	575,4	863,1	532,9	1065,8	569,3	854,0
6RA7090-6KV62	40	1000	737,3	1106,0	715,2	1072,8	639,5	1279,0	702,3	1053,5
6RA7093-4KV62	40	1500	1171,6	1757,4	1140,1	1710,2	1036,6	2073,2	1116,2	1674,3
6RA7095-4KV62	40	2000	1477,7	2216,6	1435,3	2153,0	1326,7	2653,4	1404,6	2106,9
830V, 4Q										
6RA7088-6LV62	40	950	700,8	1051,2	679,8	1019,7	607,8	1215,6	667,6	1001,4
6RA7093-4LV62	40	1500	1171,6	1757,4	1140,1	1710,2	1036,6	2073,2	1116,2	1674,3
6RA7095-4LV62	40	1900	1485,4	2228,1	1421,6	2132,4	1396,9	2793,8	1414,2	2121,3

3.4.2 Converters 3AC 400V, 30A to 125A, 1Q

Order No.		6RA70 . . – 6DS22			
		18	25	28	31
Rated supply voltage armature [1]	V	3AC 400 (+15% / – 20%)			
Rated input current armature [2]	A	25	50	75	104
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage field [1]	V	2AC 400 (+15% / – 20%) [7]			
Rated frequency	Hz	45 to 65 [10]			
Rated DC voltage [1]	V	485			
Rated DC current	A	30	60	90	125
Overload capability [6]		max. 180% of rated DC current			
Rated output	kW	14,5	29	44	61
Power loss at rated DC current (approx.)	W	163	240	347	400
Rated DC voltage field [1]	V	max. 325			
Rated DC current field	A	5	10		
Operational ambient temperature	°C	0 to 45 at I_{rated} [3] self-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current [4]			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]			
Environmental class DIN IEC 721-3-3		3K3			
Degree of protect. DIN 40050 IEC 144		IP00			
Dimensions (HxWxD)	mm	385x265x239	385x265x283		
Dimension diagram see Section		5.1.1	5.1.2		
Weights (approx.)	kg	11	14	16	16

Explanation at end of list of tables

3.4.3 Converters 3AC 400V, 210A to 600A, 1Q

Order No.		6RA70 . . – 6DS22			
		75	78	81	85
Rated supply voltage armature [1]	V	3AC 400 (+15% / – 20%)			
Rated input current armature [2]	A	175	233	332	498
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage fan	V	DC 24V internal		3AC 400 (±15%) 50Hz 3AC 460 (±10%) 60Hz	
Fan rated current	A			0,3 [8]	
Air flow rate	m^3/h	100		570	
Fan noise level	dBA	40		73	
Rated supply voltage field [1]	V	2AC 400 (+15% / – 20%) [7]			
Rated frequency	Hz	45 to 65 [10]			
Rated DC voltage [1]	V	485			
Rated DC current	A	210	280	400	600
Overload capability [6]		max. 180% of rated DC current			
Rated output	kW	102	136	194	291
Power loss at rated DC current (approx.)	W	676	800	1328	1798
Rated DC voltage field [1]	V	max. 325			
Rated DC current field	A	15		25	
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current [4]			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation <u>and</u> digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]			
Environmental class DIN IEC 721-3-3		3K3			
Degree of protect. DIN 40050 IEC 144		IP00			
Dimensions (HxWxD)	mm	385x265x283		625x268x318	
Dimension diagram see Section		5.1.2		5.1.3	5.1.4
Weights (approx.)	kg	16	17	30	

Explanation at end of list of tables

3.4.4 Converters 3AC 400V, 850A to 2000A, 1Q

Order No.		6RA70 . . – 6DS22			6RA70 . . – 4DS22	
		87	91		93	95
Rated supply voltage armature [1]	V	3AC 400 (+15% / – 20%)				
Rated input current armature [2]	A	705	995		1326	1658
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)				
Rated supply voltage fan	V	3AC 400 (±15%) 50Hz 3AC 460 (±10%) 60Hz	3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz		3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz	
			50Hz	60Hz	50Hz	60Hz
Fan rated current	A	0,3 [8]	1,0 [9]	1,25 [9]	1,0 [9]	1,25 [9]
Air flow rate	m^3/h	570	1300	1300	2400	2400
Fan noise level	dBA	73	83	87	83	87
Rated supply voltage field [1]	V	2AC 400 (+15% / – 20%) [7]				
Rated frequency	Hz	45 to 65 [10]				
Rated DC voltage [1]	V	485				
Rated DC current	A	850	1200		1600	2000
Overload capability [6]		max. 180% of rated DC current				
Rated output	kW	412	582		776	970
Power loss at rated DC current (approx.)	W	2420	4525		5710	6810
Rated DC voltage field [1]	V	max. 325				
Rated DC current field	A	30			40	
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled				
Storage and transport temperature	°C	– 25 to +70				
Installation altitude above sea level		≤ 1000 m at rated DC current [4]				
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation <u>and</u> digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]				
Environmental class DIN IEC 721-3-3		3K3				
Degree of protect. DIN 40050 IEC 144		IP00				
Dimensions (HxWxD)	mm	700x268x362	780x410x362		880x450x500	
Dimension diagram see Section		5.1.5	5.1.6		5.1.7	
Weights (approx.)	kg	40	80		125	

Explanation at end of list of tables

3.4.5 Converters 3AC 460V, 30A to 125A, 1Q

Order No.		6RA70 . . – 6FS22			
		18	25	28	31
Rated supply voltage armature [1]	V	3AC 460 (+15% / – 20%)			
Rated input current armature [2]	A	25	50	75	104
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)			
Rated frequency	Hz	45 to 65 [10]			
Rated DC voltage [1]	V	550			
Rated DC current	A	30	60	90	125
Overload capability [6]		max. 180% of rated DC current			
Rated output	kW	16,5	33	49,5	68,7
Power loss at rated DC current (approx.)	W	172	248	363	417
Rated DC voltage field [1]	V	max. 375			
Rated DC current field	A	5	10		
Operational ambient temperature	°C	0 to 45 at I_{rated} [3] self-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current [4]			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]			
Environmental class DIN IEC 721-3-3		3K3			
Degree of protect. DIN 40050 IEC 144		IP00			
Dimensions (HxWxD)	mm	385x265x239	385x265x313		
Dimension diagram see Section		5.1.1	5.2.1		
Weights (approx.)	kg	11	15	17	17

Explanation at end of list of tables

3.4.6 Converters 3AC 460V, 210A to 600A, 1Q

Order No.		6RA70 . . – 6FS22			
		75	78	82	85
Rated supply voltage armature [1]	V	3AC 460 (+15% / – 20%)			
Rated input current armature [2]	A	175	233	374	498
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage fan	V	DC 24V internal		1AC 230 (±10%)	
				50Hz	60Hz
Fan rated current	A			0,55	0,55
Air flow rate	m^3/h	100		570	570
Fan noise level	dBA	40		73	76
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)			
Rated frequency	Hz	45 to 65 [10]			
Rated DC voltage [1]	V	550			
Rated DC current	A	210	280	450	600
Overload capability [6]		max. 180% of rated DC current			
Rated output	kW	115	154	247	330
Power loss at rated DC current (approx.)	W	700	792	1519	1845
Rated DC voltage field [1]	V	max. 375			
Rated DC current field	A	15		25	
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current [4]			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation <u>and</u> digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]			
Environmental class DIN IEC 721-3-3		3K3			
Degree of protect. DIN 40050 IEC 144		IP00			
Dimensions (HxWxD)	mm	385x265x313		625x268x318	
Dimension diagram see Section		5.2.2		5.2.3	
Weights (approx.)	kg	17	18	32	

Explanation at end of list of tables

3.4.7 Converters 3AC 460V, 850A to 1200A, 1Q

Order No.		6RA70 . . – 6FS22			
		87		91	
Rated supply voltage armature [1]	V	3AC 460 (+15% / – 20%)			
Rated input current armature [2]	A	705		995	
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage fan	V	1AC 230 (±10%)		1AC 230 (±10%)	
		50Hz	60Hz	50Hz	60Hz
Fan rated current	A	0,55	0,55	2,6	3,3
Air flow rate	m^3/h	570	570	1300	1300
Fan noise level	dBA	73	76	82	85
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)			
Rated frequency	Hz	45 to 65 [10]			
Rated DC voltage [1]	V	550			
Rated DC current	A	850		1200	
Overload capability [6]		max. 180% of rated DC current			
Rated output	kW	467		660	
Power loss at rated DC current (approx.)	W	2514		4620	
Rated DC voltage field [1]	V	max. 375			
Rated DC current field	A	30			
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current [4]			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]			
Environmental class	DIN IEC 721-3-3	3K3			
Degree of protect.	DIN 40050 IEC 144	IP00			
Dimensions (HxWxD)	mm	700x268x362		780x410x362	
Dimension diagram see Section		5.2.4		5.1.6	
Weights (approx.)	kg	42		80	

Explanation at end of list of tables

3.4.8 Converters 3AC 575V, 60A to 600A, 1Q

Order No.		6RA70 . . – 6GS22				
		25	31	75	81	85
Rated supply voltage armature [1]	V	3AC 575 (+10% / – 20%)				
Rated input current armature [2]	A	50	104	175	332	498
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)				
Rated supply voltage fan	V			DC24V internal	3AC 400 (±15%) 50Hz 3AC 460 (±10%) 60Hz	
Fan rated current	A				0,3 [8]	
Air flow rate	m^3/h			100	570	
Fan noise level	dBA			40	73	
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)				
Rated frequency	Hz	45 to 65 [10]				
Rated DC voltage [1]	V	690				
Rated DC current	A	60	125	210	400	600
Overload capability [6]		max. 180% of rated DC current				
Rated output	kW	41	86	145	276	414
Power loss at rated DC current (approx.)	W	265	454	730	1550	1955
Rated DC voltage field [1]	V	max. 375				
Rated DC current field	A	10		15	25	
Operational ambient temperature	°C	0 to 45 at I_{rated} [3] self-cooled		0 to 40 at I_{rated} [3] forced-cooled		
Storage and transport temperature	°C	– 25 to +70				
Installation altitude above sea level		≤ 1000 m at rated DC current [4]				
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation <u>and</u> digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]				
Environmental class DIN IEC 721-3-3		3K3				
Degree of protect. DIN 40050 IEC 144		IP00				
Dimensions (HxWxD)	mm	385x265x283			625x268x318	
Dimension diagram see Section		5.1.2			5.1.3	5.1.4
Weights (approx.)	kg	14	16		30	

Explanation at end of list of tables

3.4.9 Converters 3AC 575V, 800A to 2200A, 1Q

Order No.		6RA70 . . – 6GS22			6RA70 . . – 4GS22			
		87	90		93		95	96
Rated supply voltage armature [1]	V	3AC 575 (+10% / – 20%)						
Rated input current armature [2]	A	663	829		1326		1658	1824
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)						
Rated supply voltage fan	V	3AC 400 (±15%) 50Hz 3AC 460 (±10%) 60Hz	3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz		3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz			
			50Hz	60Hz	50Hz		60Hz	
Fan rated current	A	0,3 [8]	1,0 [9]	1,25 [9]	1,0 [9]		1,25 [9]	
Air flow rate	m^3/h	570	1300	1300	2400		2400	
Fan noise level	dBA	73	83	87	83		87	
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)						
Rated frequency	Hz	45 to 65 [10]						
Rated DC voltage [1]	V	690						
Rated DC current	A	800	1000		1600		2000	2200
Overload capability [6]		max. 180% of rated DC current						
Rated output	kW	552	690		1104		1380	1518
Power loss at rated DC current (approx.)	W	2638	4130		5942		7349	7400
Rated DC voltage field [1]	V	max. 375						
Rated DC current field	A	30			40			85
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled						
Storage and transport temperature	°C	– 25 to +70						
Installation altitude above sea level		≤ 1000 m at rated DC current [4]						
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]						
Environmental class DIN IEC 721-3-3		3K3						
Degree of protect. DIN 40050 IEC 144		IP00						
Dimensions (HxWxD)	mm	700x268x362	780x410x362		880x450x500			
Dimension diagram see Section		5.1.5	5.1.6		5.1.7			
Weights (approx.)	kg	40	80		125			

Explanation at end of list of tables

3.4.10 Converters 3AC 690V, 720A to 2000A, 1Q

Order No.		6RA70 . . – 6KS22			6RA70 . . – 4KS22	
		86	88		93	95
Rated supply voltage armature [1]	V	3AC 690 (+10% / – 20%)				
Rated input current armature [2]	A	597	788		1244	1658
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)				
Rated supply voltage fan	V	3AC 400 (±15%) 50Hz 3AC 460 (±10%) 60Hz	3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz		3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz	
			50Hz	60Hz	50Hz	60Hz
Fan rated current	A	0,3 [8]	1,0 [9]	1,25 [9]	1,0 [9]	1,25 [9]
Air flow rate	m^3/h	570	1300	1300	2400	2400
Fan noise level	dBA	73	83	87	83	87
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)				
Rated frequency	Hz	45 to 65 [10]				
Rated DC voltage [1]	V	830				
Rated DC current	A	720	950		1500	2000
Overload capability [6]		max. 180% of rated DC current				
Rated output	kW	598	789		1245	1660
Power loss at rated DC current (approx.)	W	2720	4380		6706	8190
Rated DC voltage field [1]	V	max. 375				
Rated DC current field	A	30			40	
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled				
Storage and transport temperature	°C	– 25 to +70				
Installation altitude above sea level		≤ 1000 m at rated DC current [4]				
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]				
Environmental class DIN IEC 721-3-3		3K3				
Degree of protect. DIN 40050 IEC 144		IP00				
Dimensions (HxWxD)	mm	700x268x362	780x410x362		880x450x500	
Dimension diagram see Section		5.1.5	5.1.6		5.1.7	
Weights (approx.)	kg	40	80		125	

Explanation at end of list of tables

3.4.11 Converters 3AC 830V, 900A to 1900A, 1Q

Order No.		6RA70 . . – 6LS22		6RA70 . . – 4LS22	
		88		93	95
Rated supply voltage armature [1]	V	3AC 830 (+10% / – 20%)			
Rated input current armature [2]	A	746		1244	1575
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage fan	V	3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz		3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz	
		50Hz	60Hz	50Hz	60Hz
Fan rated current	A	1,0 [9]	1,25 [9]	1,0 [9]	1,25 [9]
Air flow rate	m^3/h	1300	1300	2400	2400
Fan noise level	dBA	83	87	83	87
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)			
Rated frequency	Hz	45 to 65 [10]			
Rated DC voltage [1]	V	1000			
Rated DC current	A	900		1500	1900
Overload capability [6]		max. 180% of rated DC current			
Rated output	kW	900		1500	1900
Power loss at rated DC current (approx.)	W	4638		6778	8700
Rated DC voltage field [1]	V	max. 375			
Rated DC current field	A	30		40	
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current [4]			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]			
Environmental class DIN IEC 721-3-3		3K3			
Degree of protect. DIN 40050 IEC 144		IP00			
Dimensions (HxWxD)	mm	780x410x362		880x450x500	
Dimension diagram see Section		5.1.6		5.1.7	
Weights (approx.)	kg	80		125	

Explanation at end of list of tables

3.4.12 Converters 3AC 400V, 15A to 125A, 4Q

Order No.		6RA70 . . – 6DV62				
		13	18	25	28	31
Rated supply voltage armature [1]	V	3AC 400 (+15% / – 20%)				
Rated input current armature [2]	A	13	25	50	75	104
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)				
Rated supply voltage field [1]	V	2AC 400 (+15% / – 20%) [7]				
Rated frequency	Hz	45 to 65 [10]				
Rated DC voltage [1]	V	420				
Rated DC current	A	15	30	60	90	125
Overload capability [6]		max. 180% of rated DC current				
Rated output	kW	6,3	12,6	25	38	52,5
Power loss at rated DC current (approx.)	W	117	163	240	312	400
Rated DC voltage field [1]	V	max. 325				
Rated DC current field	A	3	5	10		
Operational ambient temperature	°C	0 to 45 at I_{rated} [3] self-cooled				
Storage and transport temperature	°C	– 25 to +70				
Installation altitude above sea level		≤ 1000 m at rated DC current [4]				
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]				
Environmental class	DIN IEC 721-3-3	3K3				
Degree of protect.	DIN 40050 IEC 144	IP00				
Dimensions (HxWxD)	mm	385x265x239		385x265x283		
Dimension diagram see Section		5.1.8		5.1.9		
Weights (approx.)	kg	11	11	14	14	16

Explanation at end of list of tables

3.4.13 Converters 3AC 400V, 210A to 600A, 4Q

Order No.		6RA70 . . – 6DV62			
		75	78	81	85
Rated supply voltage armature [1]	V	3AC 400 (+15% / – 20%)			
Rated input current armature [2]	A	175	233	332	498
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage fan	V	DC 24V internal		3AC 400 (±15%) 50Hz 3AC 460 (±10%) 60Hz	
Fan rated current	A			0,3 [8]	
Air flow rate	m^3/h	100		570	
Fan noise level	dBA	40		73	
Rated supply voltage field [1]	V	2AC 400 (+15% / – 20%) [7]			
Rated frequency	Hz	45 to 65 [10]			
Rated DC voltage [1]	V	420			
Rated DC current	A	210	280	400	600
Overload capability [6]		max. 180% of rated DC current			
Rated output	kW	88	118	168	252
Power loss at rated DC current (approx.)	W	676	800	1328	1800
Rated DC voltage field [1]	V	max. 325			
Rated DC current field	A	15		25	
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current [4]			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation <u>and</u> digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]			
Environmental class	DIN IEC 721-3-3	3K3			
Degree of protect.	DIN 40050 IEC 144	IP00			
Dimensions (HxWxD)	mm	385x265x283		625x268x318	
Dimension diagram see Section		5.1.9		5.1.10	
Weights (approx.)	kg	16	17	30	

Explanation at end of list of tables

3.4.14 Converters 3AC 400V, 850A to 2000A, 4Q

Order No.		6RA70 . . – 6DV62			6RA70 . . – 4DV62	
		87	91		93	95
Rated supply voltage armature [1]	V	3AC 400 (+15% / – 20%)				
Rated input current armature [2]	A	705	995		1326	1658
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)				
Rated supply voltage fan	V	3AC 400 (±15%) 50Hz 3AC 460 (±10%) 60Hz	3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz		3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz	
			50Hz	60Hz	50Hz	60Hz
Fan rated current	A	0,3 [8]	1,0 [9]	1,25 [9]	1,0 [9]	1,25 [9]
Air flow rate	m^3/h	570	1300	1300	2400	2400
Fan noise level	dBA	73	83	87	83	87
Rated supply voltage field [1]	V	2AC 400 (+15% / – 20%) [7]				
Rated frequency	Hz	45 to 65 [10]				
Rated DC voltage [1]	V	420				
Rated DC current	A	850	1200		1600	2000
Overload capability [6]		max. 180% of rated DC current				
Rated output	kW	357	504		672	840
Power loss at rated DC current (approx.)	W	2420	4525		5708	6810
Rated DC voltage field [1]	V	max. 325				
Rated DC current field	A	30			40	
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled				
Storage and transport temperature	°C	– 25 to +70				
Installation altitude above sea level		≤ 1000 m at rated DC current [4]				
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]				
Environmental class DIN IEC 721-3-3		3K3				
Degree of protect.	DIN 40050 IEC 144	IP00				
Dimensions (HxWxD)	mm	700x268x362	780x410x362		880x450x500	
Dimension diagram see Section		5.1.11	5.1.12		5.1.13	
Weights (approx.)	kg	45	85		145	

Explanation at end of list of tables

3.4.15 Converters 3AC 460V, 30A to 125A, 4Q

Order No.		6RA70 . . – 6FV62			
		18	25	28	31
Rated supply voltage armature 1)	V	3AC 460 (+15% / – 20%)			
Rated input current armature 2)	A	25	50	75	104
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage field 1)	V	2AC 460 (+15% / – 20%)			
Rated frequency	Hz	45 to 65 10)			
Rated DC voltage 1)	V	480			
Rated DC current	A	30	60	90	125
Overload capability 6)		max. 180% of rated DC current			
Rated output	kW	14,4	28,8	43	60
Power loss at rated DC current (approx.)	W	172	248	328	417
Rated DC voltage field 1)	V	max. 375			
Rated DC current field	A	5	10		
Operational ambient temperature	°C	0 to 45 at I_{rated} 3) self-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current 4)			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint 5)			
Environmental class DIN IEC 721-3-3		3K3			
Degree of protect. DIN 40050 IEC 144		IP00			
Dimensions (HxWxD)	mm	385x265x239	385x265x313		
Dimension diagram see Section		5.1.8	5.2.5		
Weights (approx.)	kg	11	15	15	17

Explanation at end of list of tables

3.4.16 Converters 3AC 460V, 210A to 600A, 4Q

Order No.		6RA70 . . – 6FV62			
		75	78	82	85
Rated supply voltage armature [1)]	V	3AC 460 (+15% / – 20%)			
Rated input current armature [2)]	A	175	233	374	498
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage fan	V	DC 24V internal		1AC 230 (±10%)	
				50Hz	60Hz
Fan rated current	A			0,55	0,55
Air flow rate	m^3/h	100		570	570
Fan noise level	dBA	40		73	76
Rated supply voltage field [1)]	V	2AC 460 (+15% / – 20%)			
Rated frequency	Hz	45 to 65 [10)]			
Rated DC voltage [1)]	V	480			
Rated DC current	A	210	280	450	600
Overload capability [6)]		max. 180% of rated DC current			
Rated output	kW	100	134	216	288
Power loss at rated DC current (approx.)	W	700	792	1519	1845
Rated DC voltage field [1)]	V	max. 375			
Rated DC current field	A	15		25	
Operational ambient temperature	°C	0 to 40 at I_{rated} [3)] forced-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current [4)]			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5)]			
Environmental class	DIN IEC 721-3-3	3K3			
Degree of protect.	DIN 40050 IEC 144	IP00			
Dimensions (HxWxD)	mm	385x265x313		625x268x318	
Dimension diagram see Section		5.2.6		5.2.7	
Weights (approx.)	kg	17	18	32	

Explanation at end of list of tables

3.4.17 Converters 3AC 460V, 850A to 1200A, 4Q

Order No.		6RA70 . . – 6FV62			
		87		91	
Rated supply voltage armature [1)]	V	3AC 460 (+15% / – 20%)			
Rated input current armature [2)]	A	705		995	
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage fan	V	1AC 230 (±10%)		1AC 230 (±10%)	
		50Hz	60Hz	50Hz	60Hz
Fan rated current	A	0,55	0,55	2,6	3,3
Air flow rate	m^3/h	570	570	1300	1300
Fan noise level	dBA	73	76	82	85
Rated supply voltage field [1)]	V	2AC 460 (+15% / – 20%)			
Rated frequency	Hz	45 to 65 [10)]			
Rated DC voltage [1)]	V	480			
Rated DC current	A	850		1200	
Overload capability [6)]		max. 180% of rated DC current			
Rated output	kW	408		576	
Power loss at rated DC current (approx.)	W	2514		4620	
Rated DC voltage field [1)]	V	max. 375			
Rated DC current field	A	30			
Operational ambient temperature	°C	0 to 40 at I_{rated} [3)] forced-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current [4)]			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation and digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5)]			
Environmental class DIN IEC 721-3-3		3K3			
Degree of protect. DIN 40050 IEC 144		IP00			
Dimensions (HxWxD)	mm	700x268x362		780x410x362	
Dimension diagram see Section		5.2.8		5.1.12	
Weights (approx.)	kg	47		85	

Explanation at end of list of tables

3.4.18 Converters 3AC 575V, 60A to 600A, 4Q

Order No.		6RA70 . . – 6GV62				
		25	31	75	81	85
Rated supply voltage armature [1]	V	3AC 575 (+10% / – 20%)				
Rated input current armature [2]	A	50	104	175	332	498
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)				
Rated supply voltage fan	V			DC24V internal	3AC 400 (±15%) 50Hz 3AC 460 (±10%) 60Hz	
Fan rated current	A				0,3 [8]	
Air flow rate	m^3/h			100	570	
Fan noise level	dBA			40	73	
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)				
Rated frequency	Hz	45 to 65 [10]				
Rated DC voltage [1]	V	600				
Rated DC current	A	60	125	210	400	600
Overload capability [6]		max. 180% of rated DC current				
Rated output	kW	36	75	126	240	360
Power loss at rated DC current (approx.)	W	265	455	730	1550	1955
Rated DC voltage field [1]	V	max. 375				
Rated DC current field	A	10		15	25	
Operational ambient temperature	°C	0 to 45 at I_{rated} [3] self-cooled		0 to 40 at I_{rated} [3] forced-cooled		
Storage and transport temperature	°C	– 25 to +70				
Installation altitude above sea level		≤ 1000 m at rated DC current [4]				
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation <u>and</u> digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]				
Environmental class DIN IEC 721-3-3		3K3				
Degree of protect. DIN 40050 IEC 144		IP00				
Dimensions (HxWxD)	mm	385x265x283			625x268x318	
Dimension diagram see Section		5.1.9			5.1.10	
Weights (approx.)	kg	14	16		30	

Explanation at end of list of tables

3.4.19 Converters 3AC 575V, 850A to 2200A, 4Q

Order No.		6RA70 . . – 6GV62		6RA70 . . – 4GV62		
		87	90	93	95	96
Rated supply voltage armature [1]	V	3AC 575 (+10% / – 20%)				
Rated input current armature [2]	A	705	912	1326	1658	1824
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)				
Rated supply voltage fan	V	3AC 400 (±15%) 50Hz 3AC 460 (±10%) 60Hz	3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz	3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz		
			50Hz / 60Hz	50Hz / 60Hz		
Fan rated current	A	0,3 [8]	1,0 [9] / 1,25 [9]	1,0 [9] / 1,25 [9]		
Air flow rate	m^3/h	570	1300 / 1300	2400 / 2400		
Fan noise level	dBA	73	83 / 87	83 / 87		
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)				
Rated frequency	Hz	45 to 65 [10]				
Rated DC voltage [1]	V	600				
Rated DC current	A	850	1100	1600	2000	2200
Overload capability [6]		max. 180% of rated DC current				
Rated output	kW	510	660	960	1200	1320
Power loss at rated DC current (approx.)	W	2780	4515	5942	7349	7400
Rated DC voltage field [1]	V	max. 375				
Rated DC current field	A	30		40		85
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled				
Storage and transport temperature	°C	– 25 to +70				
Installation altitude above sea level		≤ 1000 m at rated DC current [4]				
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation <u>and</u> digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]				
Environmental class DIN IEC 721-3-3		3K3				
Degree of protect. DIN 40050 IEC 144		IP00				
Dimensions (HxWxD)	mm	700x268x362	780x410x362	880x450x500		
Dimension diagram see Section		5.1.11	5.1.12	5.1.13		
Weights (approx.)	kg	45	85	145		

Explanation at end of list of tables

3.4.20 Converters 3AC 690V, 760A to 2000A, 4Q

Order No.		6RA70 . . – 6KV62			6RA70 . . – 4KV62	
		86	90		93	95
Rated supply voltage armature [1]	V	3AC 690 (+10% / – 20%)				
Rated input current armature [2]	A	630	829		1244	1658
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)				
Rated supply voltage fan	V	3AC 400 (±15%) 50Hz 3AC 460 (±10%) 60Hz	3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz		3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz	
			50Hz	60Hz	50Hz	60Hz
Fan rated current	A	0,3 [8]	1,0 [9]	1,25 [9]	1,0 [9]	1,25 [9]
Air flow rate	m^3/h	570	1300	1300	2400	2400
Fan noise level	dBA	73	83	87	83	87
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)				
Rated frequency	Hz	45 to 65 [10]				
Rated DC voltage [1]	V	725				
Rated DC current	A	760	1000		1500	2000
Overload capability [6]		max. 180% of rated DC current				
Rated output	kW	551	725		1088	1450
Power loss at rated DC current (approx.)	W	2850	4605		6706	8190
Rated DC voltage field [1]	V	max. 375				
Rated DC current field	A	30			40	
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled				
Storage and transport temperature	°C	– 25 to +70				
Installation altitude above sea level		≤ 1000 m at rated DC current [4]				
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation <u>and</u> digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]				
Environmental class DIN IEC 721-3-3		3K3				
Degree of protect. DIN 40050 IEC 144		IP00				
Dimensions (HxWxD)	mm	700x268x362	780x410x362		880x450x500	
Dimension diagram see Section		5.1.11	5.1.12		5.1.13	
Weights (approx.)	kg	45	85		145	

Explanation at end of list of tables

3.4.21 Converters 3AC 830V, 950A to 1900A, 4Q

Order No.		6RA70 . . – 6LV62		6RA70 . . – 4LV62	
		88		93	95
Rated supply voltage armature [1]	V	3AC 830 (+10% / – 20%)			
Rated input current armature [2]	A	788		1244	1575
Rated supply voltage electronics power supply	V	2AC 380 (– 25%) to 460 (+15%); I_n=1A or 1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min)			
Rated supply voltage fan	V	3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz		3AC 400 (±10%) 50Hz 3AC 460 (±10%) 60Hz	
		50Hz	60Hz	50Hz	60Hz
Fan rated current	A	1,0 [9]	1,25 [9]	1,0 [9]	1,25 [9]
Air flow rate	m^3/h	1300	1300	2400	2400
Fan noise level	dBA	83	87	83	87
Rated supply voltage field [1]	V	2AC 460 (+15% / – 20%)			
Rated frequency	Hz	45 to 65 [10]			
Rated DC voltage [1]	V	875			
Rated DC current	A	950		1500	1900
Overload capability [6]		max. 180% of rated DC current			
Rated output	kW	831		1313	1663
Power loss at rated DC current (approx.)	W	4870		7153	8700
Rated DC voltage field [1]	V	max. 375			
Rated DC current field	A	30		40	
Operational ambient temperature	°C	0 to 40 at I_{rated} [3] forced-cooled			
Storage and transport temperature	°C	– 25 to +70			
Installation altitude above sea level		≤ 1000 m at rated DC current [4]			
Control stability		Δn = 0.006% of the rated motor speed, valid for pulse encoder operation <u>and</u> digital setpoint Δn = 0.1% of the rated motor speed, valid for analog tacho or analog setpoint [5]			
Environmental class	DIN IEC 721-3-3	3K3			
Degree of protect.	DIN 40050 IEC 144	IP00			
Dimensions (HxWxD)	mm	780x410x362		880x450x500	
Dimension diagram see Section		5.1.12		5.1.13	
Weights (approx.)	kg	85		145	

Explanation at end of list of tables

1) The armature/field supply voltage can be lower than the rated armature/field voltage (setting in parameter P078, input voltages down to 85V are permissible for converters with rated supply voltage of 400V). The output voltage is reduced accordingly.

   The specified output DC voltage can be guaranteed up to an undervoltage corresponding to 5% of line voltage (rated supply voltage armature/field).

2) Values apply to output rated DC current.

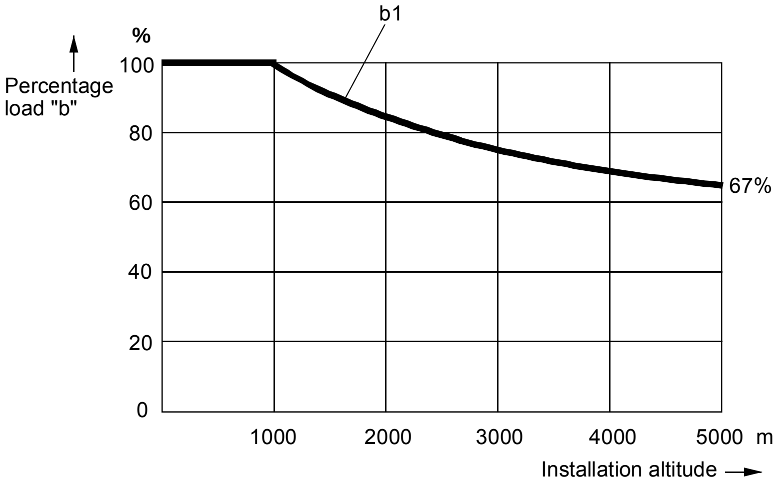
3) Load factor K1 (direct current) as a function of coolant temperature (see P077 Section 11).
   K1 > 1 permitted only if K1 * K2 ≤ 1.
   Total derating factor K = K1 * K2 (K2 see below)

Ambient temperature or coolant temperature	Load factor K1	
	in devices with self-cooling	in devices with enhanced air cooling
≤ + 30°C	1,18	1,10
+ 35°C	1,12	1,05
+ 40°C	1,06	1,00
+ 45°C	1,00	0,95
+ 50°C	0,94	0,90 a)
+ 55°C	0,88	
+ 60°C	0,82 b)	

a) In spite of derating, converters of ≥400 A with forced air cooling may be operated at an ambient or coolant temperature of 50°C only if the rated supply voltage of the converter fan is safely within the limited tolerance range of 400V + 10% –15%.

b) Not permissible when T400 or OP1S is used.

4) Load values as a function of installation altitude (refer to P077 in Section 11)
   Total derating factor K = K1 * K2 (K1 see above)



Installation altitude [m]	Derating factor K2
1000	1,0
2000	0,835
3000	0,74
4000	0,71
5000	0,67

Curve b1: Reduction factor of load values (DC current) at installation altitudes above 1000 m

The supply voltages of all circuits are available up to an installation altitude of 5000 m for basic insulation.

Converters for 830V rated supply voltage are an exception:
Up to 4000m 830V
Up to 4500m 795V
Up to 5000m 727V

5) Conditions

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 ±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)

6) Also refer to Section 3.3 and 9.

7) Also permissible for 2AC 460 (+15% / – 20%).

8) Motor protection type 3RV1011-0DA1 or 3RV1011-0EA1 trimmed to 0.3A manufactured by Siemens is to be provided for blower motor type R2D220-AB02-19 in drive models 6RA7081, 6RA7085, 6RA7087 with rated input voltage 400V or 575V.

9) Motor protection type 3RV1011-0KA1 or 3RV1011-1AA1 trimmed to 1.25A manufactured by Siemens is to be provided for blower motor type RH28M-2DK.3F.1R in drive models 6RA7090, 6RA7091, 6RA7093, 6RA7095 with rated input voltage 400V or 575V.

10) 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."

EN60146 T1-1 / VDE 0558 T11
Semiconductor converter
General requirements and line-commutated converters

DIN EN50178 / VDE 0160
Regulations for equipping electrical power systems with electronic equipment.

EN61800-3
Variable-speed drives, part 3, EMC Product Standard including special testing procedures

DIN IEC 60068-2-6 acc. to severity grade 12 (SN29010 Part1)
Mechanical stressing

UL 508 C Power Conversion Equipment

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	**Ad**apter **B**oard, carrier for miniature-format supplementary boards
CAN	Field bus specification of user organization CiA (CAN in Automation) (**C**ontroller **A**rea **N**etwork)
CB	Supplementary **C**ommunication **B**oard
CBC	Supplementary board for CAN Bus link (**C**ommunication **B**oard **C**AN Bus)
CBD	Supplementary board for DeviceNet link (**C**ommunication **B**oard **D**eviceNet)
CBP2	Supplementary board for PROFIBUS link (**C**ommunication **B**oard **P**ROFIBUS)
COB	**C**ommunication **Ob**ject for CAN Bus communication
CUD1	Electronics board C98043-A7001 of SIMOREG DC Master (**C**ontrol **U**nit / **D**irect Current)
CUD2	Terminal expansion board C98043-A7006 for CUD1
DeviceNet	Field bus specification of ODVA (Open DeviceNet Vendor Association)
DP	**D**istributed **P**eripherals
EB1	Supplementary board with additional inputs/outputs (**E**xpansion **B**oard **1**)
EB2	Supplementary board with additional inputs/outputs (**E**xpansion **B**oard **2**)
GSD file	Device master data file defining the communication features of the PROFIBUS communication board
ID	**Id**entifier for CAN Bus communication
IND	Parameter **Ind**ex
LBA	Connection module for mounting supplementary modules (**L**ocal **B**us **A**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 (**O**perator **P**anel **1** / **S**tore)
PKE	Parameter identifier
PKW	Reference to parameter (parameter identifier value)
PMU	Simple operator panel of SIMOREG DC Master (**Para**m**eterization **U**nit)
PNU	**P**arameter **nu**mber
PPO	Definition of number of parameter and process data words for PROFIBUS communication (**P**arameter **P**rocess Data **O**bject)
PROFIBUS	Field bus specification of PROFIBUS user organization (**Pro**cess **Fi**eld **Bus**)
PWE	Parameter value

PZD	Process data
SBP	Supplementary board for linking tacho (**S**ensor **B**oard **P**ulse)
SCB1	Supplementary board for linking SCI1 or SCI2 via fiber optic cable (**S**erial **C**ommunication **B**oard **1**)
SCI1	Supplementary board with additional inputs/outputs; I/O slave module on SCB1 (**S**erial **C**ommunication **I**nterface **1**)
SCI2	Supplementary board with additional inputs/outputs; I/O slave module on SCB1 (**S**erial **C**ommunication **I**nterface **2**)
SIMOLINK	Field bus specification for fiber optic ring bus (**Si**emens **Mo**tion **Link**)
SLB	Supplementary board for SIMOLINK link (**S**IMO**L**INK **B**oard)
STW	Control word
T100	Supplementary board with technology functions (**T**echnology Board **100**)
T300	Supplementary board with technology functions (**T**echnology Board **300**)
T400	Supplementary board with technology functions (**T**echnology Board **400**)
TB	**T**echnology board T100, T300 or T400
USS	**U**niversal serial interface
ZSW	Status word

4 Shipment, unpacking

SIMOREG 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.

4.1 Remove the transportation protection for devices with 1500A to 2200A rated DC

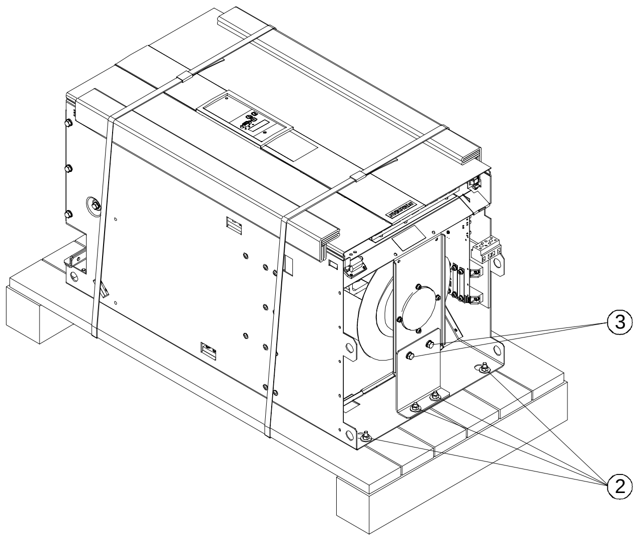
Remove the brackets for cabinet mounting by cutting open the cable ties and fix them to the outside of the device if required.

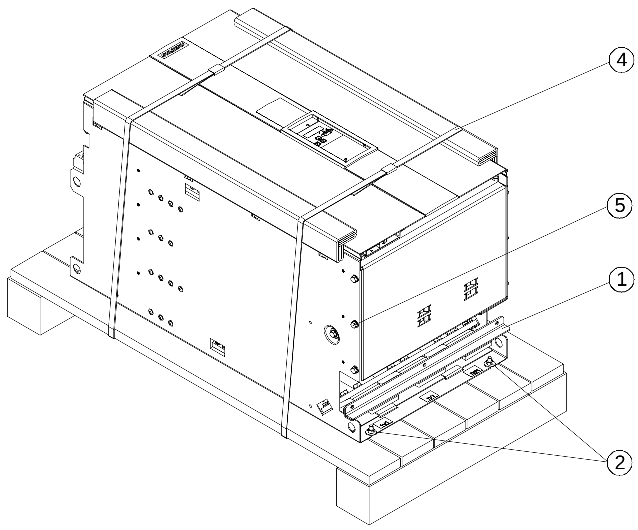
Remove the six M8 hexagon-head nuts.

③ Remove the two M8 hexagon-head nuts and the transportation bracket.

④ Remove the two banding strips.

⑤ Remove the transportation sheet <u>after</u> assembling the device and <u>before</u> startup by removing the six M6 hexagon-head nuts.





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.).

To preclude the risk of deformation damage to the housings of converters with rated DC current of 720A or higher, the lifting lugs used to raise them must not be subjected to any horizontal forces.

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

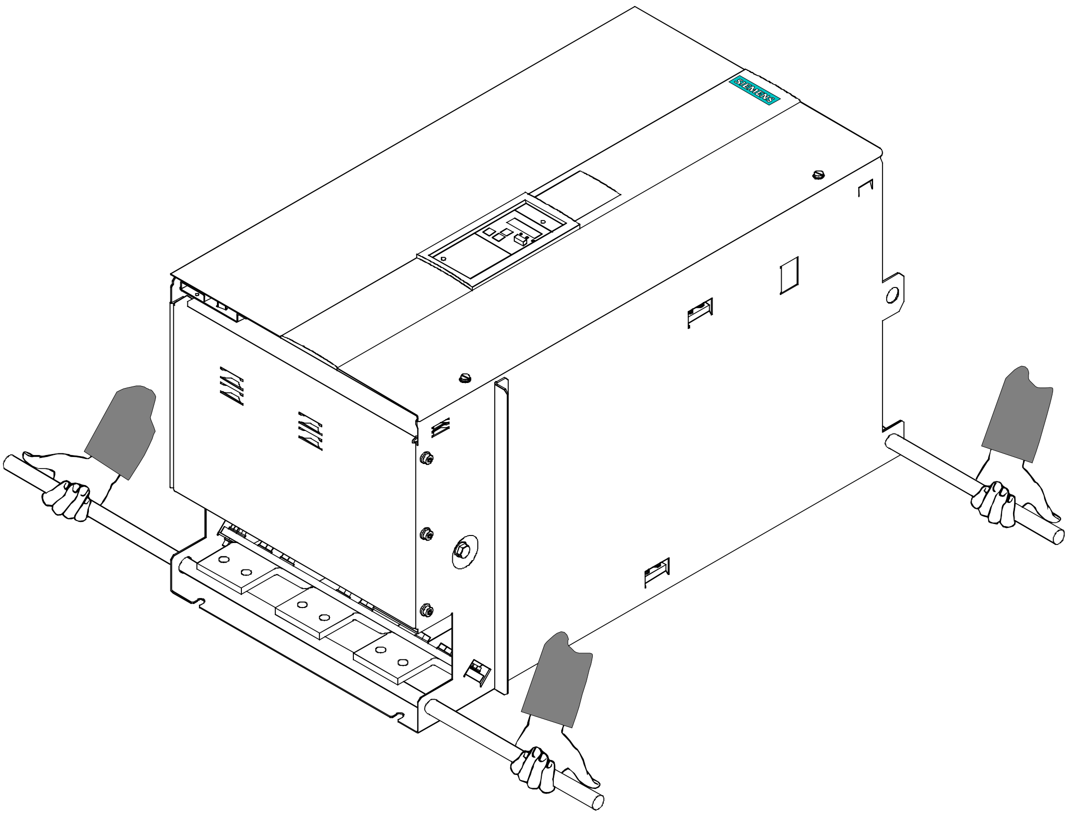
The converter must be installed in accordance with the relevant safety regulations (e.g. DIN, VDE), as well as all other relevant national and local regulations. It must be ensured that the grounding, cable dimensioning and appropriate short-circuit protection have been implemented to guarantee operational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

Installation of SIMOREG devices in cabinets in accordance with UL 508 C standards

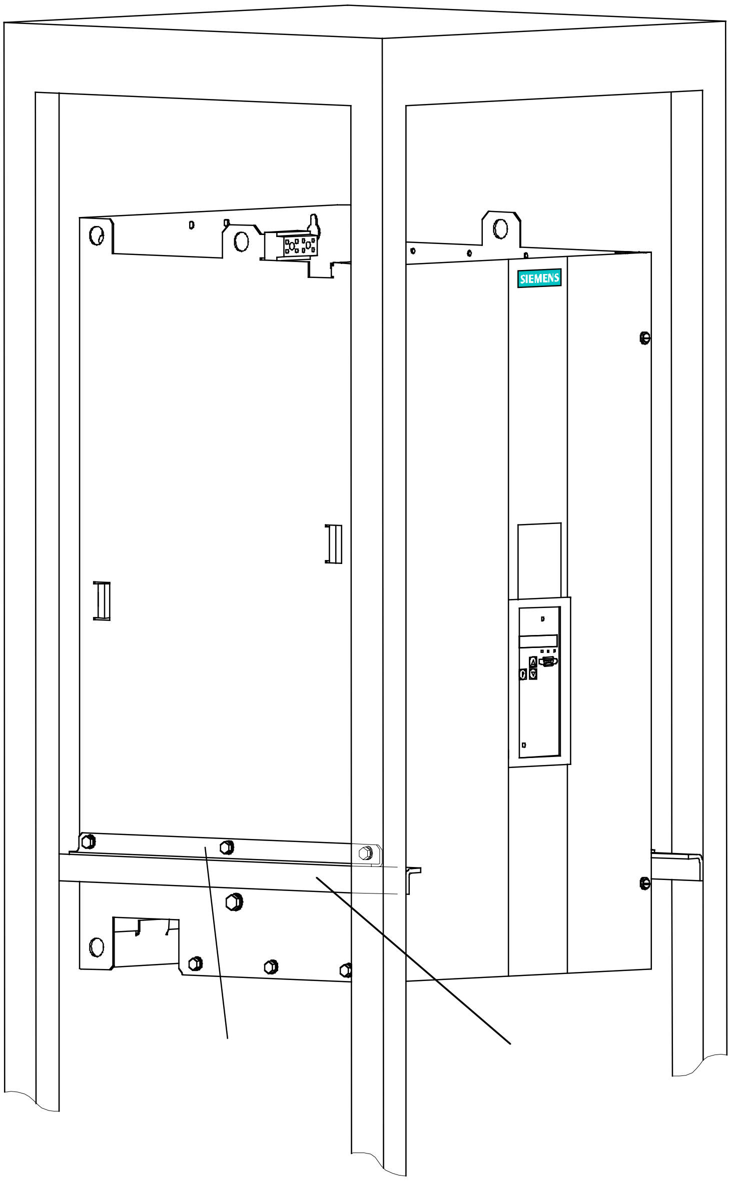
When the drive is provided in a panel (enclosure), the panel is ventilated and designated "Type 1".

The minimum size panel (enclosure) to be used with the drive is 600 mm length, 600 mm width, 2200 mm hight.

Possible lifting method for converters with rated DC current of 1500A to 2200A



Cubicle mounting of converters with rated DC current of 1500A to 2200A



- These converters are supplied with 2 fixing angles . These can be bolted to the SIMOREG unit by means of the supplied M6 hexagon-head screws (3 per angle) to assist cubicle mounting.
- The unit can then be supported by 2 further angles (not included in scope of supply) in the control cubicle.
- The converters must be bolted to the cubicle rear panel in 4 places.

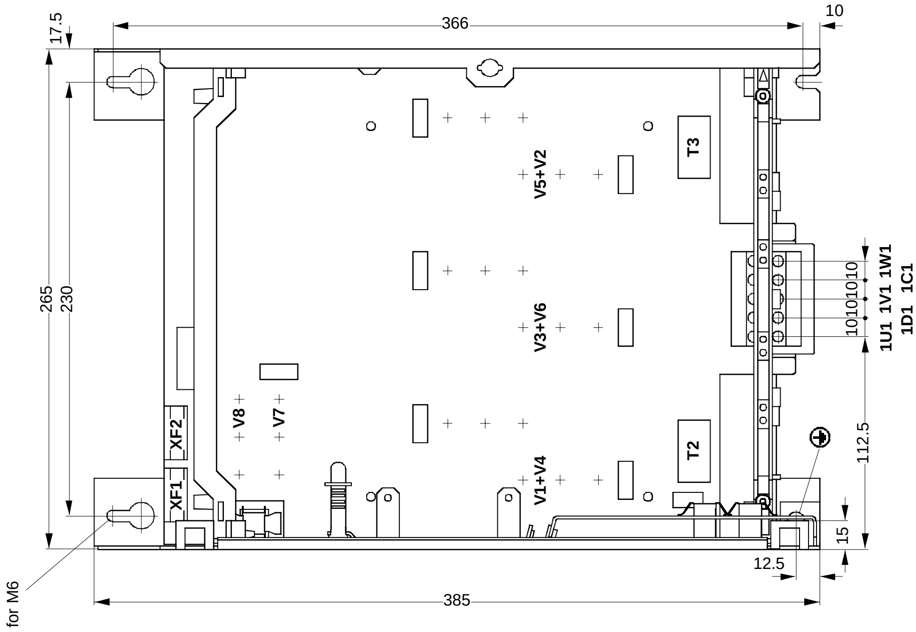
WARNING

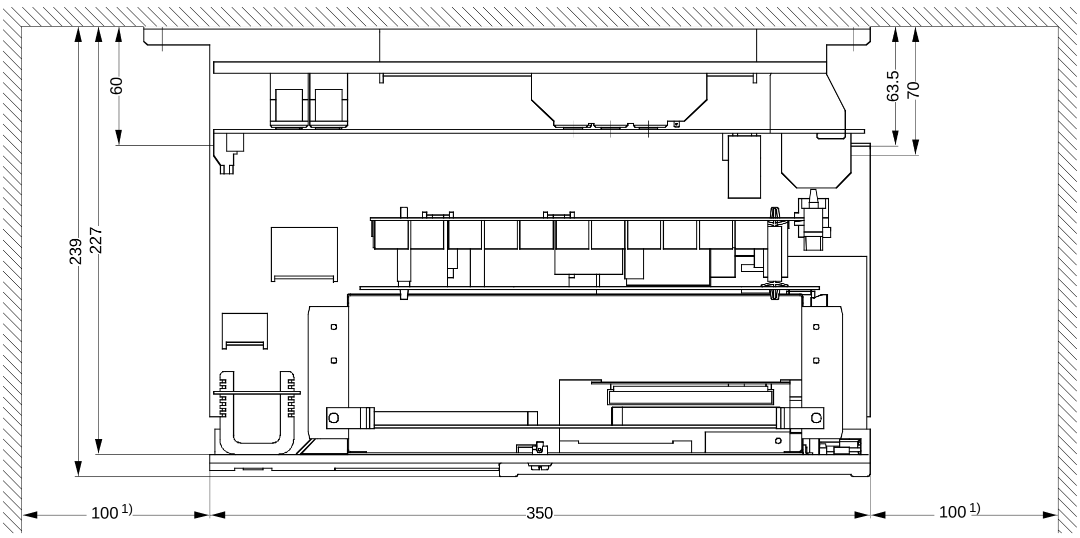
A clearance of at least 100 mm must be left above and below the converter in order to ensure an unrestricted cooling air intake and outlet.

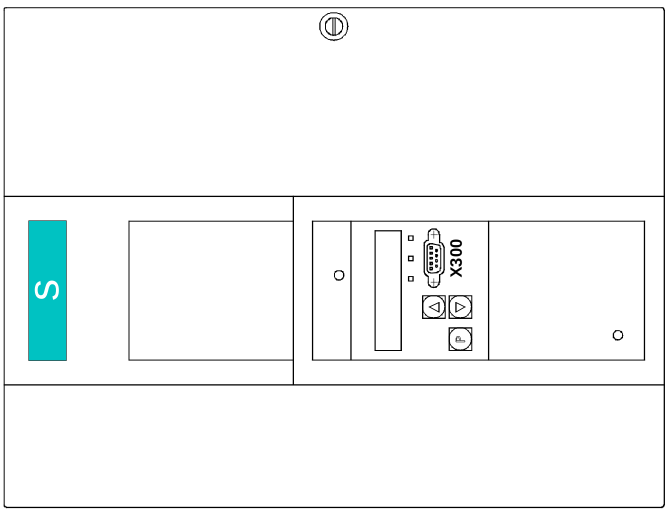
The converter may overheat if this clearance is not provided!

5.1 Dimension diagrams for standard devices

5.1.1 Converters: 3AC 400V and 460V, 30A, 1Q



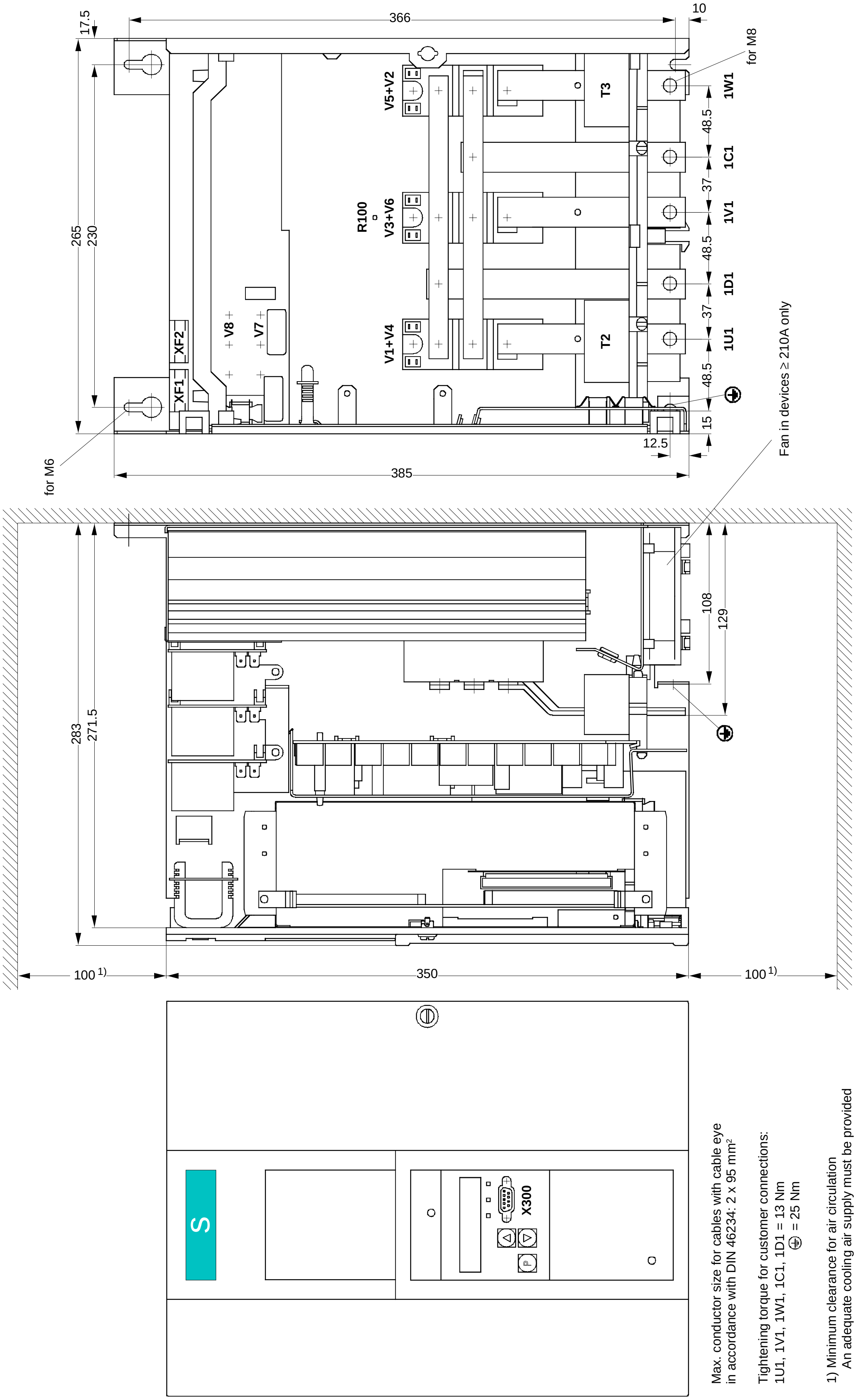




Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 1.5 Nm
⏚ = 25 Nm

1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

5.1.2 Converters: 3AC 400V and 575V, 60A to 280A, 1Q

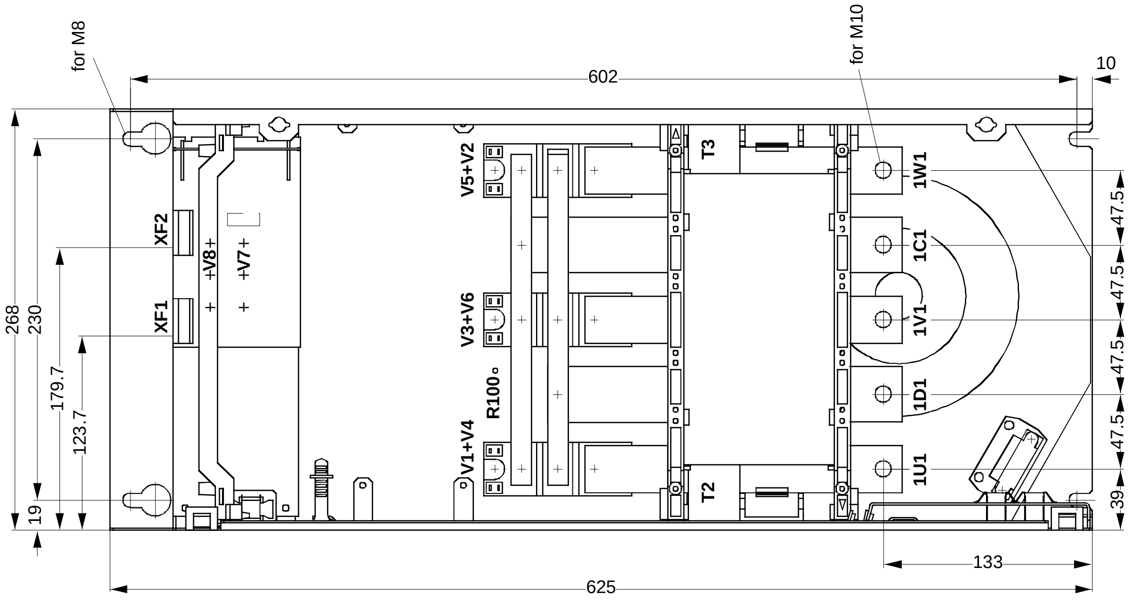


Max. conductor size for cables with cable eye in accordance with DIN 46234: 2 x 95 mm²

Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 13 Nm
⏚ = 25 Nm

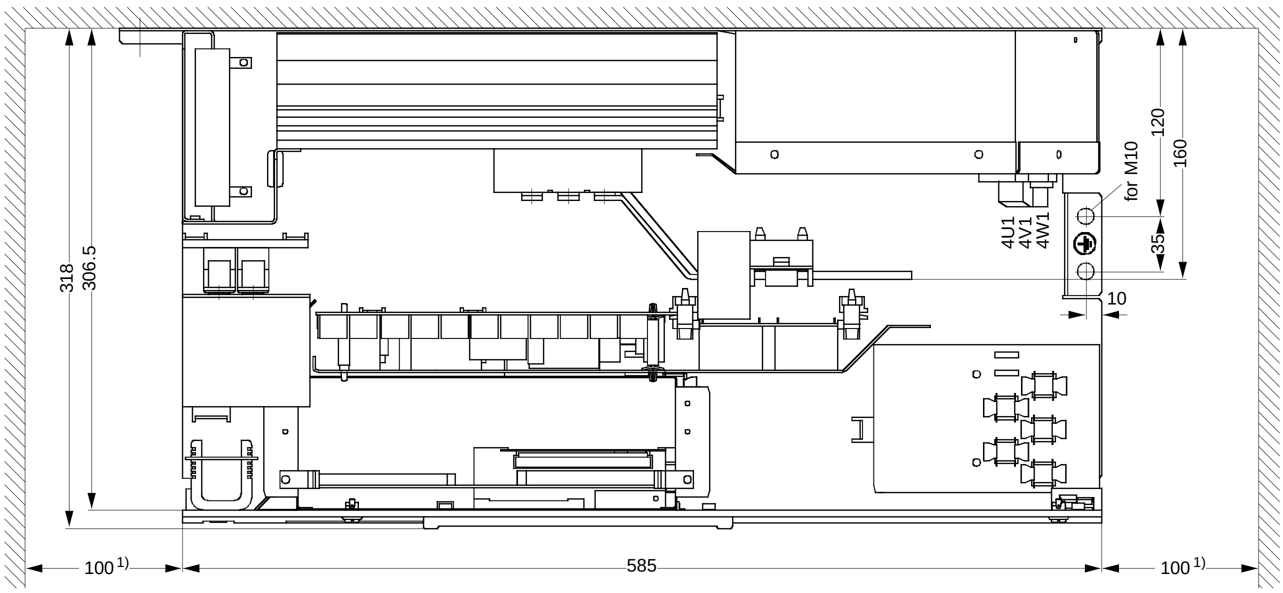
1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

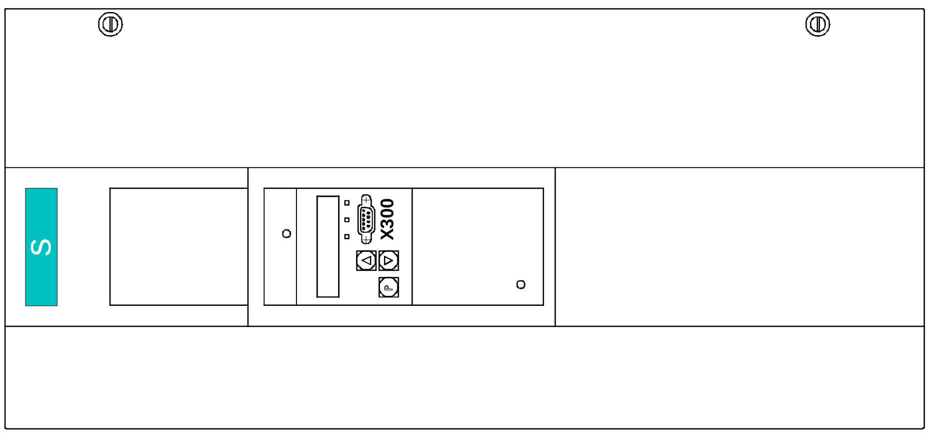
5.1.3 Converters: 3AC 400V and 575V, 400A, 1Q



Max. conductor size for cables with cable eye in accordance with DIN 46234:
1U1, 1V1, 1W1 = 2 x 150 mm²
1C1, 1D1 = 2 x 185 mm²

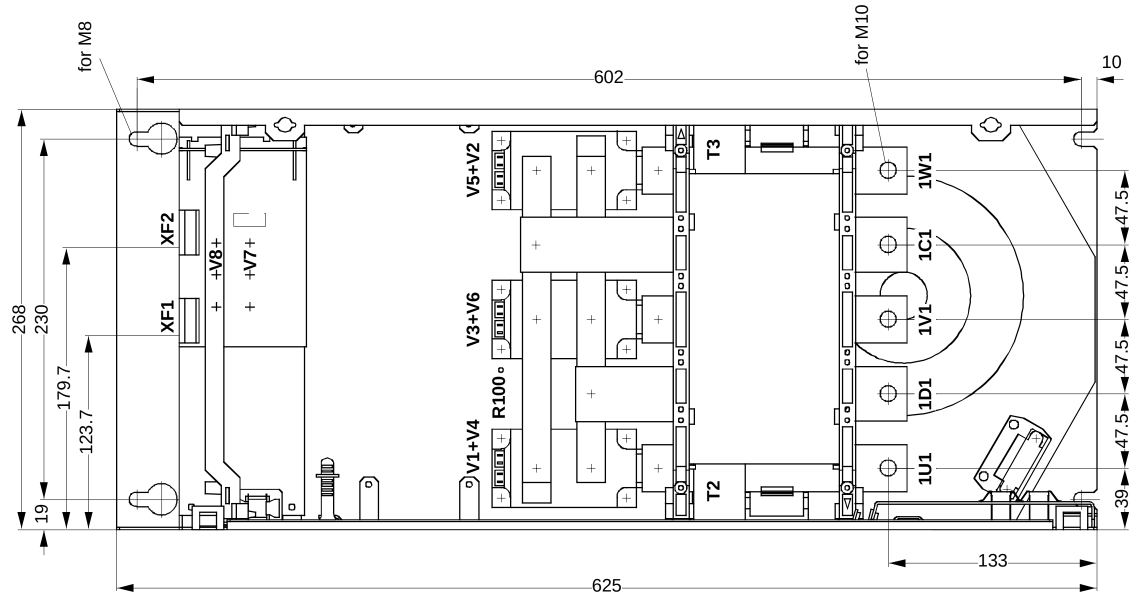
Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 25 Nm
⏚ = 50 Nm





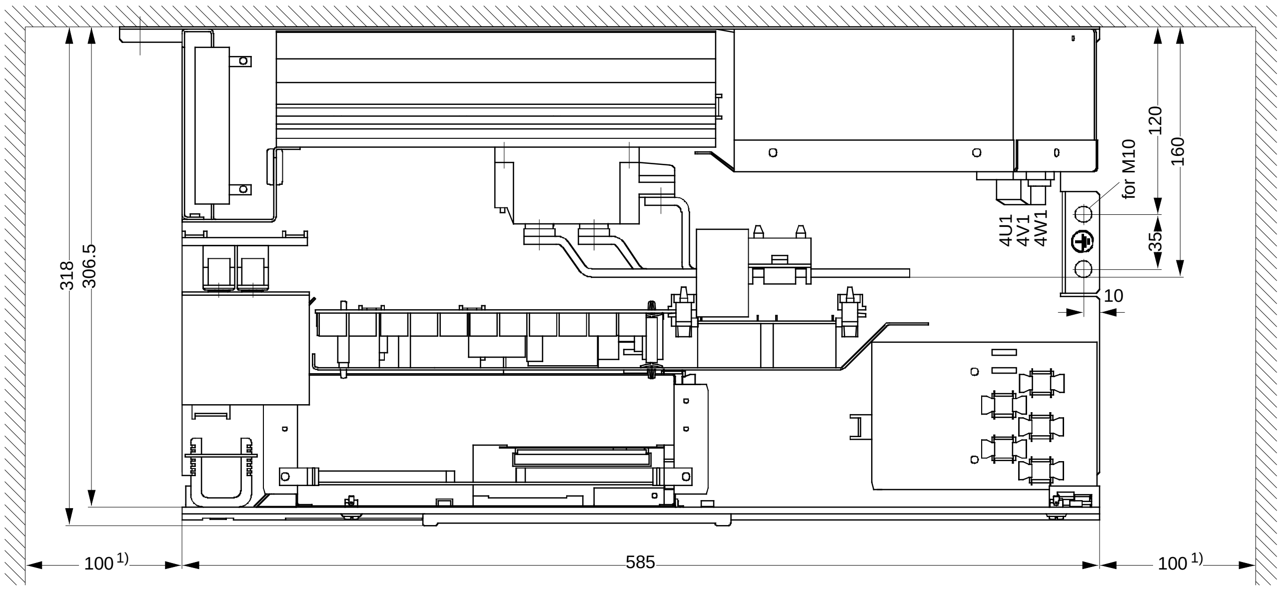
1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

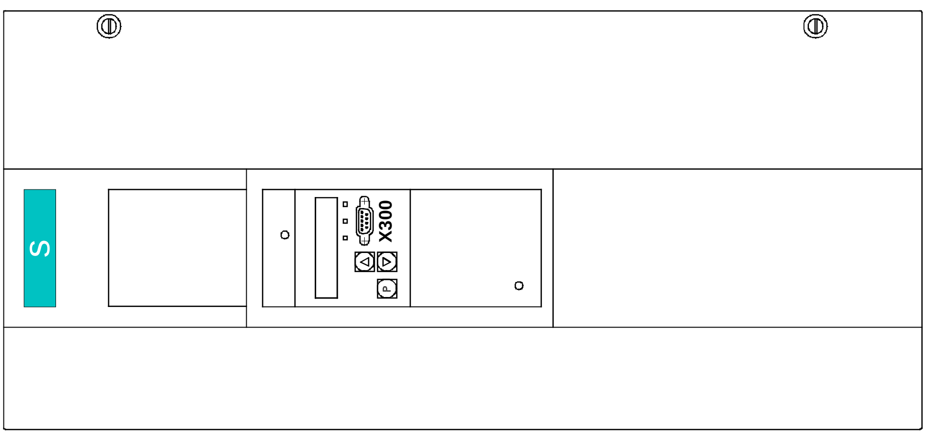
5.1.4 Converters: 3AC 400V and 575V, 600A, 1Q



Max. conductor size for cables with cable eye in accordance with DIN 46234:
1U1, 1V1, 1W1 = 2 x 150 mm²
1C1, 1D1 = 2 x 185 mm²

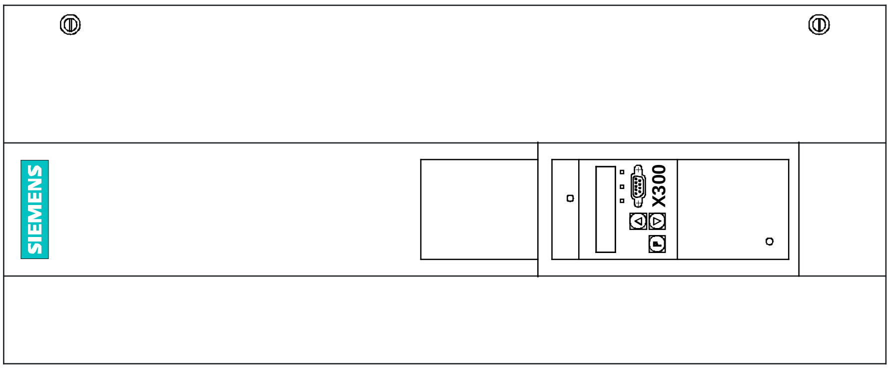
Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 25 Nm
⏚ = 50 Nm





1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

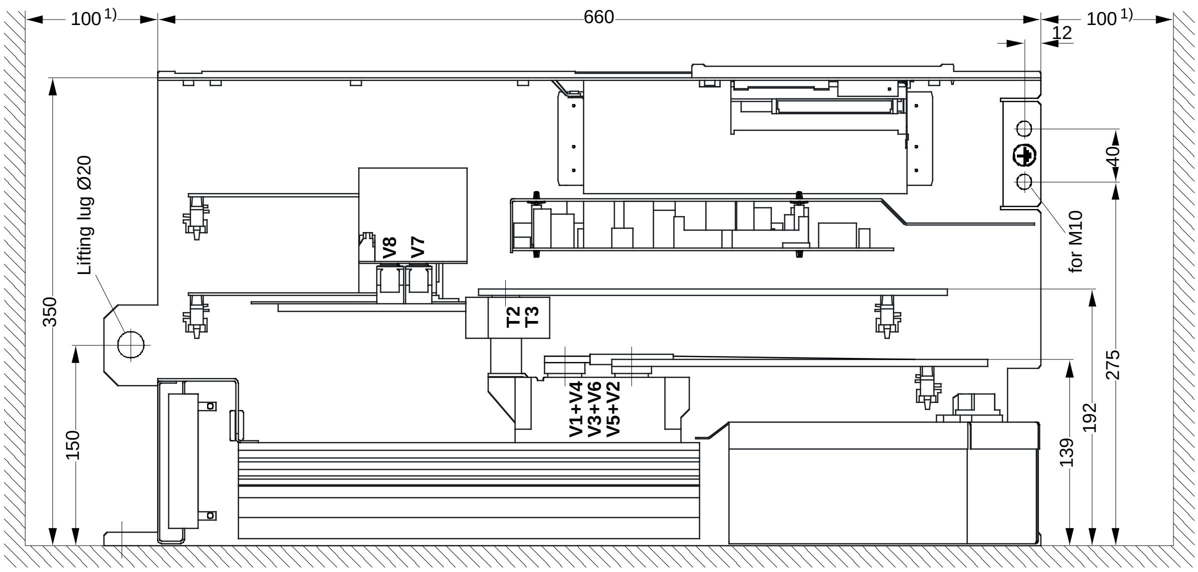
5.1.5 Converters: 3AC 400V, 575V, and 690V, 720A to 850A, 1Q

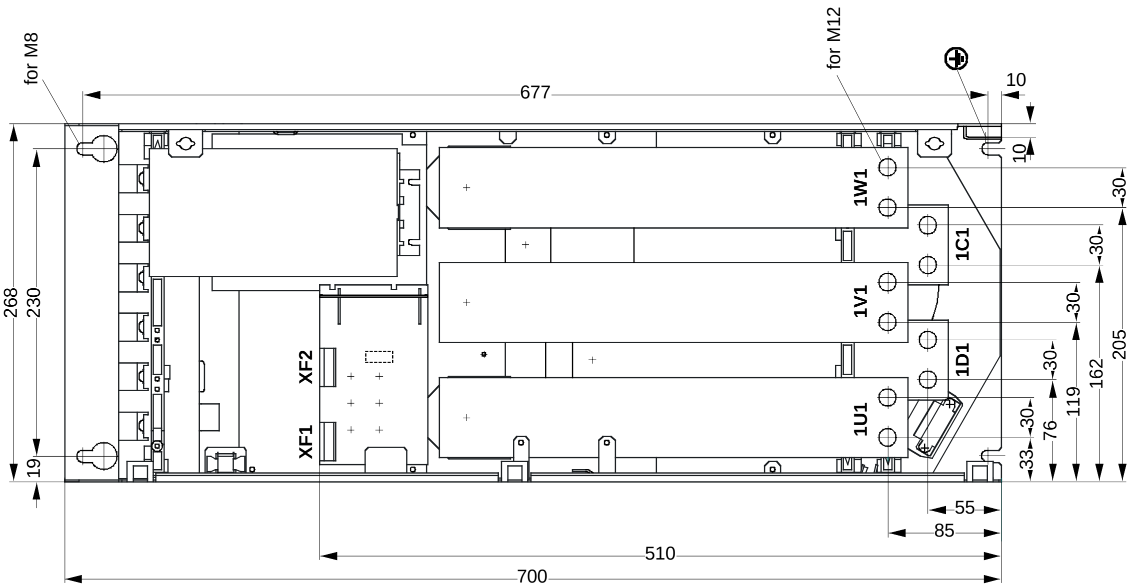


Max. conductor size for cables with cable eye
in accordance with DIN 46234: 4 x 150 mm²

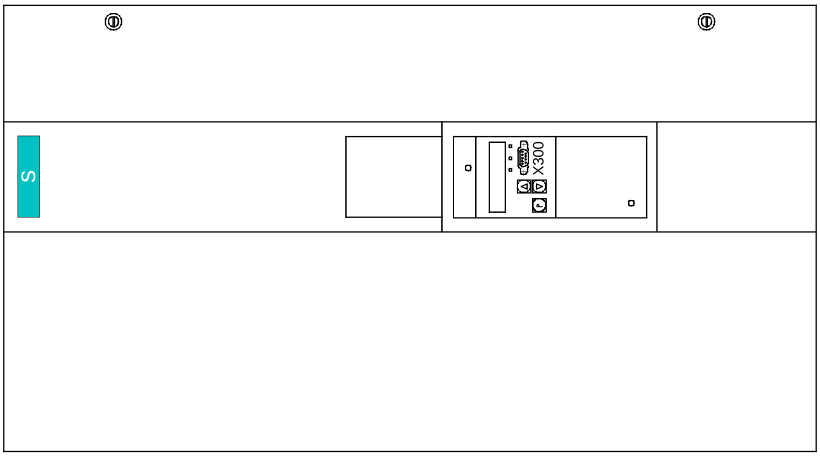
Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 44 Nm
⏚ = 50 Nm

1) Minimum clearance for air circulation
An adequate cooling air supply must be provided





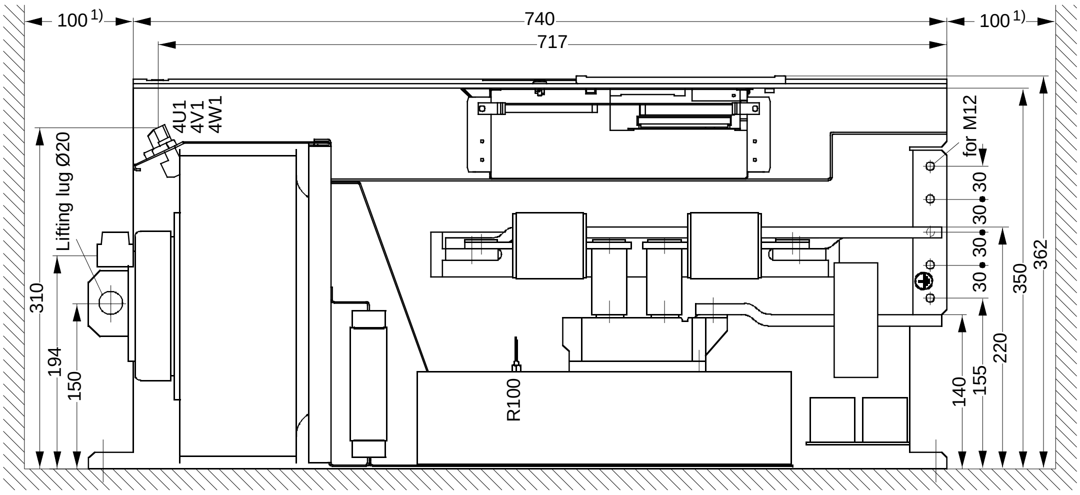
5.1.6 Converters: 3AC 400V, 460V, 575V, 690V, and 830V, 900A to 1200A, 1Q

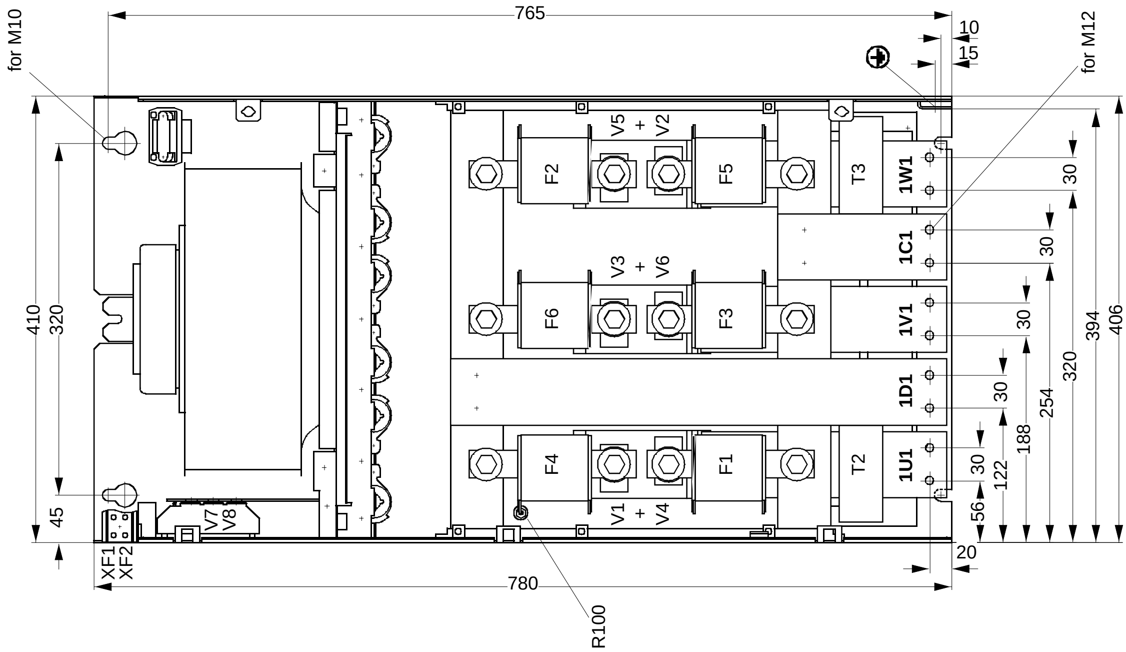


Max. conductor size for cables with cable eye in accordance with DIN 46234: 4 x 150 mm²

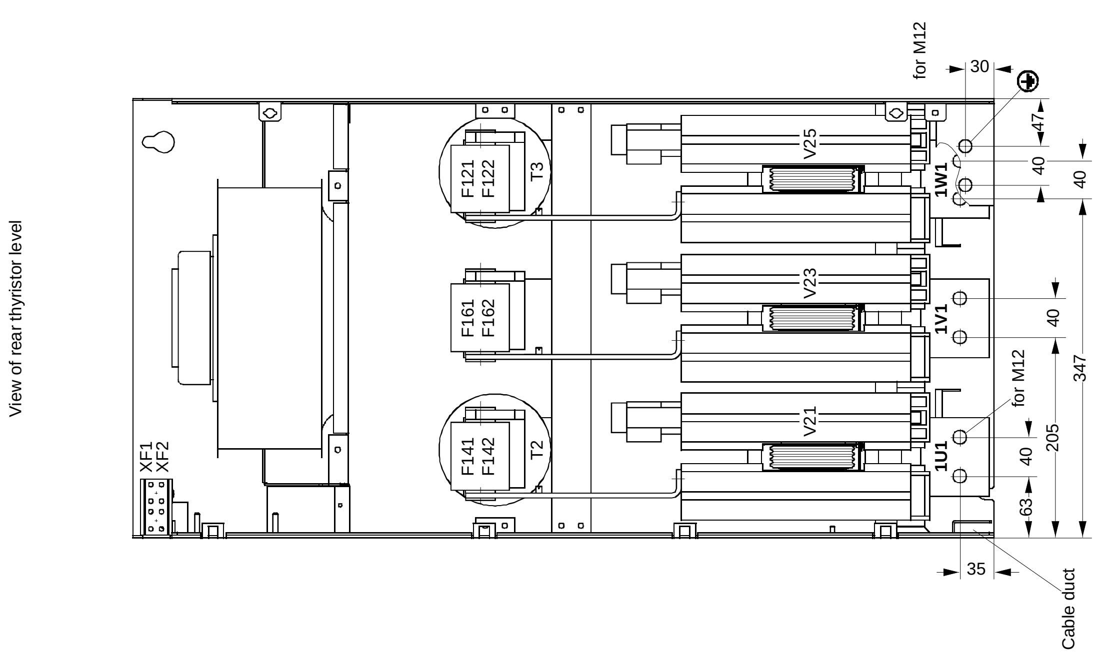
Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 44 Nm
⏚ = 60 Nm

1) Minimum clearance for circulation
An adequate cooling air supply must be provided



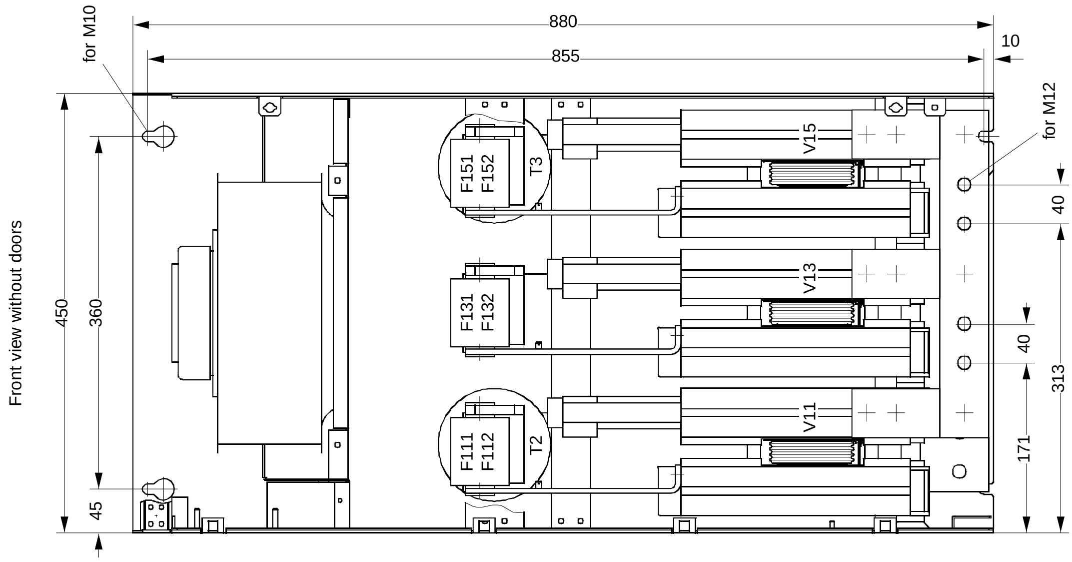


5.1.7 Converters: 3AC 400V, 575V, 690V, and 830V, 1500A to 2200A, 1Q



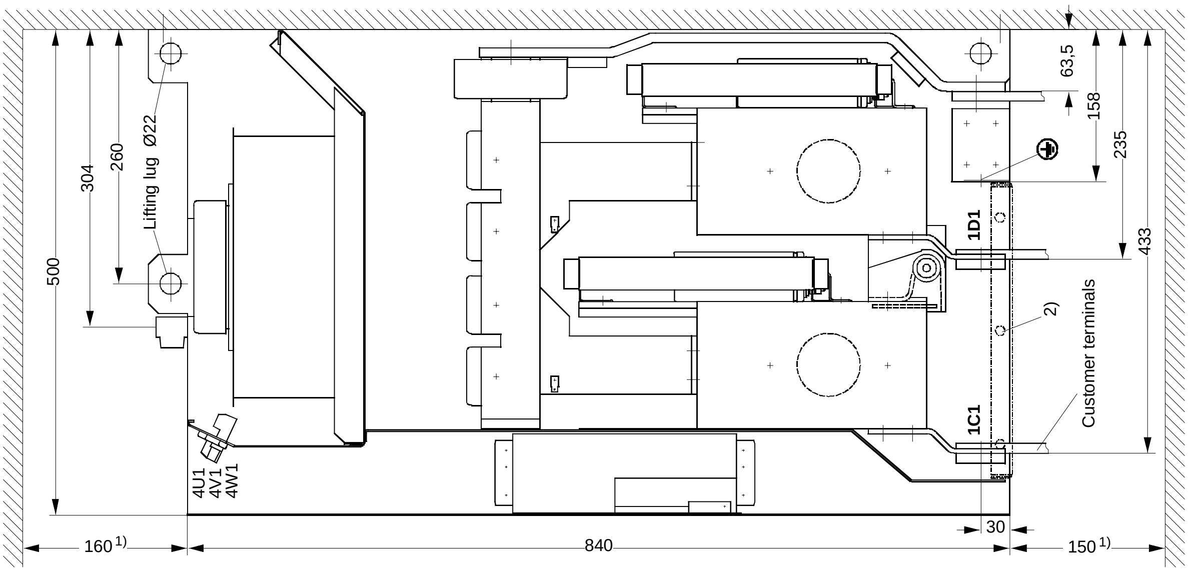
Max. conductor size for cables with cable eye in accordance with DIN 46234:
1U1, 1V1, 1W1 = 4 x 240 mm²
1C1, 1D1 = 8 x 240 mm²

Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 44 Nm
⊕ = 60 Nm

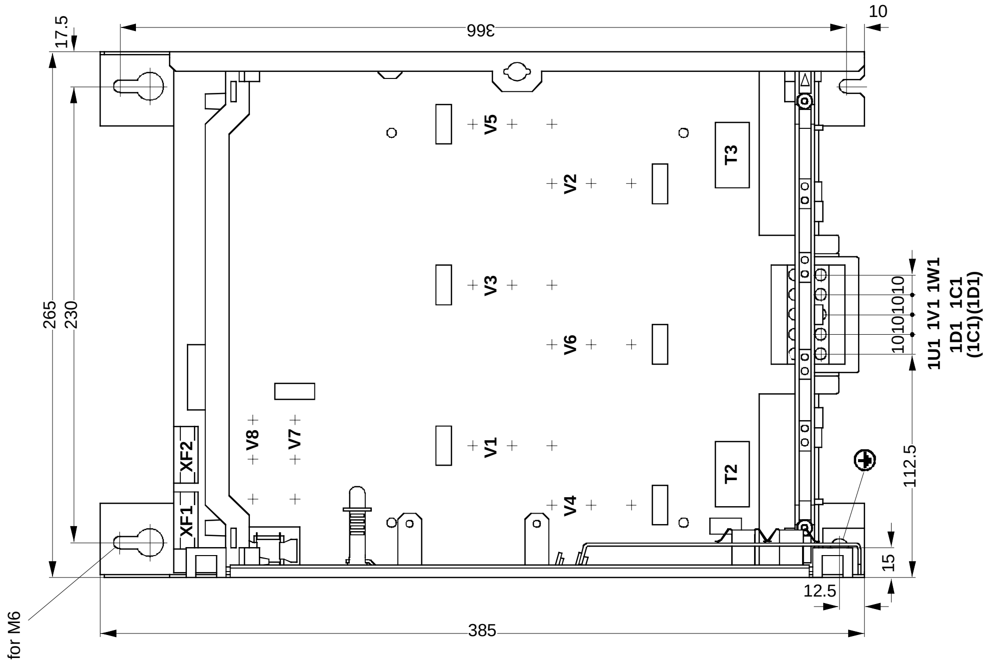


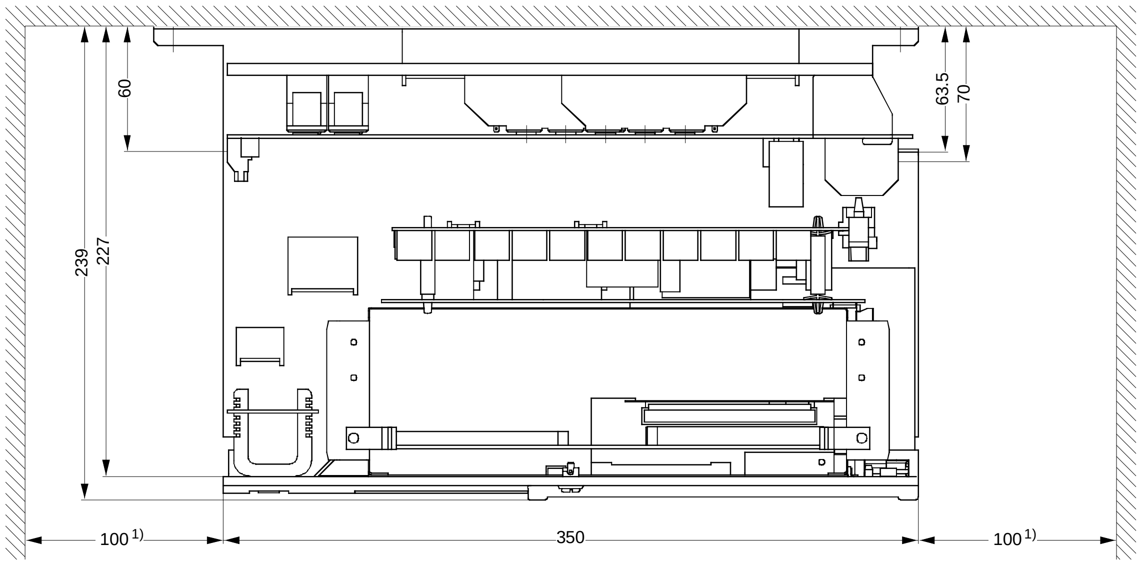
1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

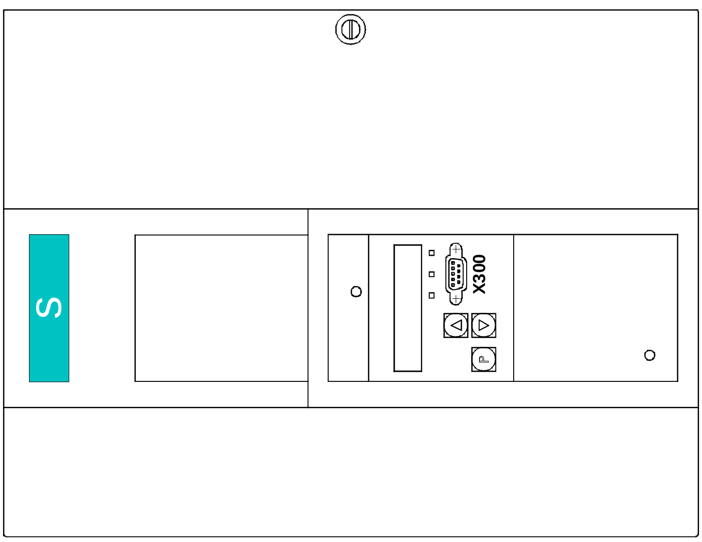
2) Remove transport cover by undoing 6 M6 hexagon head screws before start-up



5.1.8 Converters: 3AC 400V and 460V, 15A to 30A, 4Q



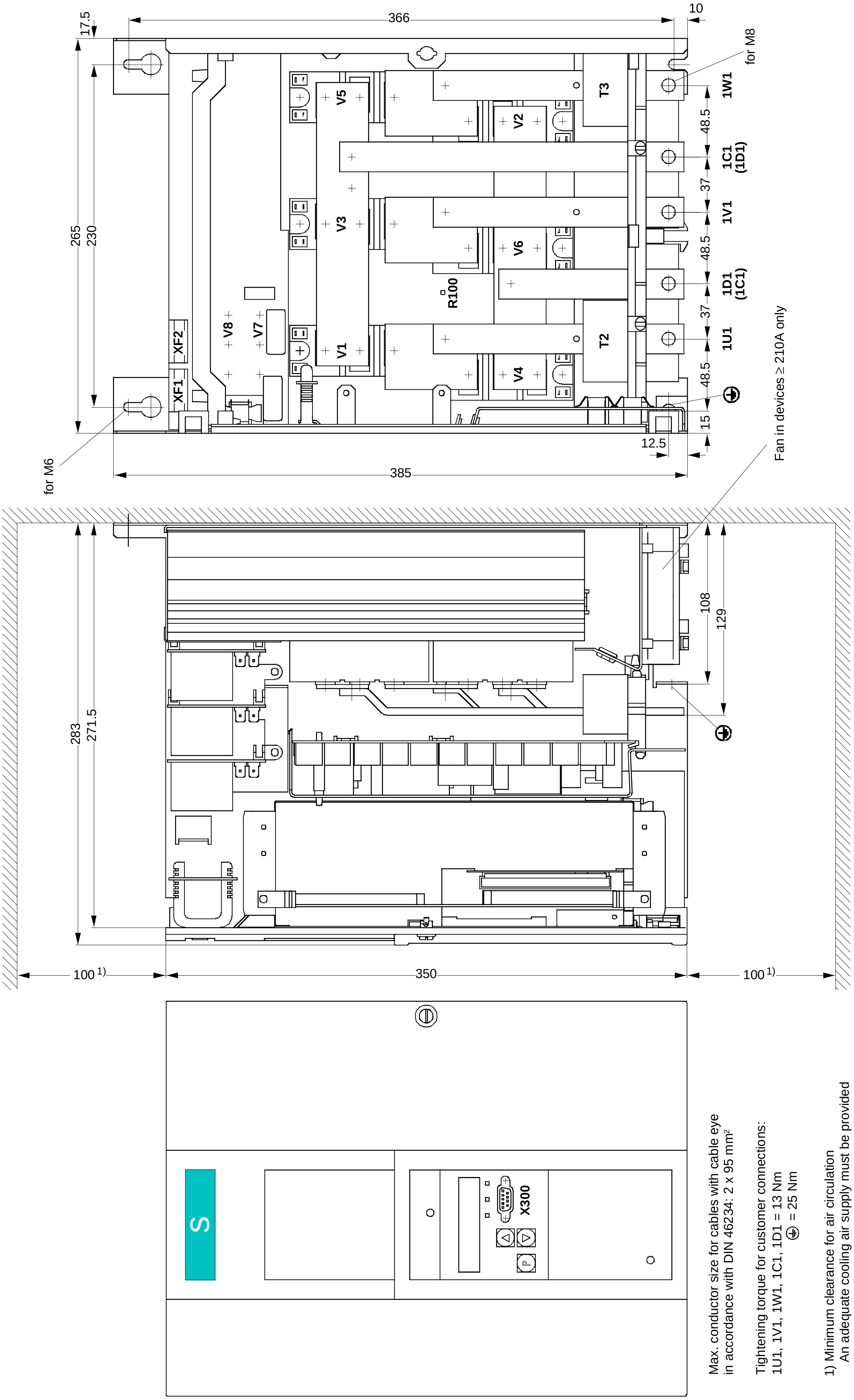




Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 1,5 Nm
⏚ = 25 Nm

1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

5.1.9 Converters: 3AC 400V and 575V, 60A to 280A, 4Q

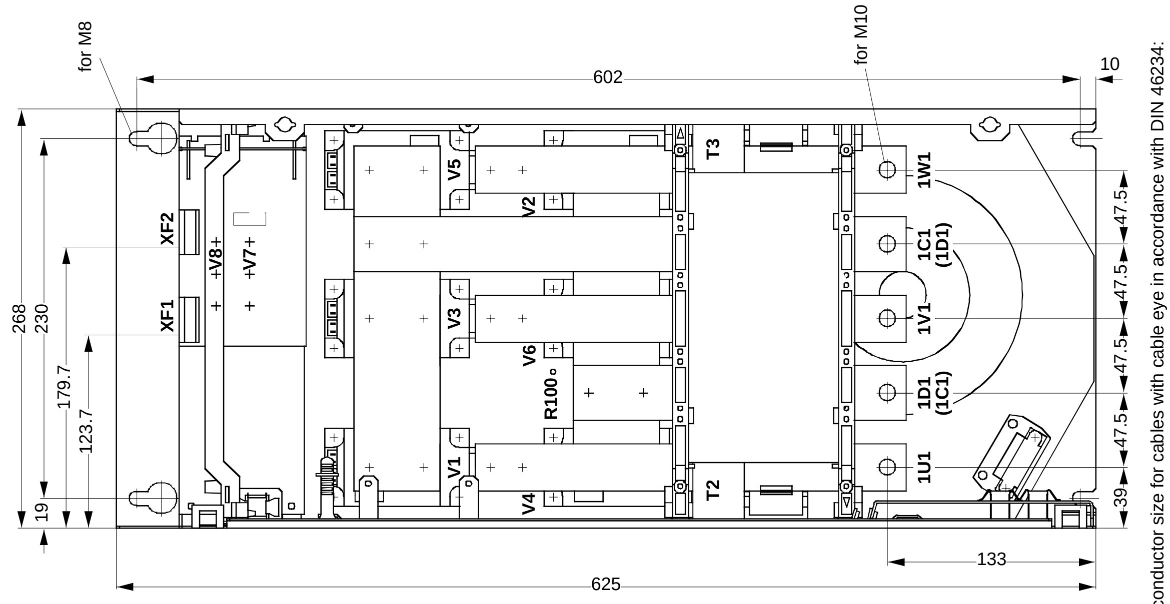


Max. conductor size for cables with cable eye
in accordance with DIN 46234: 2 x 95 mm²

Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 13 Nm
⏚ = 25 Nm

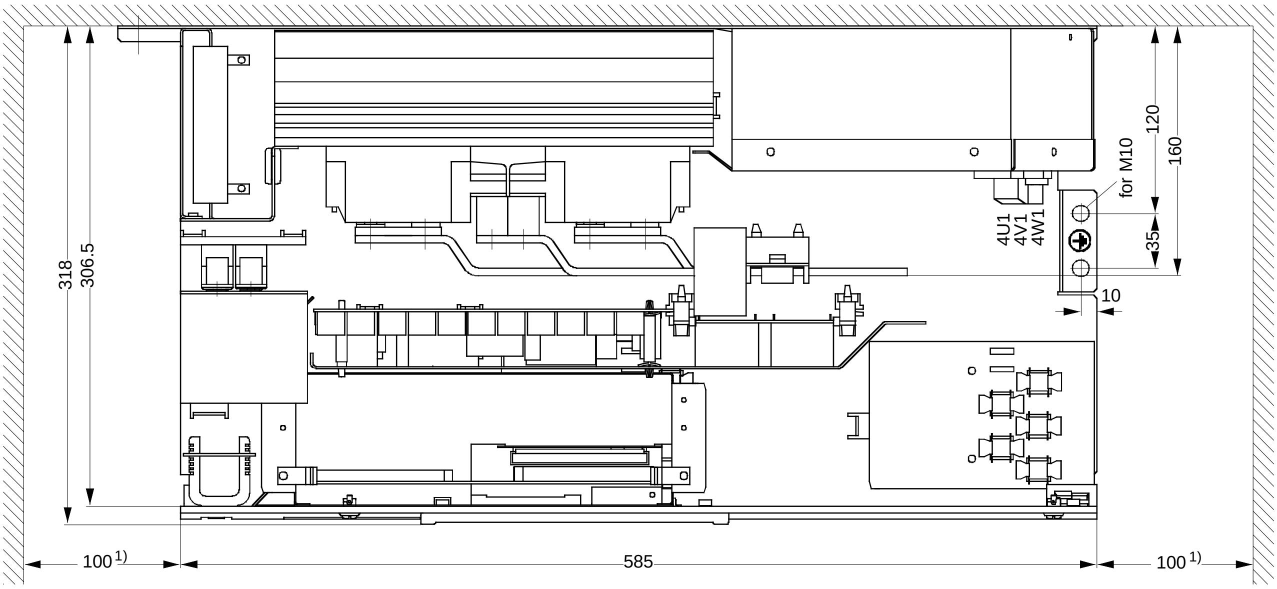
1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

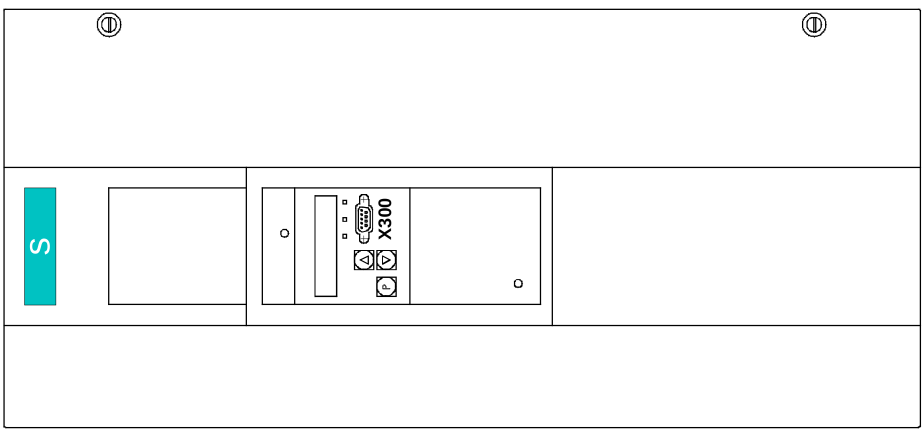
5.1.10 Converters: 3AC 400V and 575V, 400A to 600A, 4Q



Max. conductor size for cables with cable eye in accordance with DIN 46234:
1U1, 1V1, 1W1 = 2 x 150 mm²
1C1, 1D1 = 2 x 185 mm²

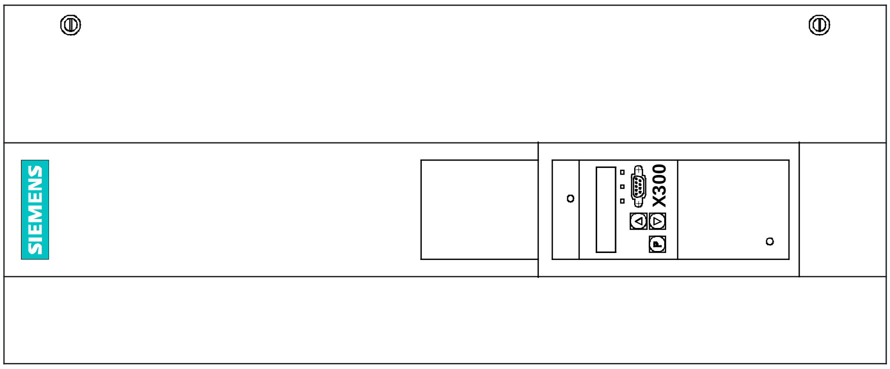
Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 25 Nm
⏚ = 50 Nm





1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

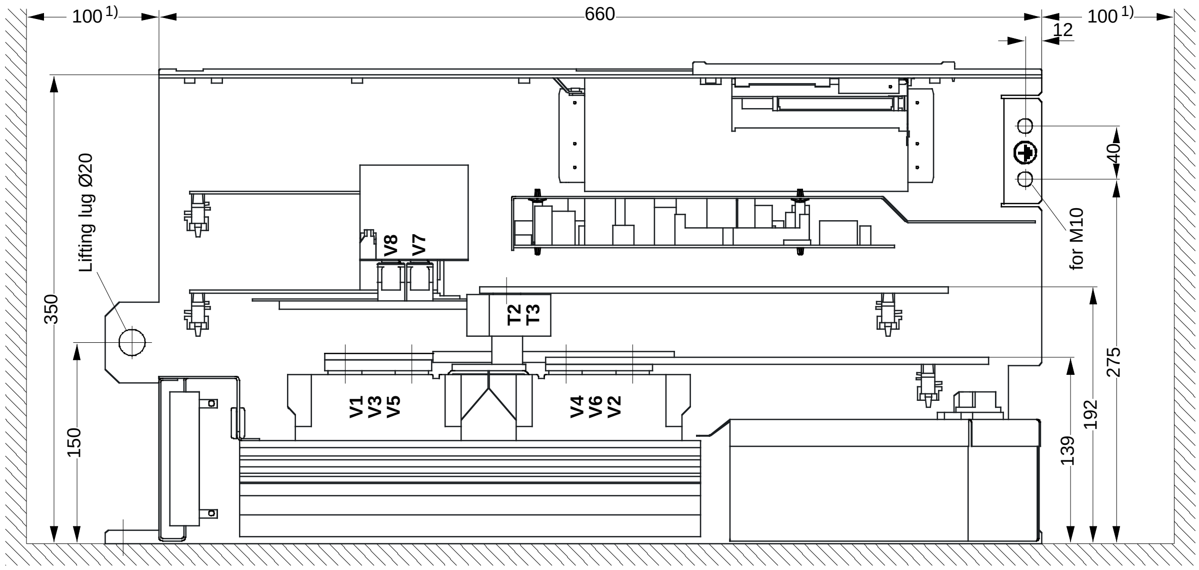
5.1.11 Converters: 3AC 400V, 575V, and 690V, 760A to 850A, 4Q

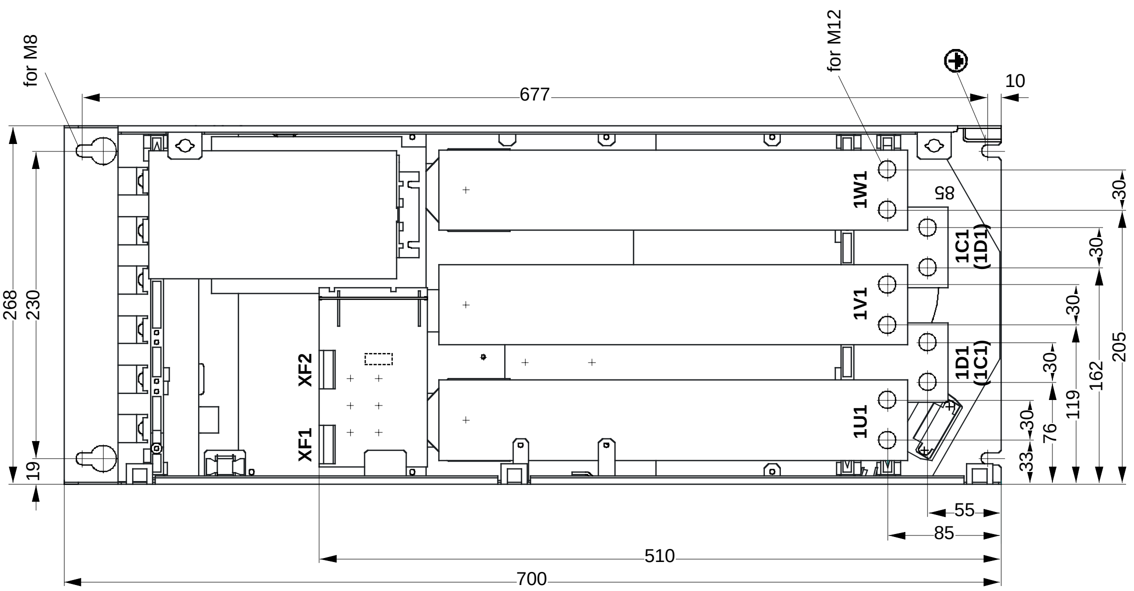


Max. conductor size for cables with cable eye in accordance with DIN 46234: 4 x 150 mm²

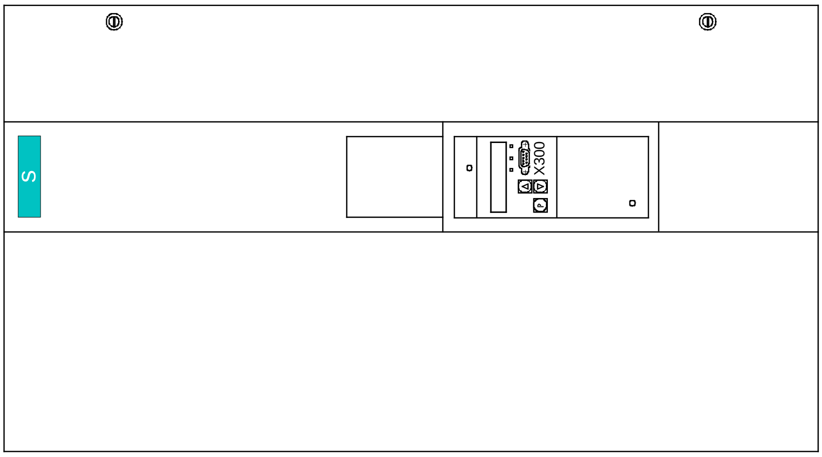
Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 44 Nm
⏚ = 50 Nm

1) Minimum clearance for air circulation
An adequate cooling air supply must be provided





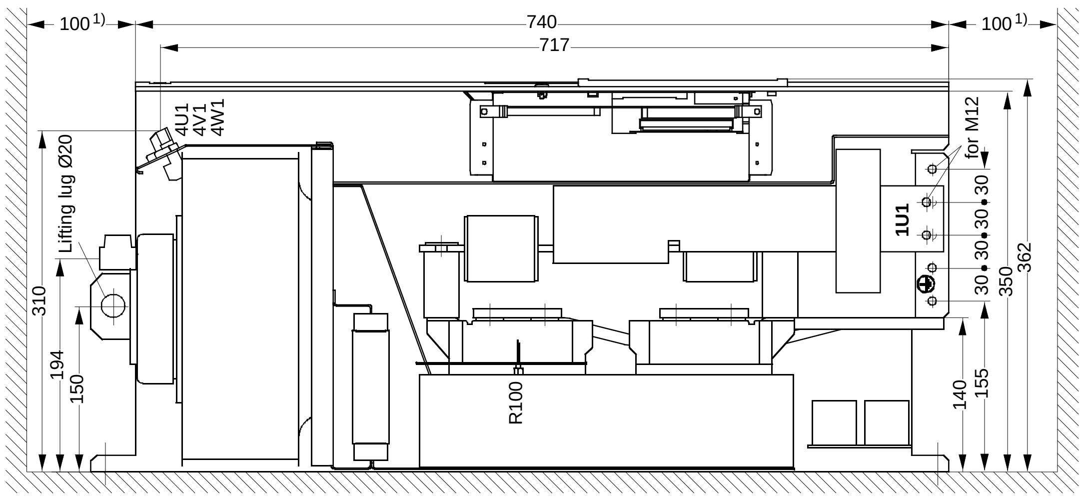
5.1.12 Converters: 3AC 400V, 460V, 575V, 690V, and 830V, 950A to 1200A, 4Q

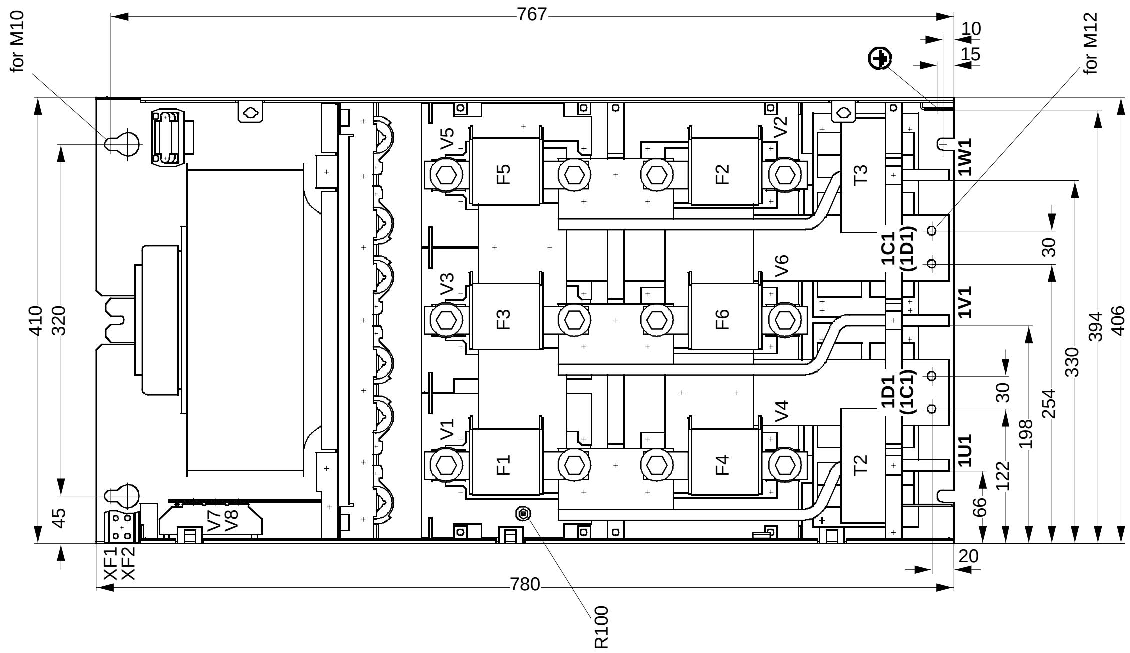


max. conductor size for cables with cable eye
in accordance with DIN 46234: 4 x 150 mm²

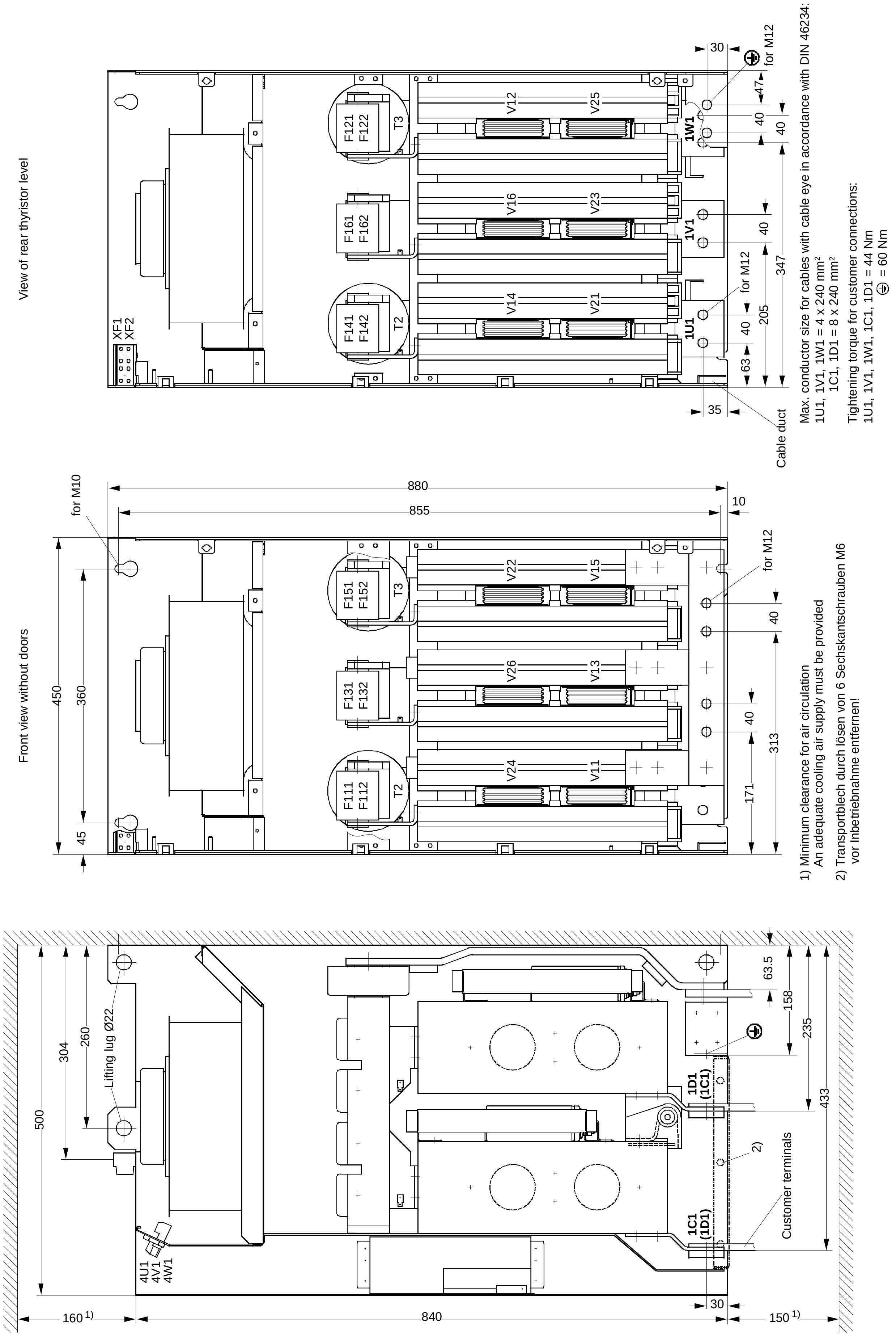
Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 44 Nm
⏚ = 60 Nm

1) Minimum clearance for air circulation
An adequate cooling air supply must be provided



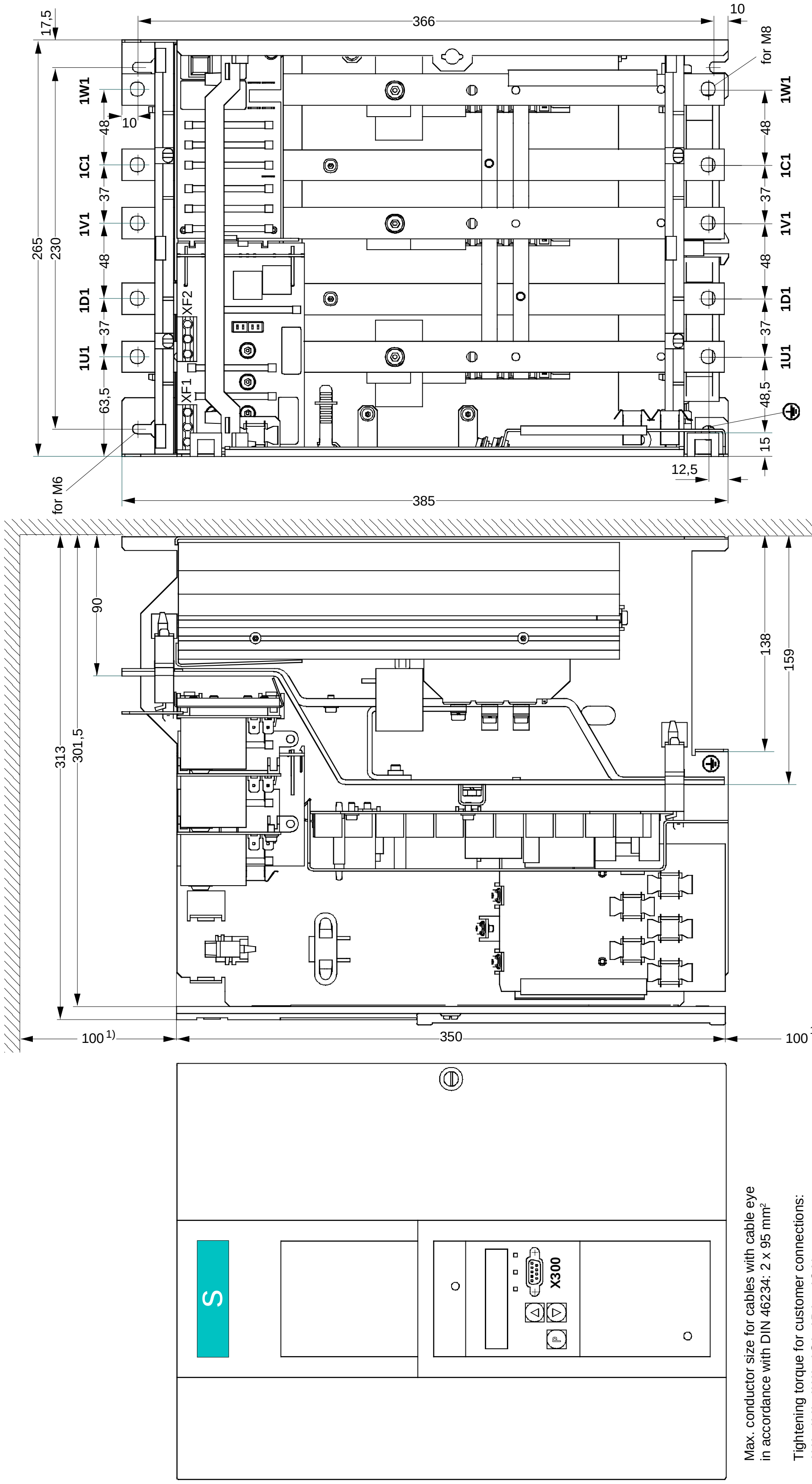


5.1.13 Converters: 3AC 400V, 575V, 690V, and 830V, 1500A to 2200A, 4Q



5.2 Dimension diagrams of the devices with additional cable connections on the top of the device

5.2.1 Converters: 3AC 460V, 60A to 125A, 1Q

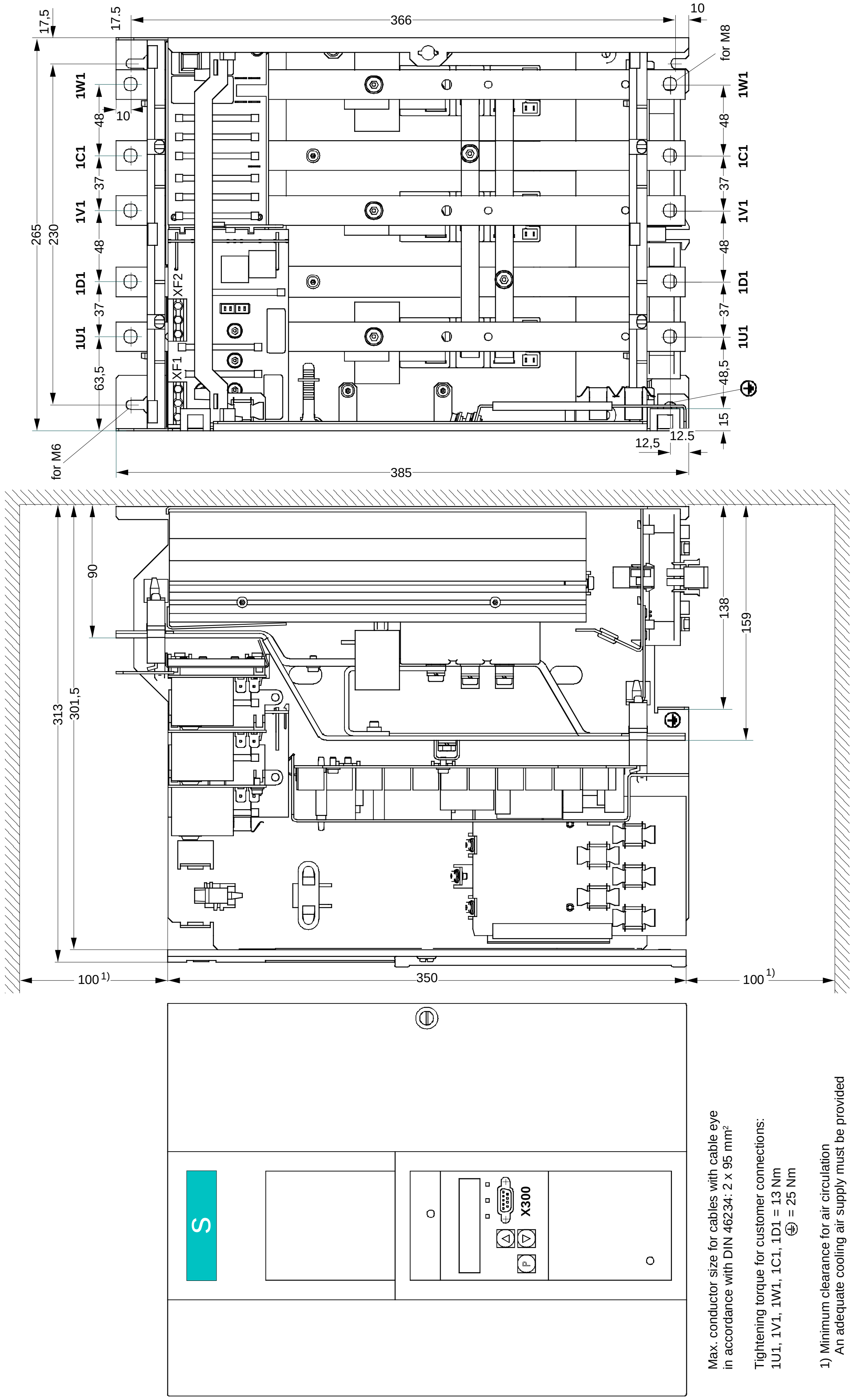


Max. conductor size for cables with cable eye in accordance with DIN 46234: 2 x 95 mm²

Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 13 Nm
⏚ = 25 Nm

1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

5.2.2 Converters: 3AC 460V, 210A to 280A, 1Q

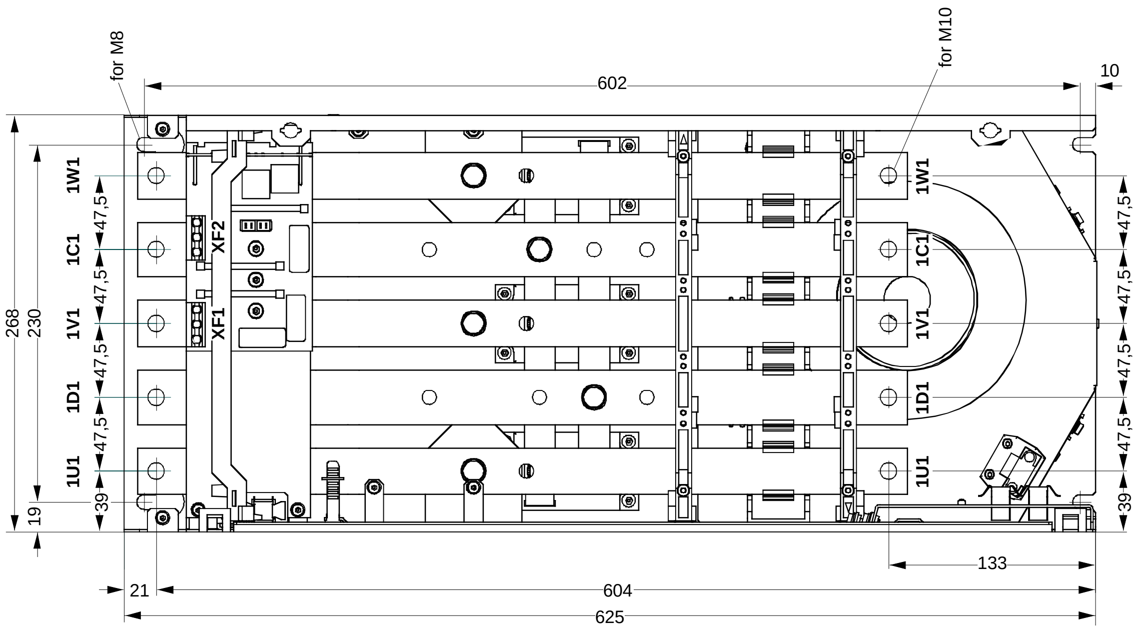


Max. conductor size for cables with cable eye
in accordance with DIN 46234: 2 x 95 mm²

Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 13 Nm
⏚ = 25 Nm

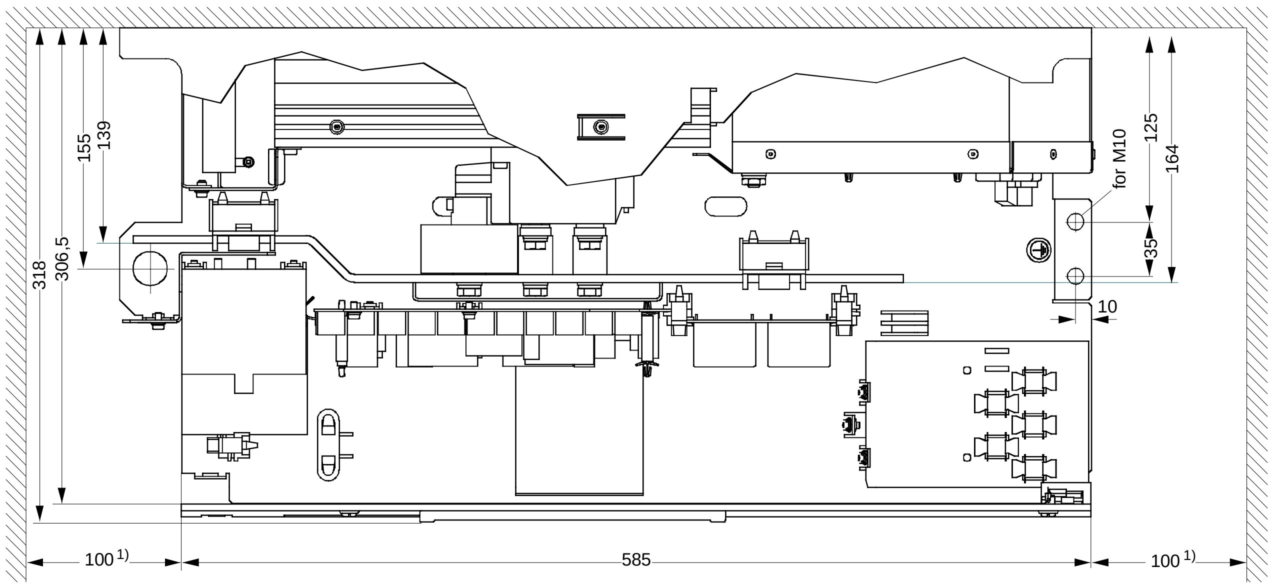
1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

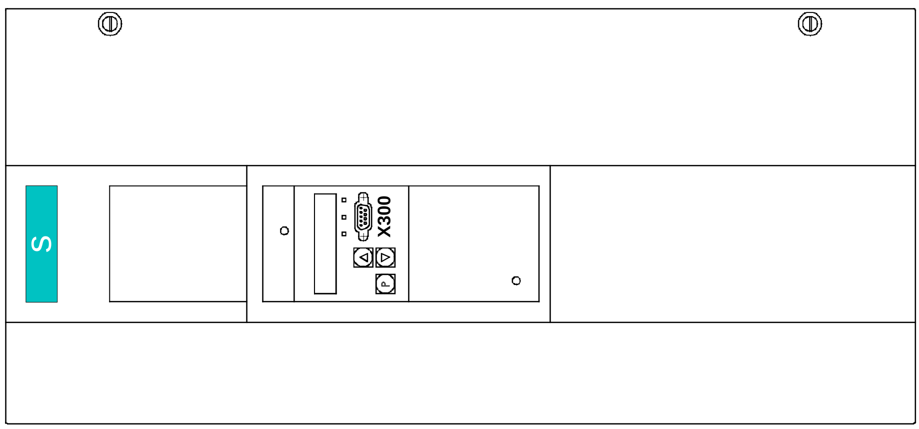
5.2.3 Converters: 3AC 460V, 450A to 600A, 1Q



Max. conductor size for cables with cable eye in accordance with DIN 46234:
1U1, 1V1, 1W1 = 2 x 150 mm²
1C1, 1D1 = 2 x 185 mm²

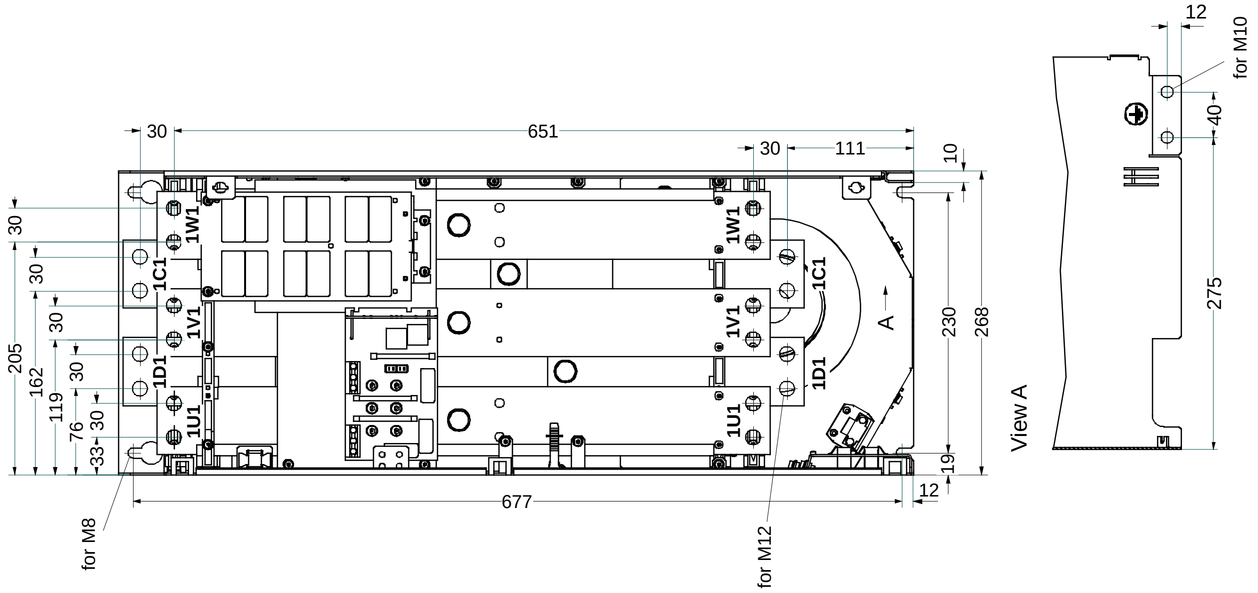
Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 25 Nm
⏚ = 50 Nm

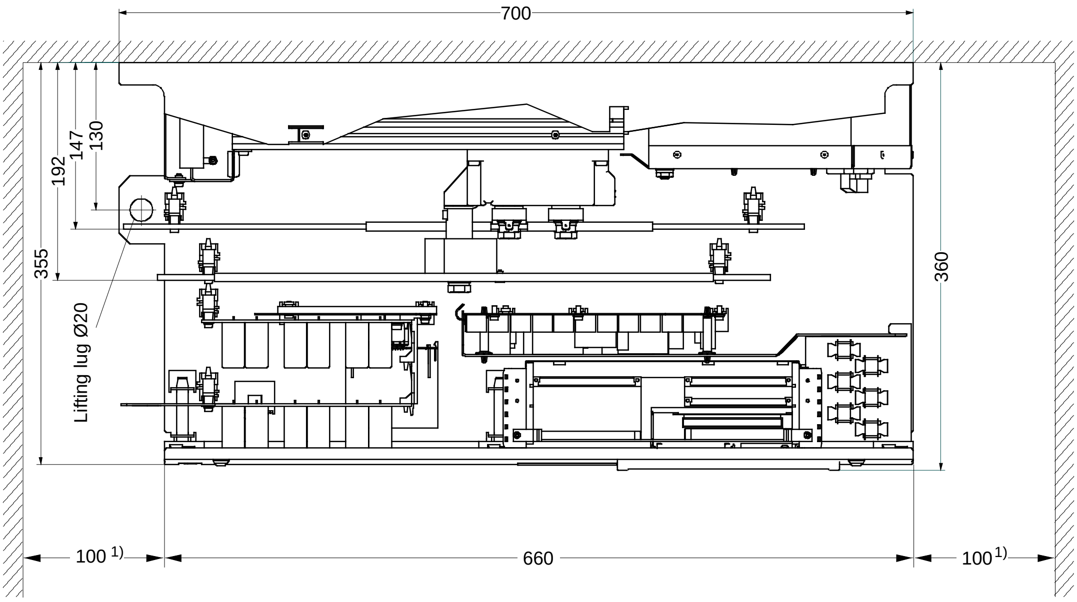


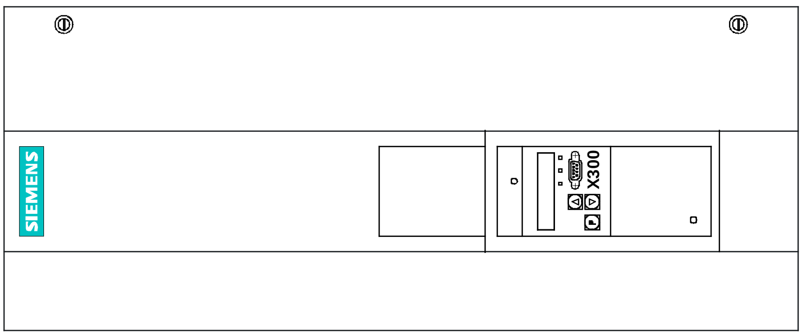


1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

5.2.4 Converters: 3AC 460V, 850A, 1Q





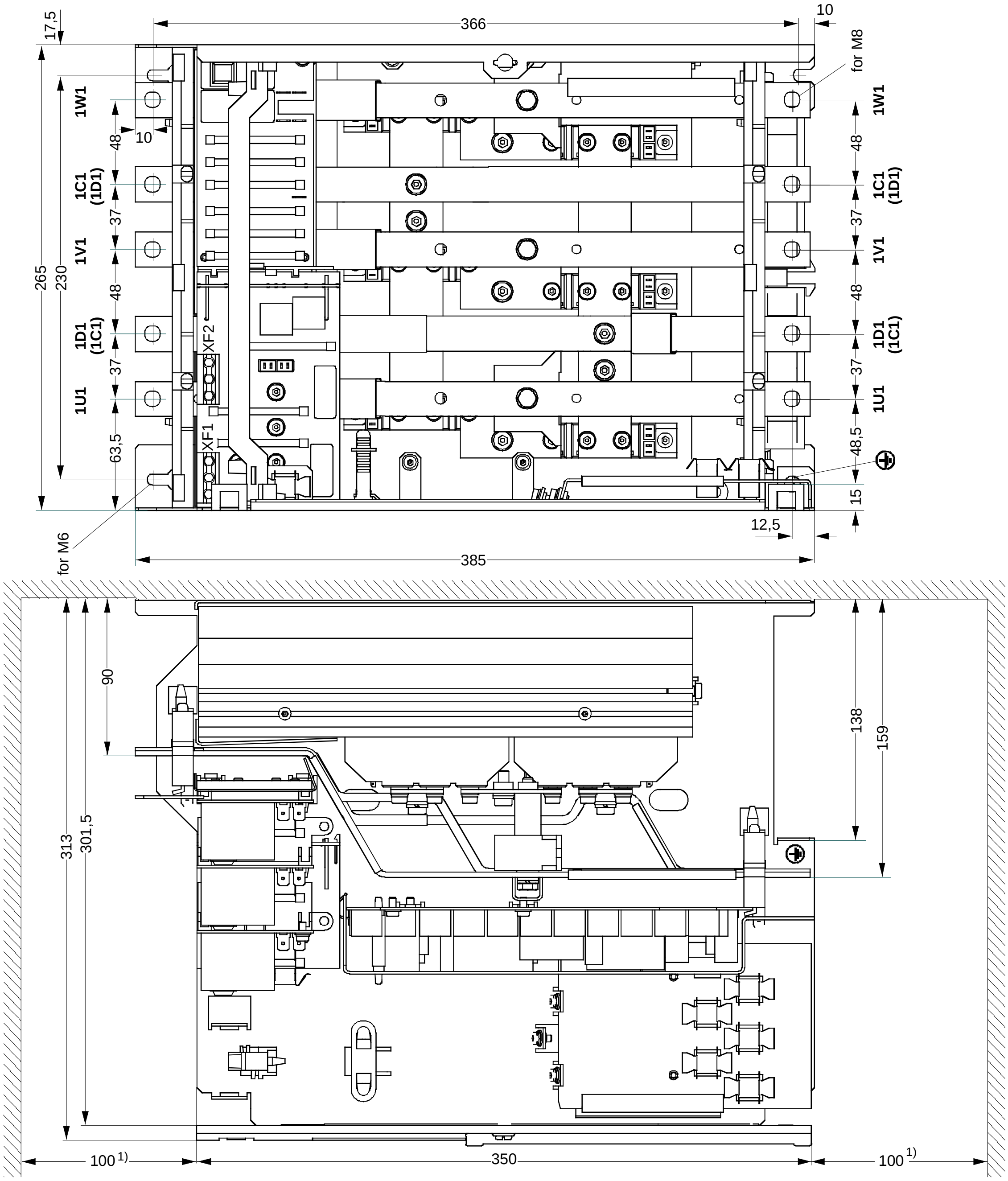


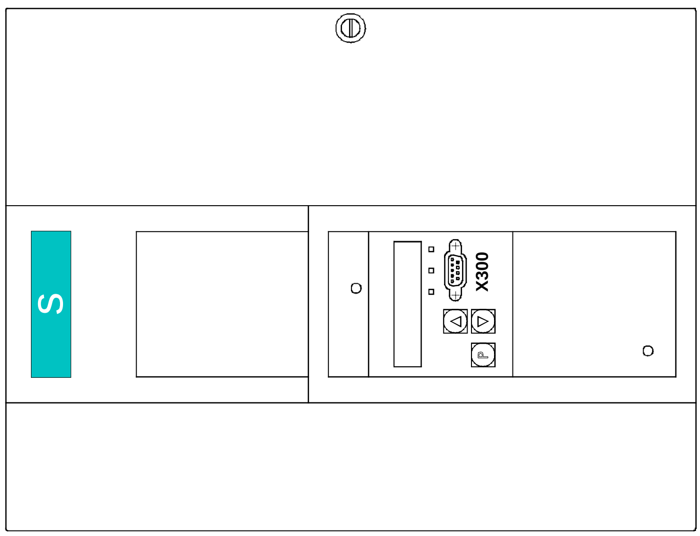
Max. conductor size for cables with cable eye
in accordance with DIN 46234: 4 x 150 mm²

Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 44 Nm
⏚ = 50 Nm

1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

5.2.5 Converters: 3AC 460V, 60A to 125A, 4Q



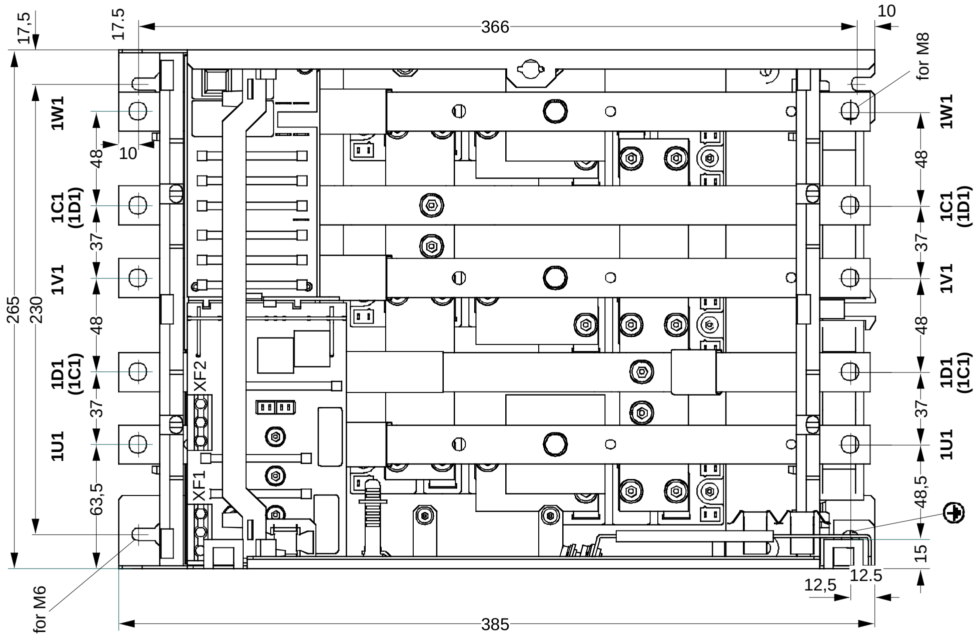


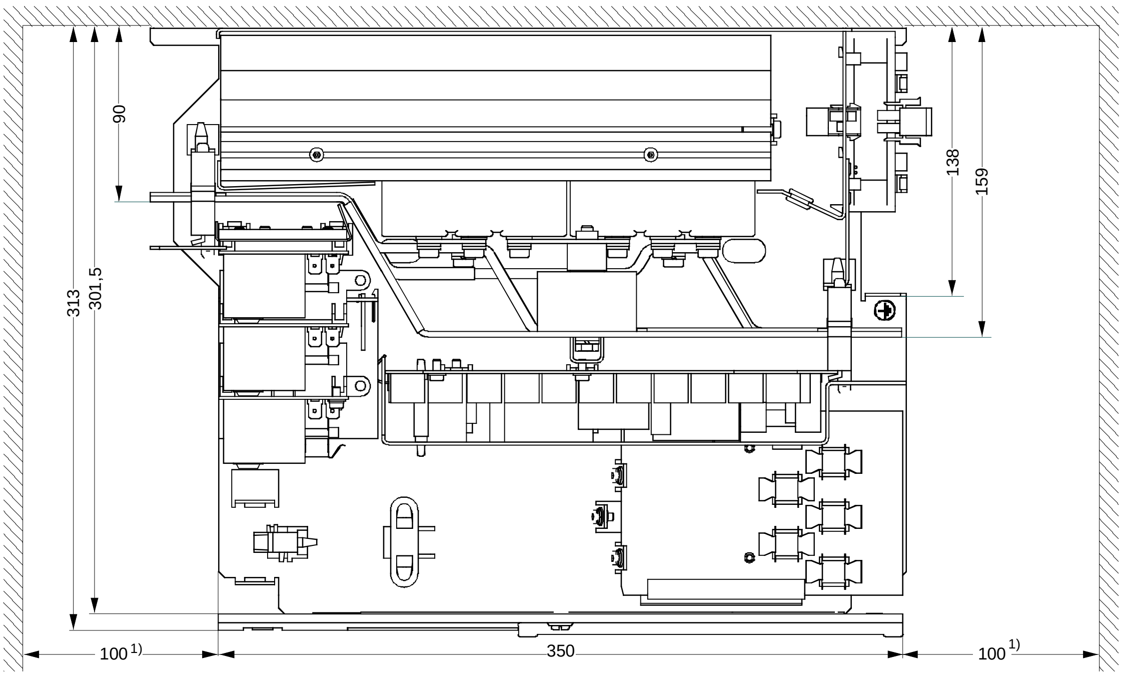
Max. conductor size for cables with cable eye in accordance with DIN 46234: 2 x 95 mm²

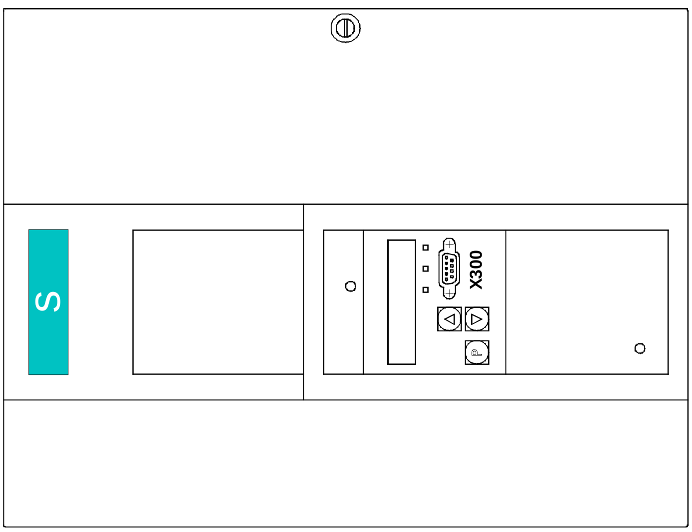
Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 13 Nm
⏚ = 25 Nm

1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

5.2.6 Converters: 3AC 460V, 210A to 280A, 4Q





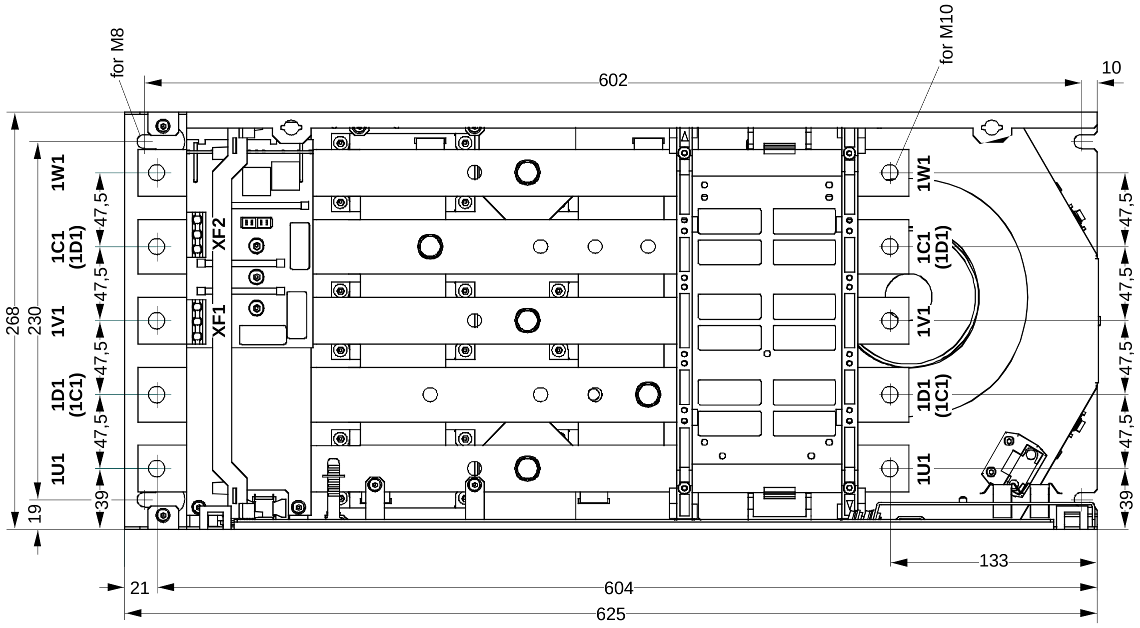


Max. conductor size for cables with cable eye in accordance with DIN 46234: 2 x 95 mm²

Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 13 Nm
⏚ = 25 Nm

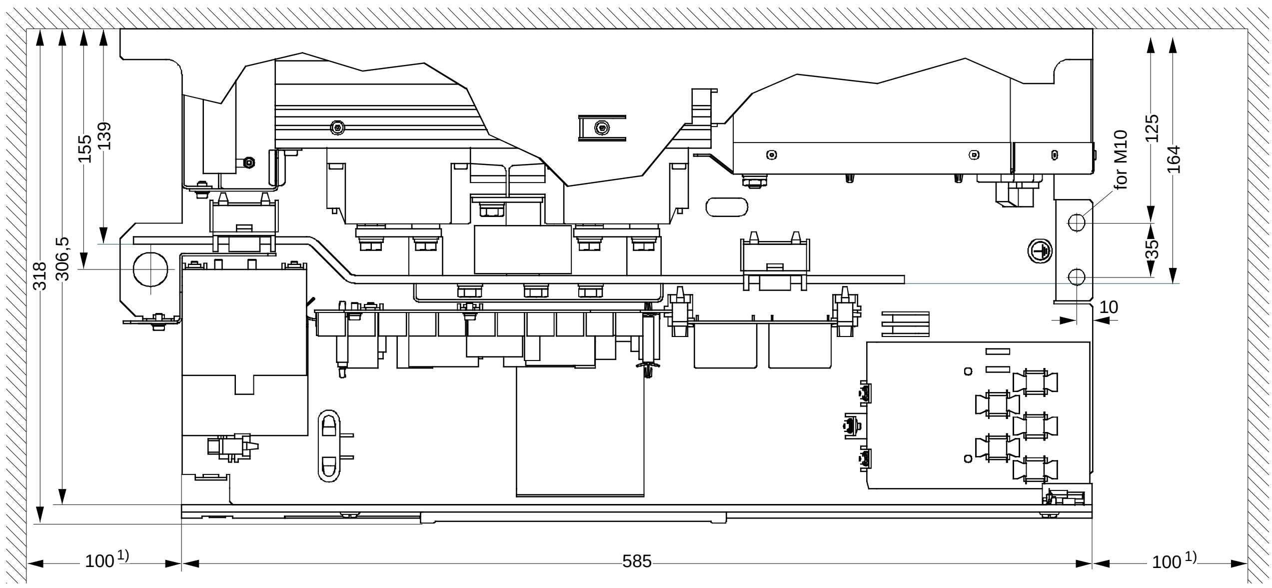
1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

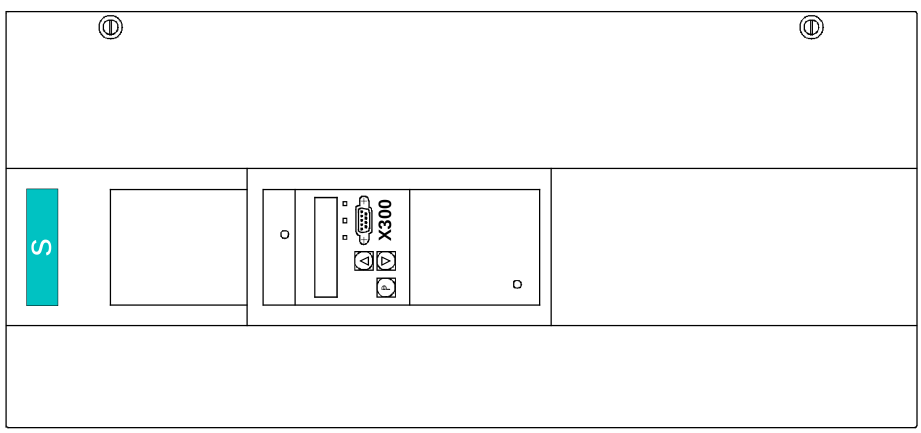
5.2.7 Converters: 3AC 460V, 450A to 600A, 4Q



Max. conductor size for cables with cable eye in accordance with DIN 46234:
1U1, 1V1, 1W1 = 2 x 150 mm²
1C1, 1D1 = 2 x 185 mm²

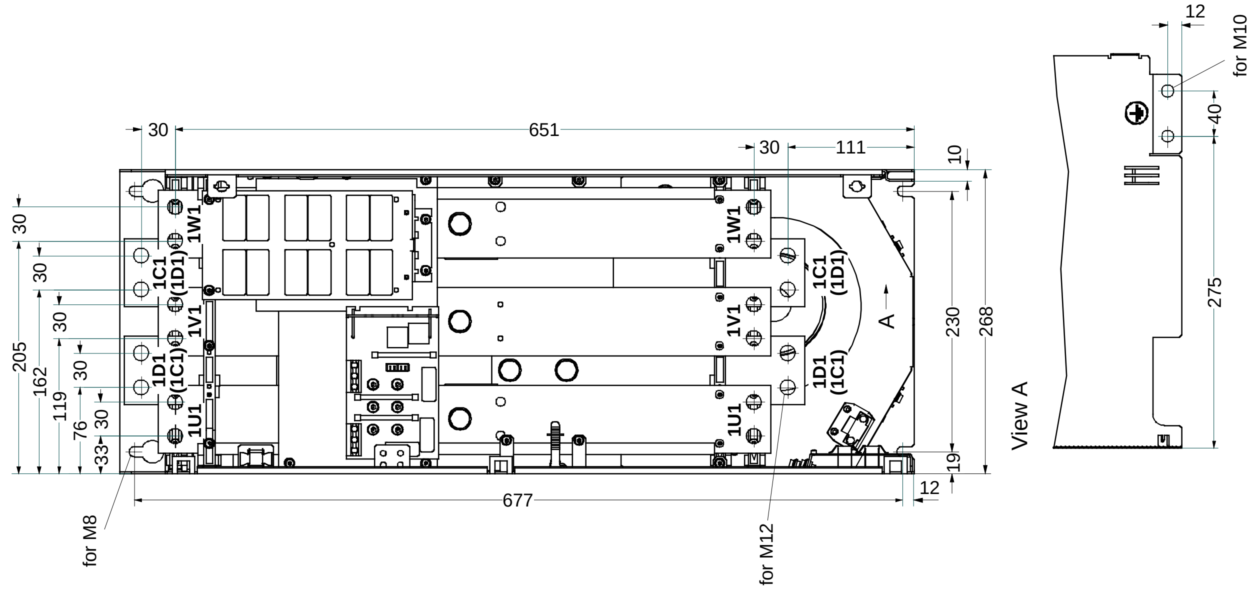
Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 25 Nm
⏚ = 50 Nm

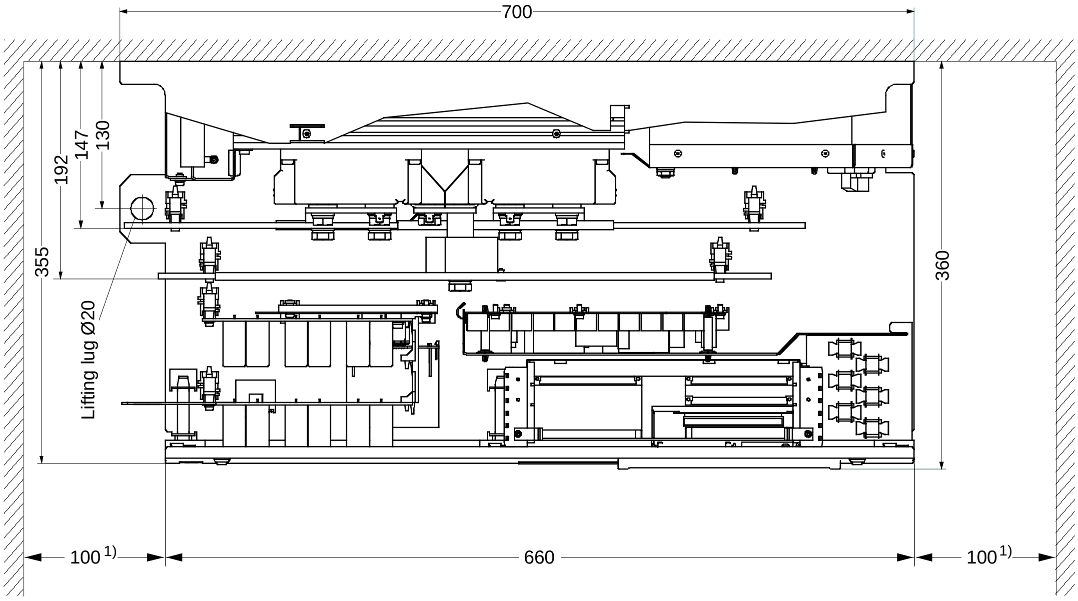


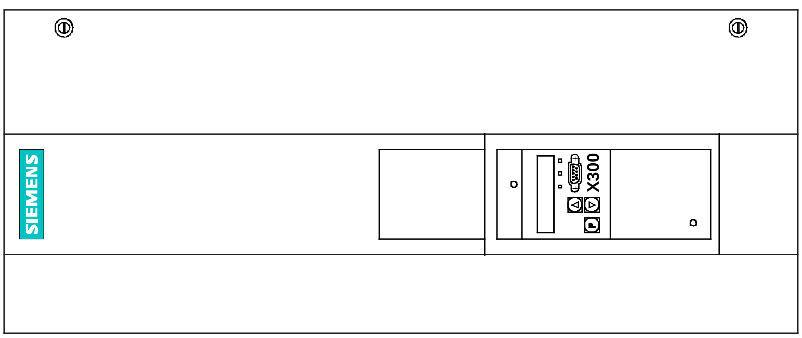


1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

5.2.8 Converters: 3AC 460V, 850A, 4Q







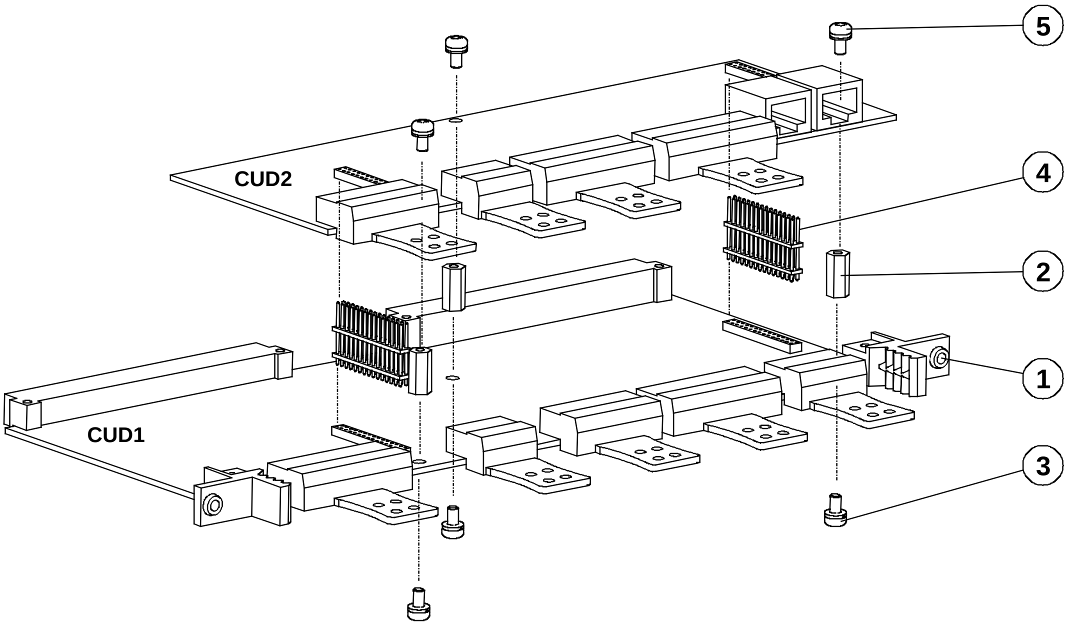
Max. conductor size for cables with cable eye in accordance with DIN 46234: 4 x 150 mm²

Tightening torque for customer connections:
1U1, 1V1, 1W1, 1C1, 1D1 = 44 Nm
⏚ = 50 Nm

1) Minimum clearance for air circulation
An adequate cooling air supply must be provided

5.3 Mounting options

5.3.1 Terminal expansion board CUD2



- Remove electronics board CUD1 from the electronics box by undoing the two fixing screws .
- Attach the 3 hexagon-head bolts supplied at position 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

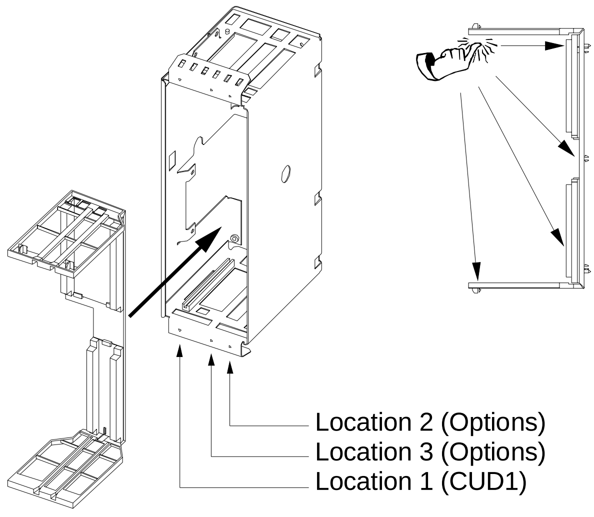
The boards contain ElectroStatic Discharge Sensitive Devices (ESDS). Before touching a board, make sure that your own body has been electrostatically discharged. The easiest way to do this is to touch a conductive, earthed object (e.g. bare metal part of cubicle) immediately beforehand.

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.

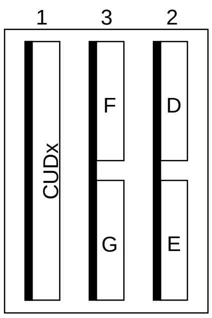
How to install an LBA local bus adapter in the electronics box:

- ♦ 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.



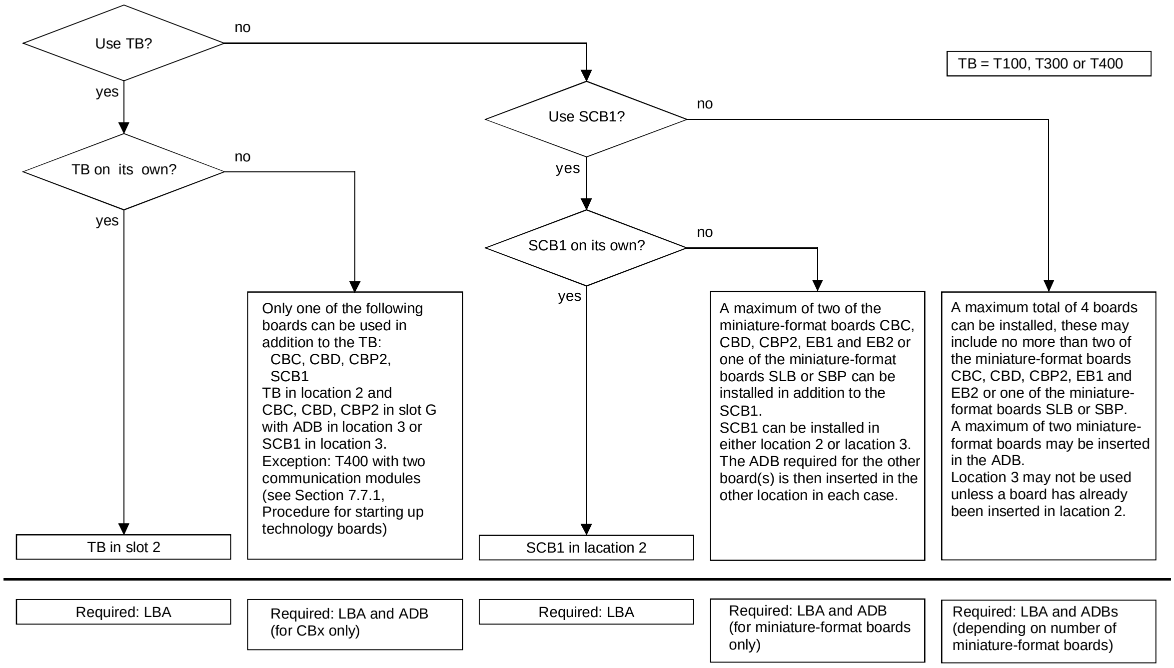
Arrangement of board locations 1 to 3 and slots D to G in electronics box

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.
- No more than 2 supplementary boards of the same type may be installed in one converter (e.g. 2 EB1s).

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 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 should be allowed to work on these devices.

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

Failure to make the correct connections may result in irreparable damage to the unit.

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

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.

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 property damage may occur if the instructions in the relevant operating manuals are not observed.

The 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 A&D Variable-Speed Drives Group of Siemens AG. The warrant conditions, specified in the contract between the two parties, is the only warranty which will be accepted by the A&D Variable-Speed Drives Group. 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 a piece of equipment to operate satisfactory in an electromagnetic environment without itself causing electromagnetic disturbances that would adversely affect other items of equipment in its vicinity.

Thus, different items of equipment must 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. Accordingly, it may be more economical to increase the interference immunity of a sensitive device rather than implementing noise suppression measures for the converter. Thus, solutions are selected depending on their cost-effectiveness.

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

6.1.1.4 SIMOREG converters 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 DC Master converters are components of an electrical drive system in the same way as contactors and switches. Properly qualified personnel must integrate them into a drive system consisting, at least, of the converter, 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 DC Master converters exceeds limit value "A1" as defined by EN55011.

If the drive forms part of a complete installation, it does not initially have to fulfil 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 in order to increase plant availability. In the event of a ground fault, no fault current flows so that the plant can still produce. When RI suppression filters are installed, however, a ground fault does cause a fault current to flow, resulting in shutdown of the drives and, in some cases, destruction of the suppression filter. For this reason, the Product Standard does not define limit values for these supply systems. From the economic viewpoint, RI suppression should, if required, be implemented on the grounded primary side of the supply transformer.

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, 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(μV) between 150 kHz and 500 kHz and max. 73 dB (μV) (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, PLCs, transmitters and sensors. Components in the control cabinet (noise sources and receivers) must be physically separated, if necessary through the use of metal partitions or metal enclosures for individual components. Figure 1 shows an example component layout in a control cabinet.

6.1.2 Proper EMC installation of drives (installation instructions)

6.1.2.1 General

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 this 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 fulfil 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 fulfil 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 over a large surface area with one another (not paint on 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.

Rule 3
Signal cables [1)] 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 conductors to the cabinet ground (ground [2)]) at both ends to obtain an additional shielding effect.

Rule 6
Avoid any unnecessary cable lengths in order to reduce coupling capacitances and inductances.

Rule 7
Crosstalk can generally be reduced if the cables are installed close to the cabinet chassis 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). A minimum 20 cm clearance 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 pipe or duct. The partition or metal duct 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 potential bonding between the shield connections, an additional potential bonding cable of at least 10 mm² 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 [2)]) 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 poorer by a factor of 5 as compared to braided shields.

Rule 10
The shields of analog signal cables may be connected to ground at both ends (conductively over a large area) if potential bonding is good. Potential 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 this case, the shield may be connected by means of a sheath wire.

Rule 11
The RI suppression filter must always be mounted close to the suspected noise source. The filter must be mounted over the largest possible area with the cabinet housing, mounting plate, etc. Incoming and outgoing cables must be routed separately.

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.
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:	Analog signal cable.:
Pulse encoder cables	e.g. $\pm$ 10 V setpoint cable
Serial interfaces, e.g. PROFIBUS-DP	

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 grounder, etc.

Cabinet design and shielding:

The cabinet design illustrated in **Figure 1** is intended to make the user aware of EMC-critical components. The example does not claim to include all possible cabinet components and their respective mounting possibilities.

Details which influence the noise immunity/radiation of the cabinet and are not absolutely clear in the overview diagram are described in **Figures 1a - 1d**.

Figures 2a -2d show details of different shield connection techniques with ordering source information.

Arrangement of RI suppression filters and commutating reactors:

Section 6.1.2.3 shows how RI suppression filters and commutating reactors are arranged in the SIMOREG DC Master system. The specified sequence for mounting reactors and filters must be observed. The line-side and load-side filter cables must be physically separated. Fuses for semiconductor protection are selected according to Section 6.6.2.

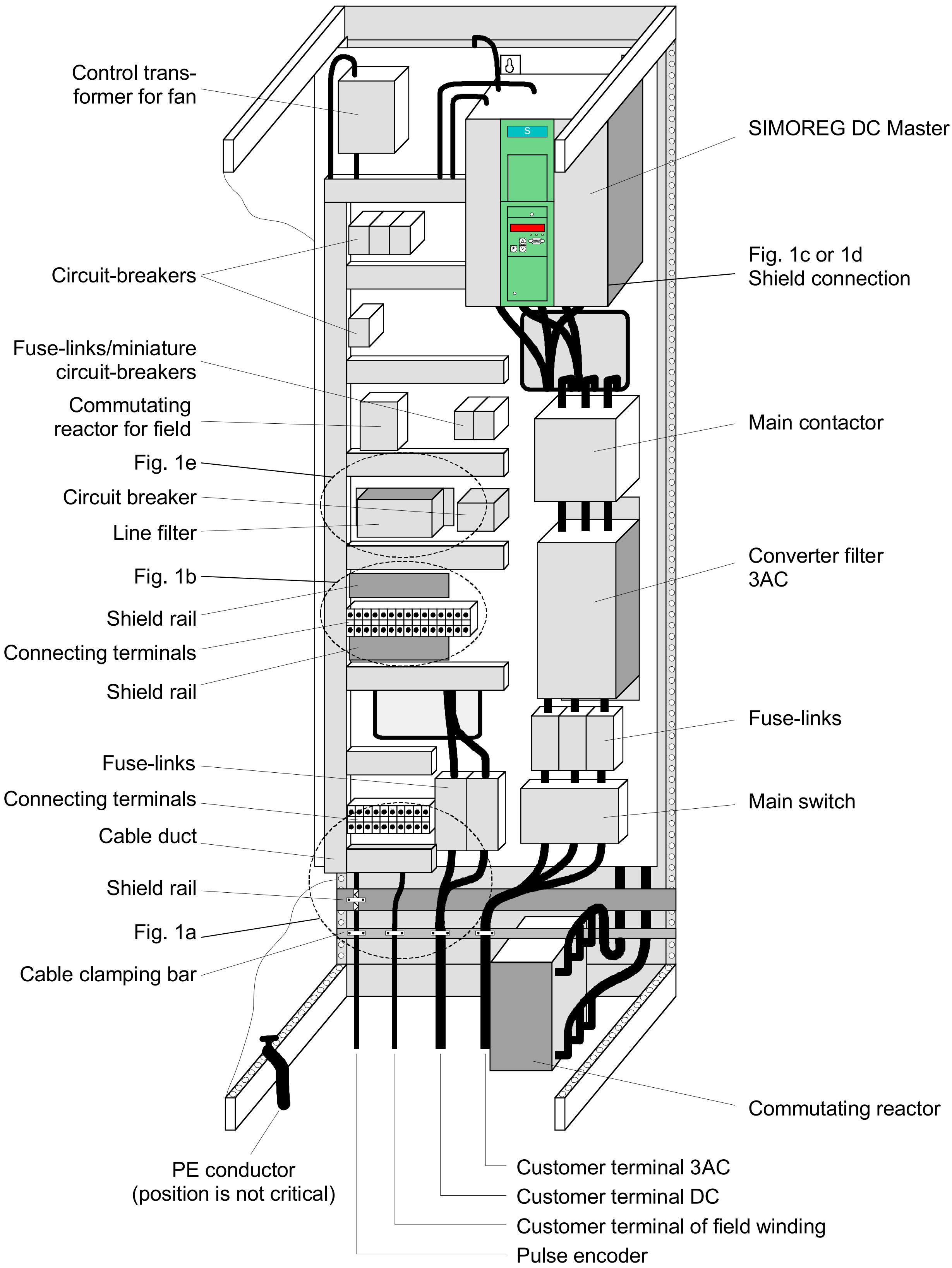


Fig. 1: Example of a cabinet design with a SIMOREG DC Master 15 A to 850 A

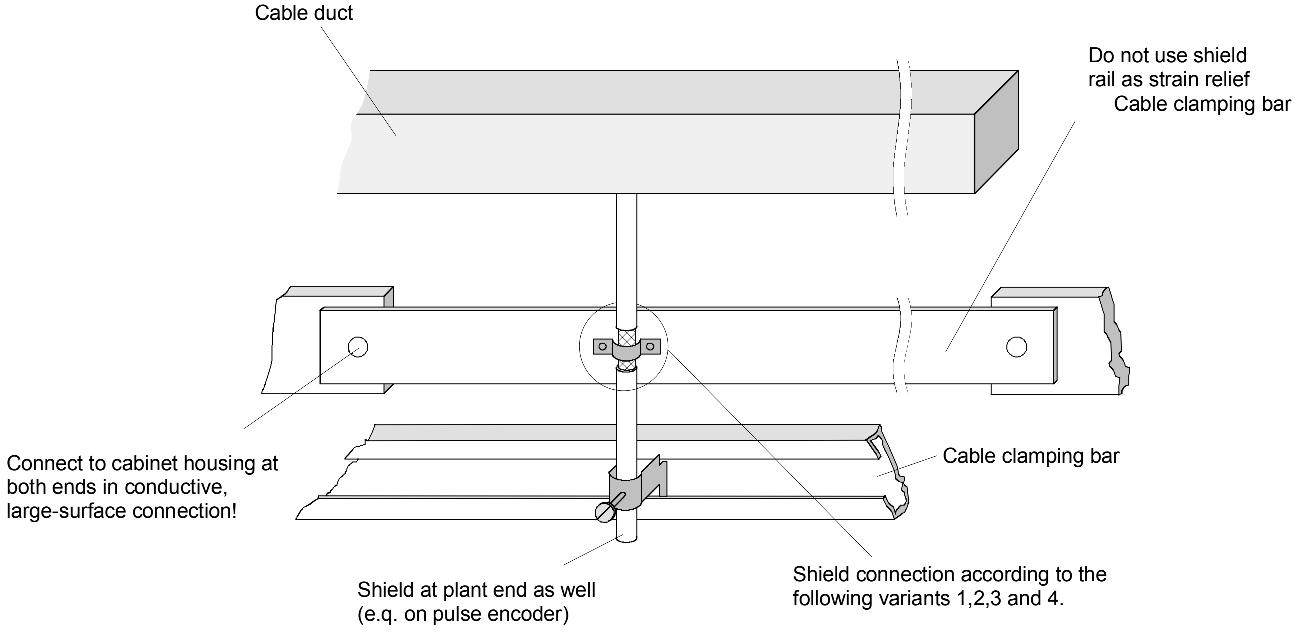


Fig. 1a: Shield at cable entry point to cabinet

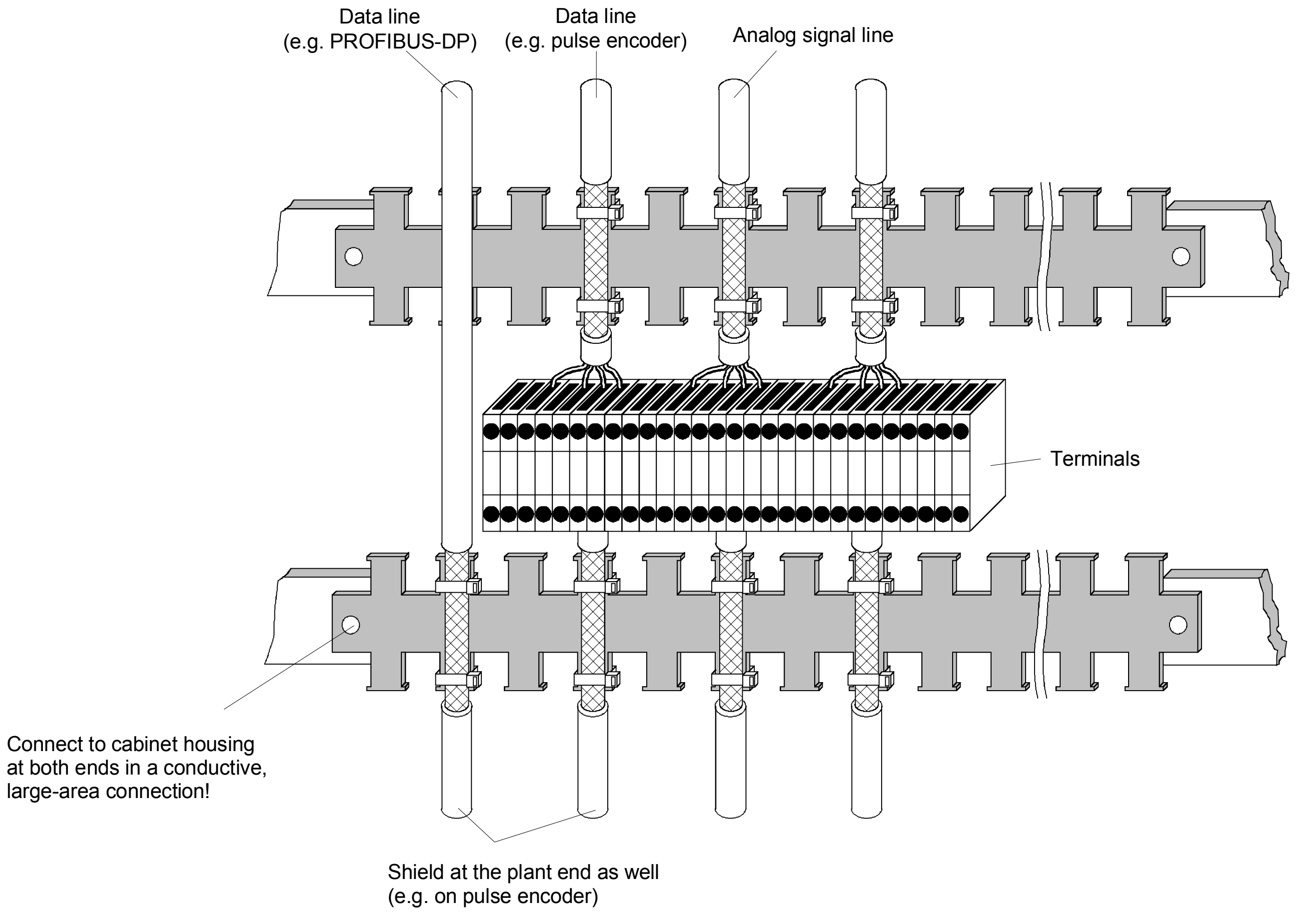
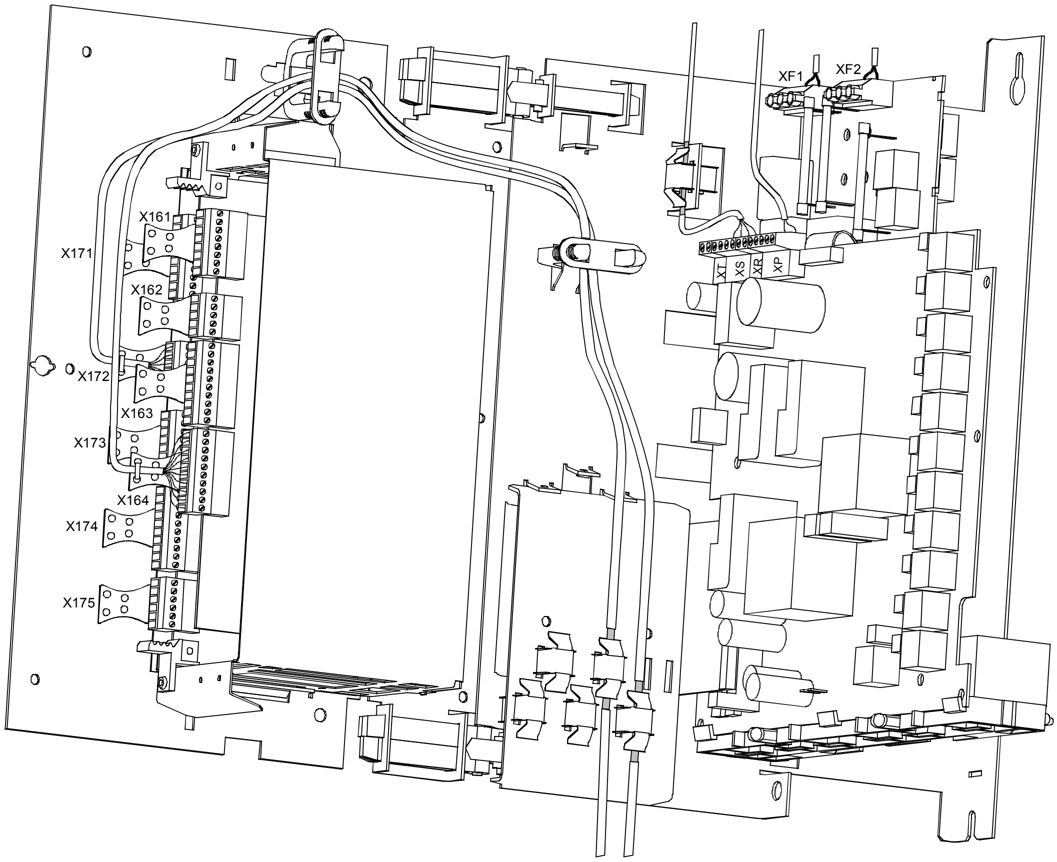


Fig. 1b: Shielding in the cabinet



The customer connections must be routed above the electronics box.

Fig. 1c: Connecting shields on SIMOREG DC Master converters up to 850A

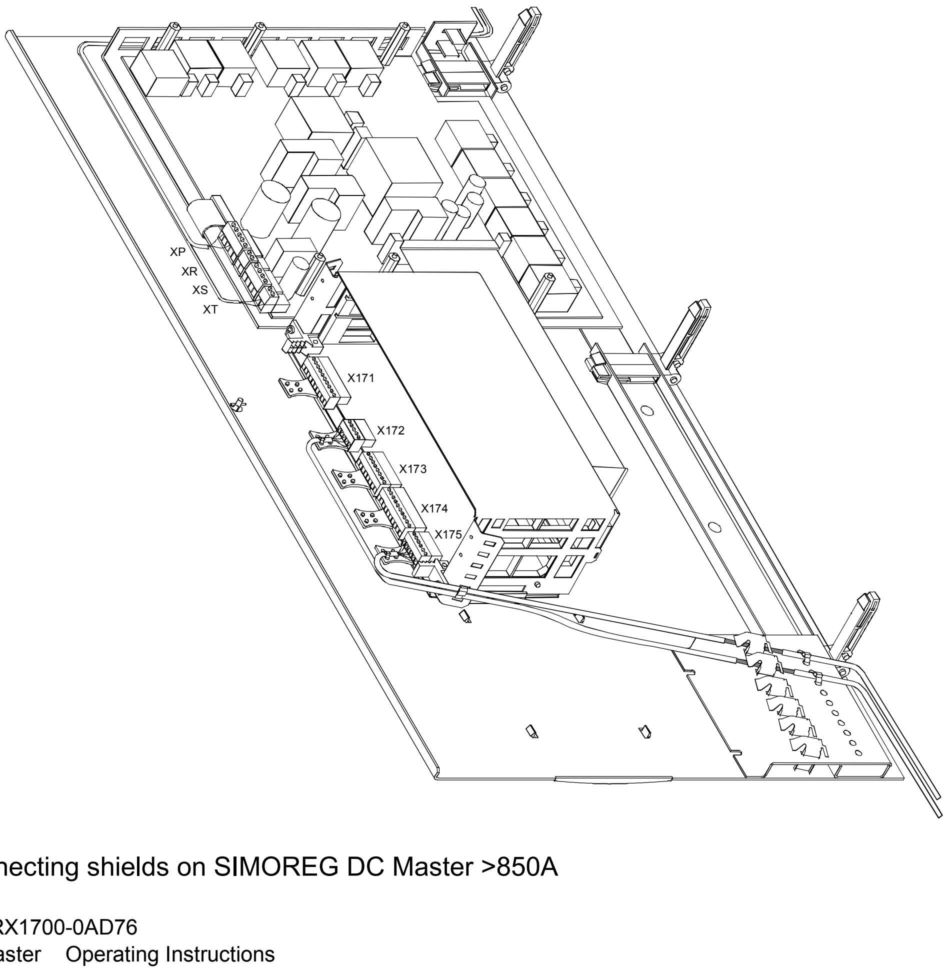


Fig. 1d: Connecting shields on SIMOREG DC Master >850A

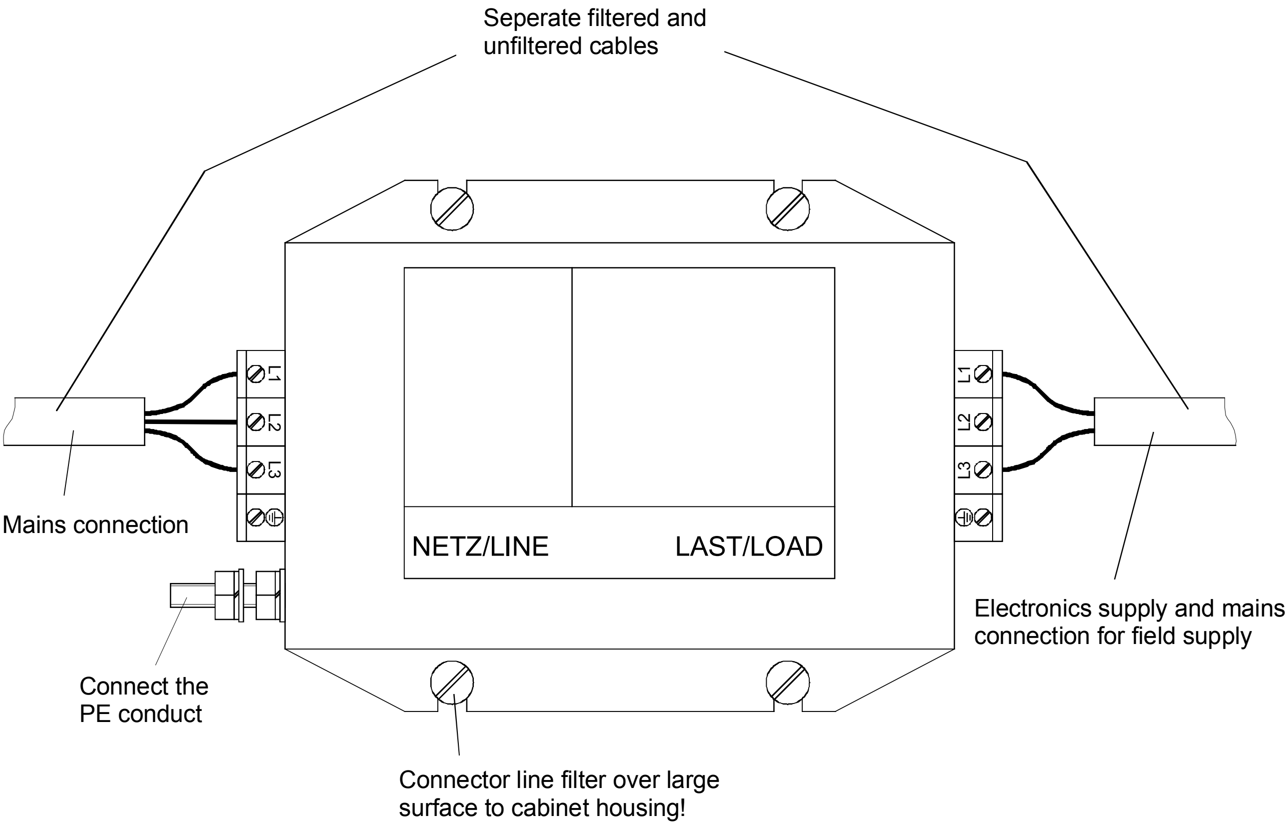


Fig. 1e: Line filter for SIMOREG DC Master 6RA70 electronics power supply

Shield connections:

Variant 1:

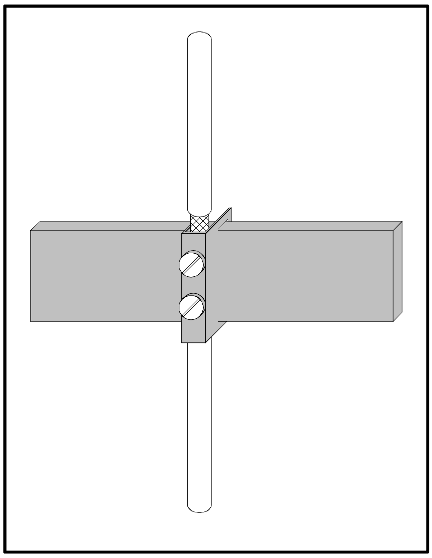


Fig. 2a: Terminal on a copper busbar, max. cable diameter 15 mm

Variant 2:

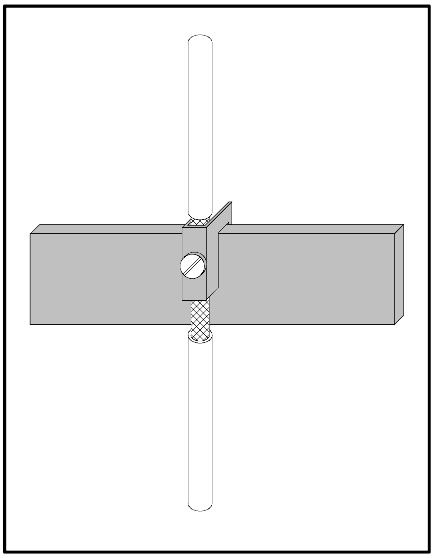


Fig. 2b: Terminal on copper busbar, max. cable diameter 10 mm

Caution!

The conductor might 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:

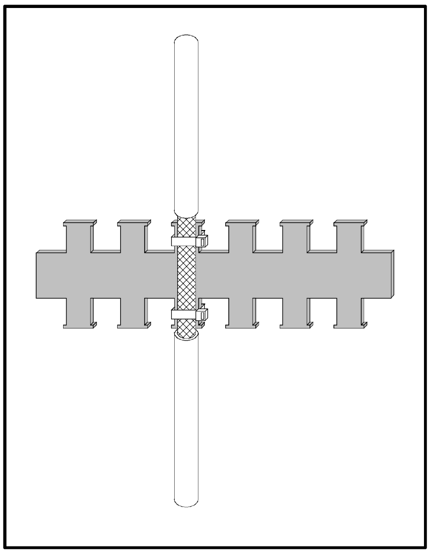


Fig. 2c: Metallized tubing or cable ties on a bare metal comb-type/serrated rail

Note:

Comb-type rail:
Item No. J48028

Variant 4:

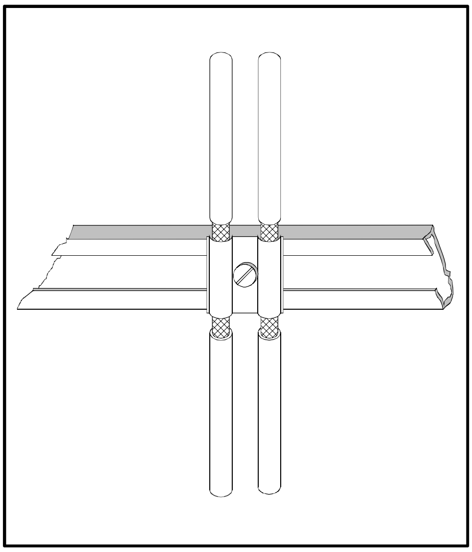


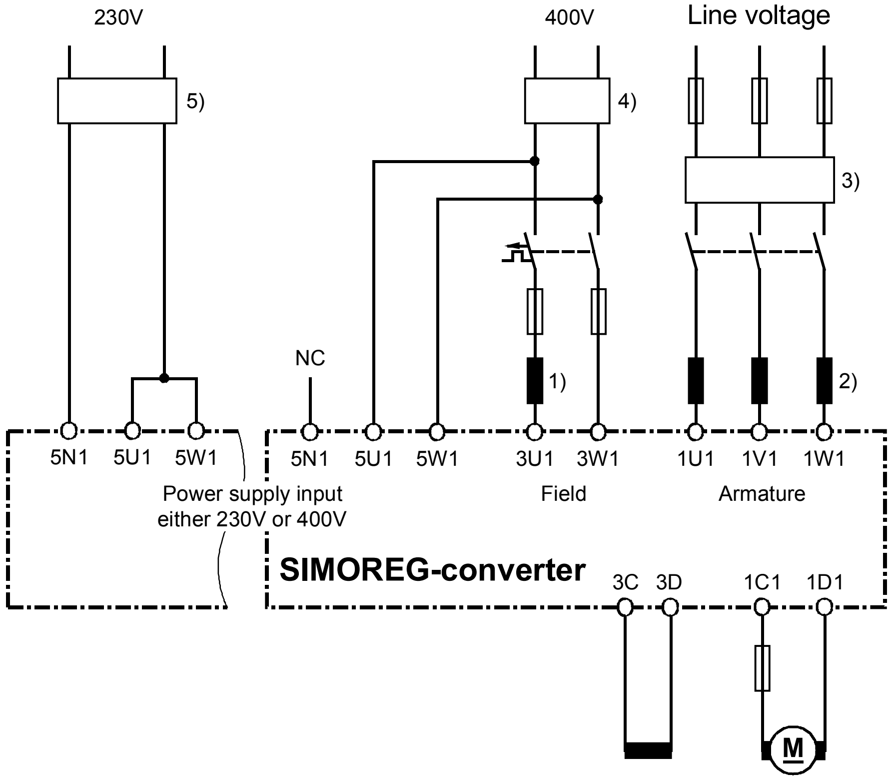
Fig. 2d: Clamp and metallic mating piece on a cable clamping rail

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 RI suppression filter



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 motor rated current in the armature.
The line current equals DC times 0.82.

3) The RI suppression filter for the armature circuit is dimensioned for the motor rated current in the armature.
The line current equals DC times 0.82

4) The RI suppression filter for the electronics power supply alone with 400 V is dimensioned for ≥1A.
The RI suppression filter for the field circuit and electronics power supply with 400 V is dimensioned for the rated current of the motor field plus 1A.

5) The RI suppression filter for the electronics power supply with 230 V is dimensioned for ≥2A.

CAUTION

When RI suppression filters are installed, commutating reactors must always be inserted between the filter and device input to decouple the surge suppression circuits and protect the X capacitors.
The commutating reactors must be selected from Catalog DA93.1. The RI suppression filters must be selected from Catalog DA93.1 or according to the table of EPCOS filters below.

6.1.2.4 List of recommended RI suppression filters made by EPCOS:

Rated current RI suppression filter (A)	RI suppression filter Order number	Terminal cross-section (mm²) Holes for M . .	Weight (kg)	Dimensions HxWxD (mm)
8	B84143-G8-R11*	4 mm²	1,3	80 x 230 x 50
20	B84143-G20-R11*	4 mm²	1,3	80 x 230 x 50
36	B84143-G36-R11*	6 mm²	2,8	150 x 280 x 60
50	B84143-G50-R11*	16 mm²	3,3	150 x 60 x 330
66	B84143-G66-R11*	25 mm²	4,4	150 x 330 x 80
90	B84143-G90-R11*	25 mm²	4,9	150 x 330 x 80
120	B84143-G120-R11*	50 mm²	7,5	200 x 380 x 90
150	B84143-G150-R11*	50 mm²	8,0	200 x 380 x 90
220	B84143-G220-R11*	95 mm²	11,5	220 x 430 x 110
150	B84143-B150-S**	M10	13	140 x 310 x 170
180	B84143-B180-S**	M10	13	140 x 310 x 170
250	B84143-B250-S**	M10	15	115 x 360 x 190
320	B84143-B320-S**	M10	21	115 x 360 x 260
400	B84143-B400-S**	M10	21	115 x 360 x 260
600	B84143-B600-S**	M10	22	115 x 410 x 260
1000	B84143-B1000-S**	M12	28	165 x 420 x 300
1600	B84143-B1600-S**	2 x M12	34	165 x 550 x 300
2500	B84143-B2500-S**	4 x M12	105	200 x 810 x 385

*) The code for the construction type must be inserted instead of *:
0 = 480 V 2 = 530 V

**) The code for the construction type must be inserted instead of **:
20 = 500 V 21 = 760 V 24 = 690 V

*) RI suppression filters produce discharge currents. VDE 0160 stipulates a 10 mm² PE connection. To ensure an optimum filtering effect, it is absolutely essential to mount the filters and converter on a single metal plate.

In the case of converters with a 3-phase connection, the minimum rated current of the filter equals the output DC of the converter times 0.82.
With a two-phase connection (field supply and electronics supply), only two phases are connected to the three-phase RI suppression filter. In this case, the line current equals the field DC (plus 1A for the electronics supply).

Important technical data of Siemens RI suppression filters:

Rated supply voltage	3AC 380-460 V (± 15%)
Rated frequency	50/60 Hz (± 6%)
Operating temperature	0° C to +40° C
Degree of protection	IP20 (EN60529) IP00 with 500 A and above

For further technical data about RI suppression filters, please refer to the Operating Instructions: SIMOVERT Master Drives RI Suppression Filters EMC Filters, Order number: 6SE7087-6CX87-0FB0.

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 (α = 20° and α = 60°) 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.

Formula 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 formula correspond to the actual plant data. If the calculated values differ, the harmonics must be calculated separately.

a.) α = 20°

Fundamental factor g = 0.962

ν	I_ν/I_1	ν	I_ν/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

b.) α = 60°

Fundamental factor g = 0.953

ν	I_ν/I_1	ν	I_ν/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 by the following equation:

$$\boxed{I_1 = g \times 0.817 \times I_d}$$

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

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

where

$$X_N = X_K - X_D = 0.03536 \times \frac{U_{v0}}{I_d} - 2\pi f_N \times L_D \quad (\Omega)$$

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 converter terminals

II.) Armature inductance L_a

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

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 V
I_d = 150 A
f_N = 50 Hz
L_D = 0.169 mH (4EU2421-7AA10 where I_{Ln} = 125 A)

When

$$X_N = 0.03536 \times \frac{400}{150} - 2\pi \times 50 \times 0.169 \times 10^{-3} = 0.0412\Omega$$

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:

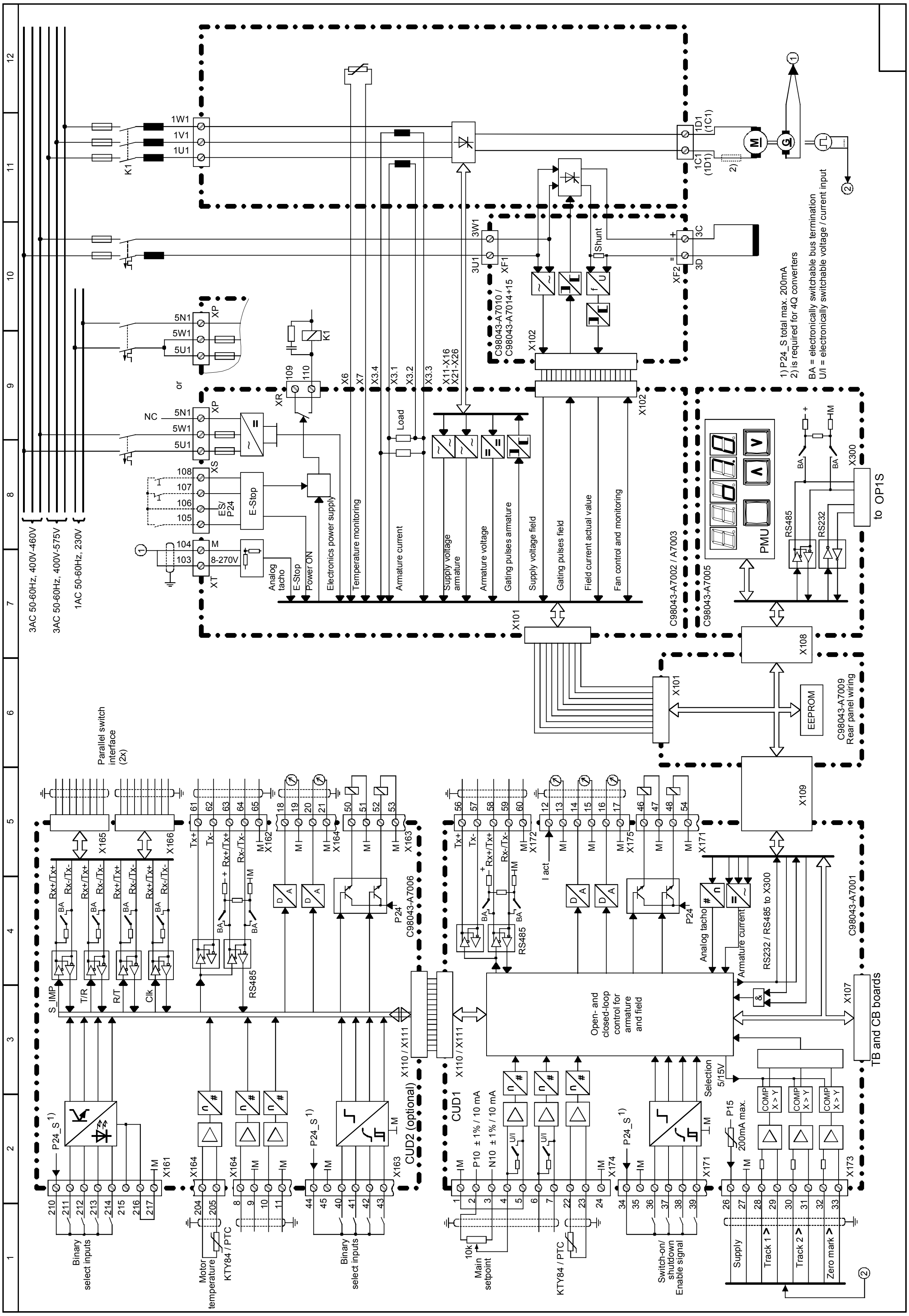
$$L_a = 0.0488 \times \frac{400}{50 \times 150} = 2.60\text{mH}$$

The harmonic currents I_v listed in the tables above (where $I_1 = g \times 0.817 \times I_d$ for firing angles α = 20° and α = 60°) 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.

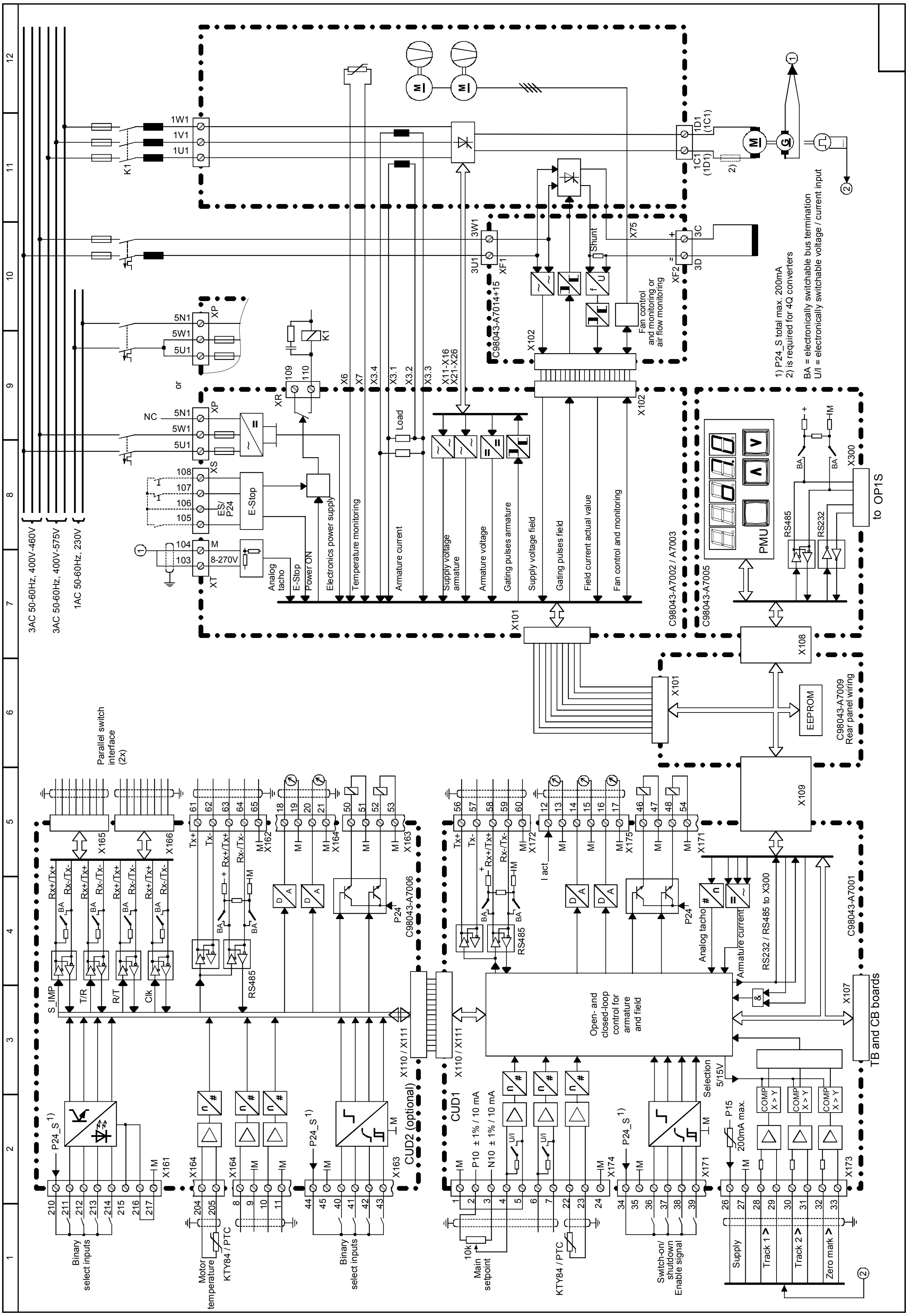
For the purpose of dimensioning filters and compensation circuits with reactors, the harmonic values calculated by these equations can be applied only if the values calculated for S_K and L_a tally with the actual values of the drive. If they do not, they must be calculated separately (this is especially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

6.2 Block diagram with recommended connection

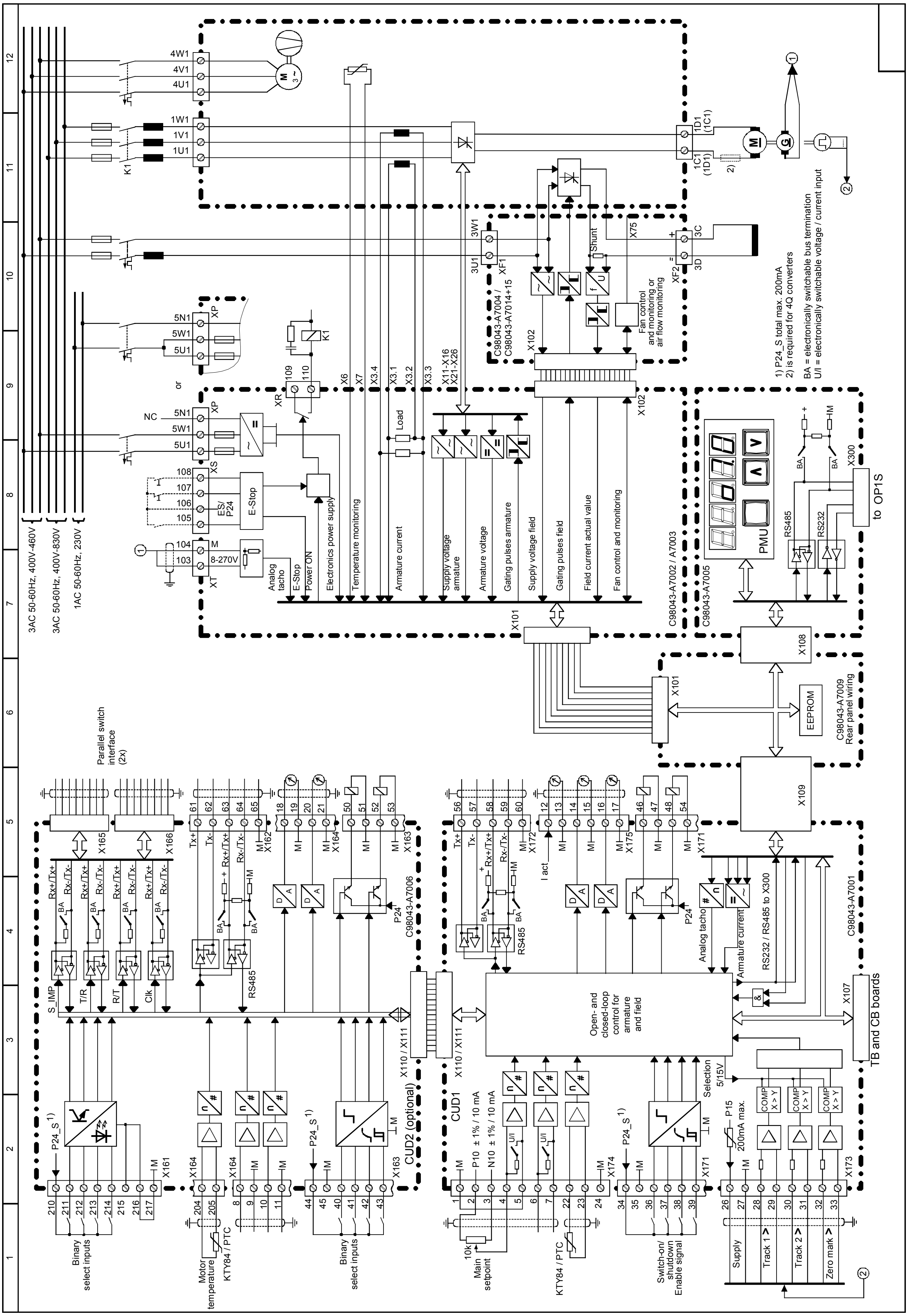
6.2.1 Converters: 15A to 125A



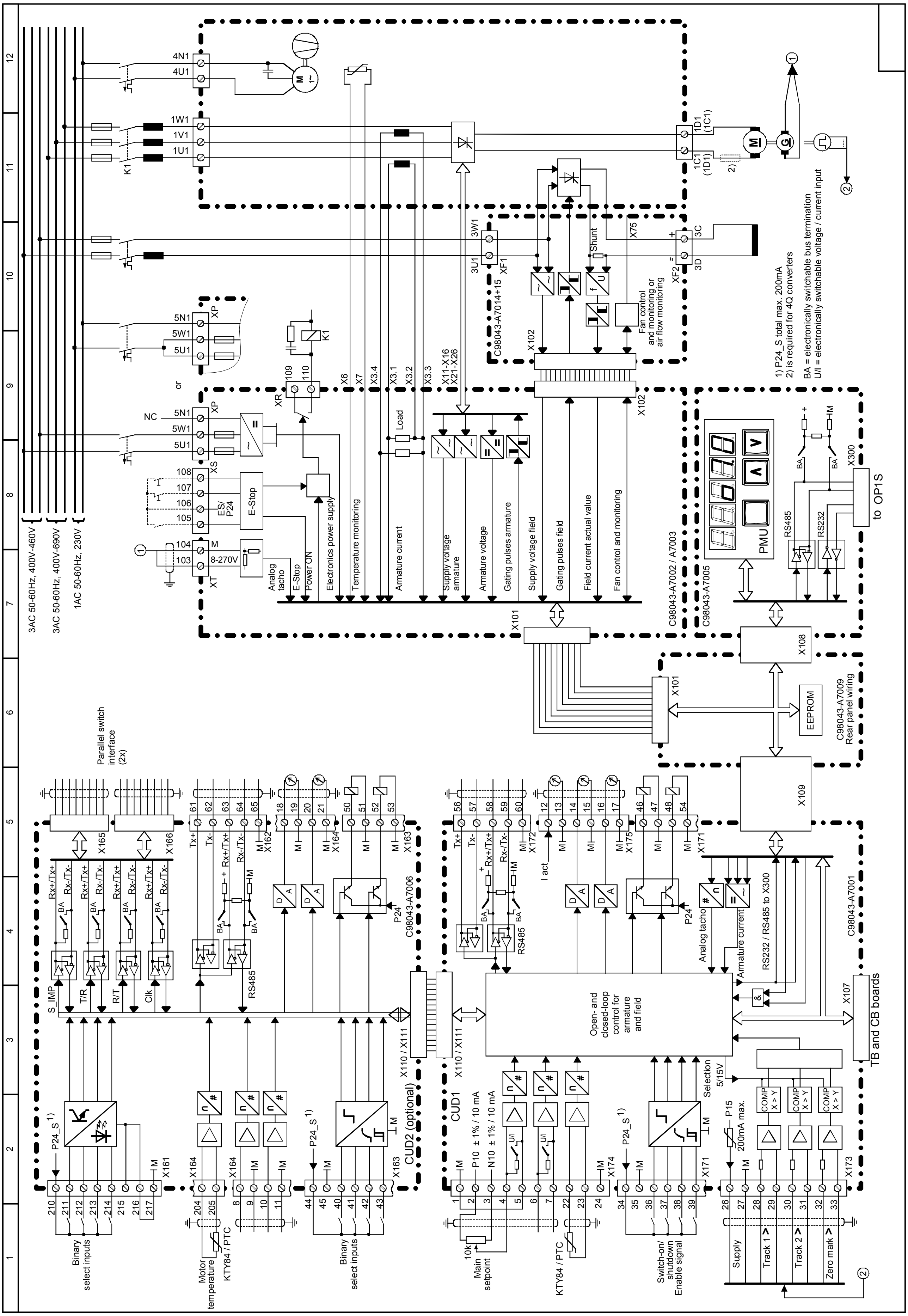
6.2.2 Converters: 210A to 280A



6.2.3 Converters: 400A to 2200A with a 3-phase fan

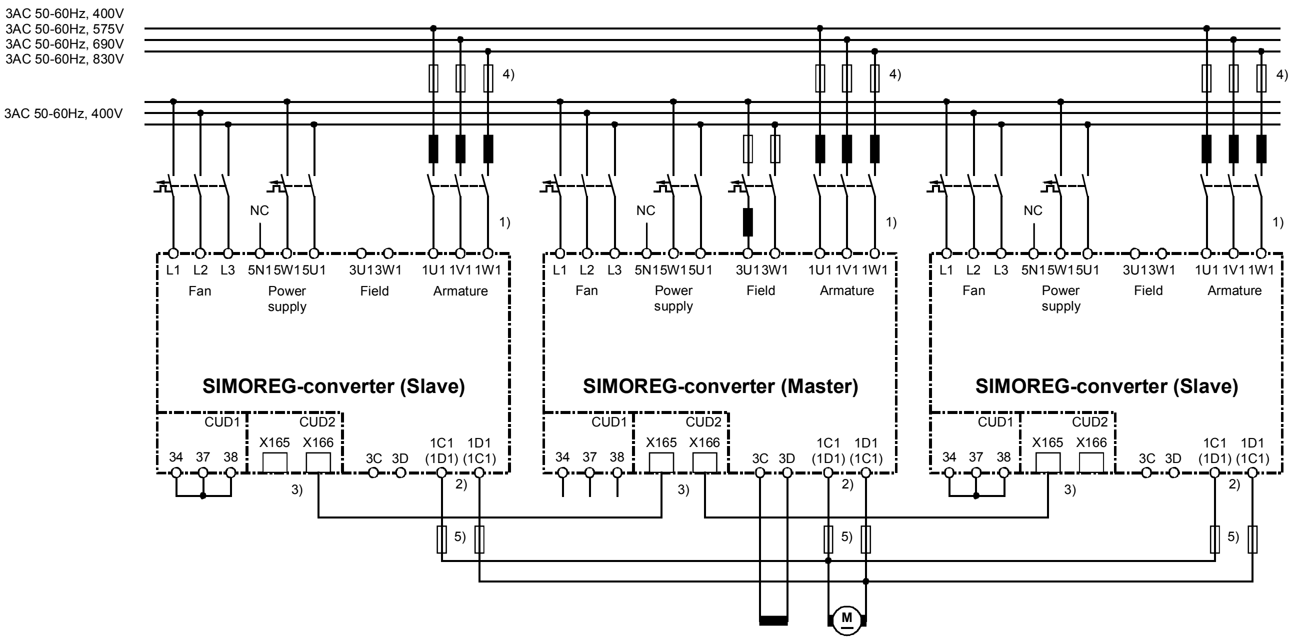


6.2.4 Converters: 450A to 850A with a 1-phase fan



6.3 Parallel connection of converters

6.3.1 Circuit diagram showing parallel connection of SIMOREG converters



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.
4) These fuses may only be used on converters up to 850A.
5) For converters up to 850A in 4Q operation only

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 SIMOREG converter. Current distribution is determined by the differential reactor tolerance. A tolerance of 5% or higher is recommended for operation without derating (reduced current).
Caution:
Parallel connections may only be made between converters with the same DC current rating!

6.3.2 Parameterization of SIMOREG converters for parallel connection

6.3.2.1 Standard operating mode

Master	**Slaves**
U800 = 1 Paralleling interface active	U800 = 2 Paralleling interface active Use master firing pulses
U803 = 0 "N+1 mode" not active	
U804.01 = 30 control word 1 U804.02 = 31 control word 2 U804.03 = 167 Actual speed value	U804.01 = 32 status word 1
U805 = 1 (bus termination) on the two end units (at both physical ends of the bus cable) 0 (no bus termination) on all other units	
U806 = 12 master for one slave 13 master for 2 slaves 14 master for 3 slaves 15 master for 4 slaves 16 master for 5 slaves Set U806.02 like U806.01	U806 = 2 1 slave U806 = 2 and 3 2 slaves U806 = 2, 3 and 4 3 slaves U806 = 2,3,4 and 5 4 slaves U806 = 2,3,4,5 and 6 5 slaves Set U806.02 like U806.01
P082 <> 0 operating mode for field	P082 = 0 internal field is not used
Set P083 depending on the source of the actual speed value	P083 = 4 Freely connected actual speed value P609 = 6023 Use actual speed value of master
P100 = $\frac{Rated\ motor\ current}{Number\ of\ SIMOREG\ units}$	P100 = $\frac{Rated\ motor\ current}{Number\ of\ SIMOREG\ units}$
Set P648, P649 depending on the source of the control word	P648 = 6021 Use control word 1 from master P649 = 6022 Use control word 2 from master
	P821.01 = 31 Suppress alarm A031
P110 = Actual armature resistance x no. of SIMOREG converters P111 = Actual armature inductance x no. of SIMOREG converters The optimization run for current controller and precontrol (P051 = 25) sets these parameters correctly.	P110 = set as on master 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 41 (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 slave !
- Optimization runs must be started on the master device. All slaves must be connected and ready to run when optimization is started.

6.3.2.2 Operating mode "N+1 mode" (redundancy mode)

Master	Standby master	Slaves
U800 = 1 Paralleling interface active	U800 = 2 Paralleling interface active Use master firing pulses	
U803 = 1 "N+1 mode" active		
U804.01 = 30 control word 1 U804.02 = 31 control word 2 U804.03 = 167 actual speed value U804.04 = any U804.05 = any U804.06 = 32 status word 1 U804.07 = any U804.08 = any U804.09 = any U804.10 = any	U804.01 = 32 status word 1 U804.02 = any U804.03 = any U804.04 = any U804.05 = any U804.06 = 30 control word 1 U804.07 = 31 control word 2 U804.08 = 167 actual speed value U804.09 = any U804.10 = any	U804.01 = 32 status word 1 U804.02 = any U804.03 = any U804.04 = any U804.05 = any U804.06 = any U804.07 = any U804.08 = any U804.09 = any U804.10 = any
U805 = 1 (bus termination) on the two end units (at both physical ends of the bus cable) 0 (no bus termination) on all other units		
U806.01 = 12 master + 1 slave 13 master + 2 slaves 14 master + 3 slaves 15 master + 4 slaves 16 master + 5 slaves U806.02 = 2 slave 2	U806.01 = 2 slave 2 U806.02 = 12 master + 1 slave 13 master + 2 slaves 14 master + 3 slaves 15 master + 4 slaves 16 master + 5 slaves	U806.01 = 3 2 slaves U806.01 = 3 and 4 3 slaves U806.01 = 3,4 and 5 4 slaves U806.01 = 3,4,5 and 6 5 slaves U806.02 = set like U806.01
P082 <> 0 operating mode for field	P082 = 0 internal field is not used	
P083, set according to source of the actual speed value		P083 = 4 Freely connected actual speed value P609 = 6023 Use actual speed value of master
P100 = $\frac{\text{Rated motor current}}{\text{Number of SIMOREG units}}$		
P648, P649, set according to source of the control word		P648 = 6021 Use control word 1 from master P649 = 6022 Use control word 2 from master
		P821.01 = 31 Suppress alarm A031
U807 = 0.000s telegram failure does not lead to a fault message		
P110 = Actual armature resistance x no. of SIMOREG converters P111 = Actual armature inductance x no. of SIMOREG converters The optimization run for current controller and precontrol (P051 = 25) sets these parameters correctly.	P110 = set as on master 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 G45 (paralleling interface).

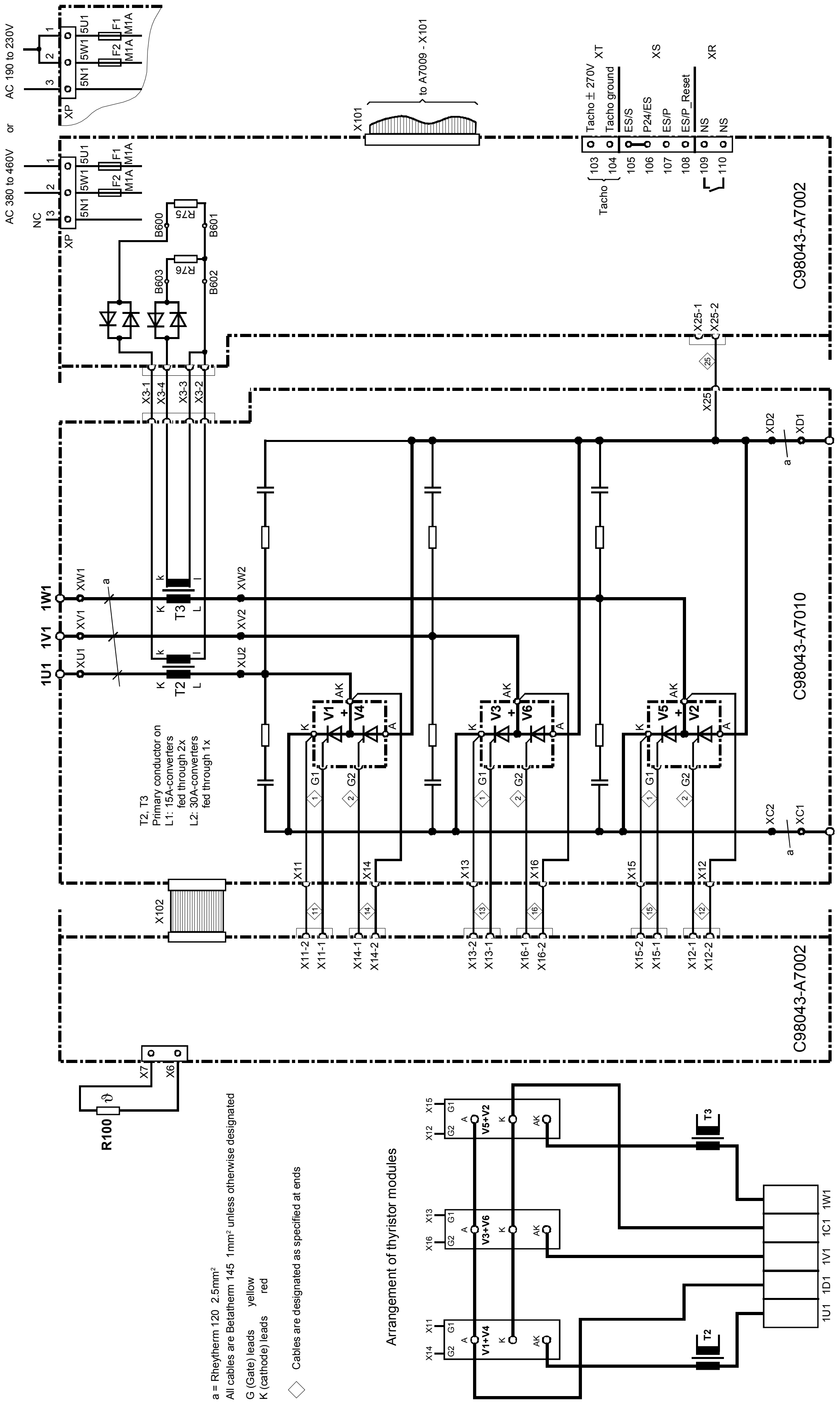
Notes:

In this mode it is possible to maintain operation with the remaining SIMOREG units if one unit should fail (e.g. fuse blown in the power section). The functional SIMOREG units continue to run without interruption if one unit fails. During configuration, make sure that the power of only n units (instead of n+1 units) is sufficient for the application.

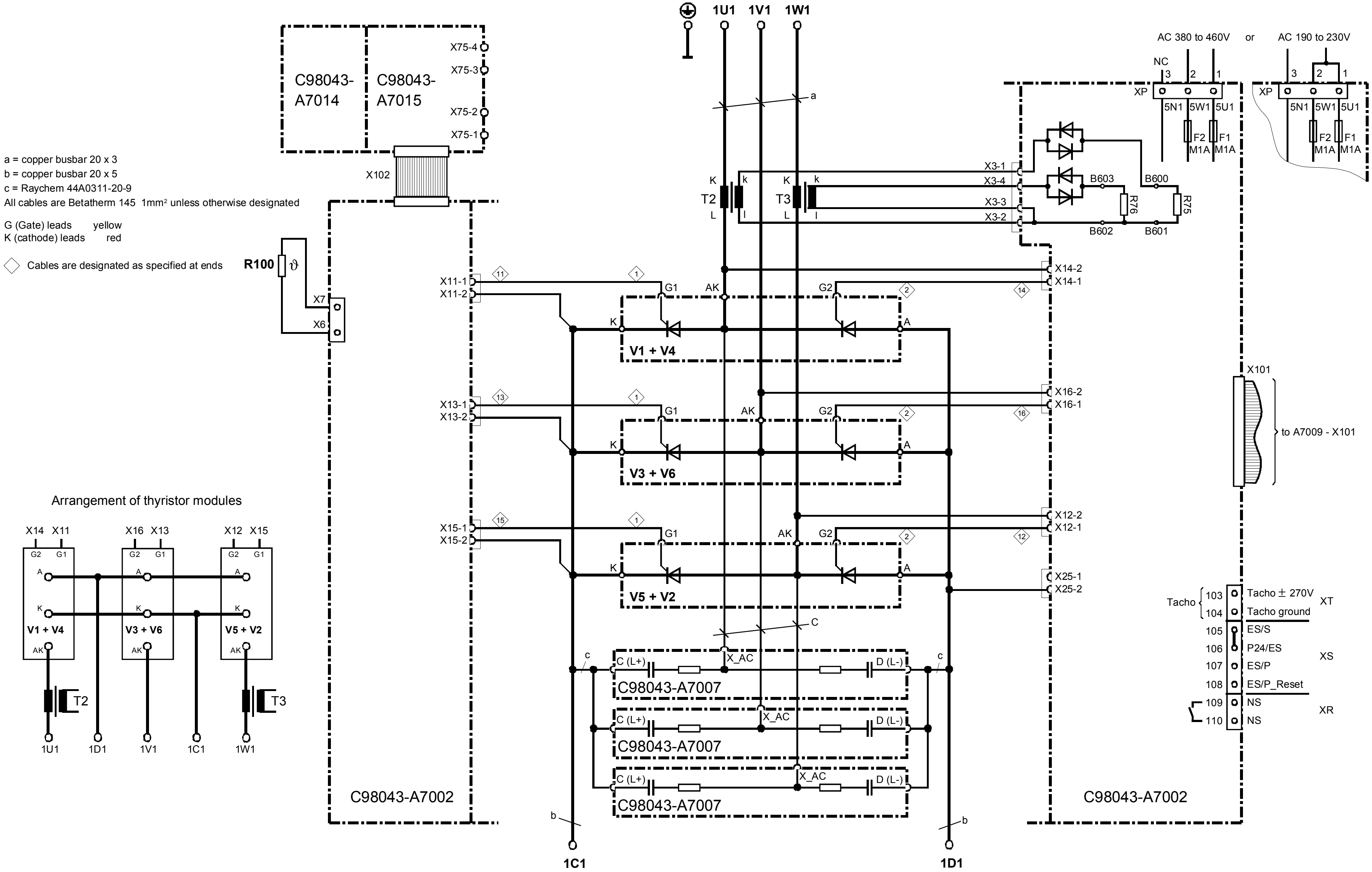
- Control commands "Switch-on/Shutdown", "Enable operation", "Emergency stop" etc. must be connected to a group of parallel-connected SIMOREG converters via the master device AND via the "standby" master device.
  Terminals 37 and 38 must be permanently connected to terminal 34 on the slaves!
- The speed setpoint and the actual speed value must be connected to a group of parallel-connected SIMOREG converters via the master device AND via the "standby" master device. !
- All parameters except for those in the above list must be set identically 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.

6.4 Power connections

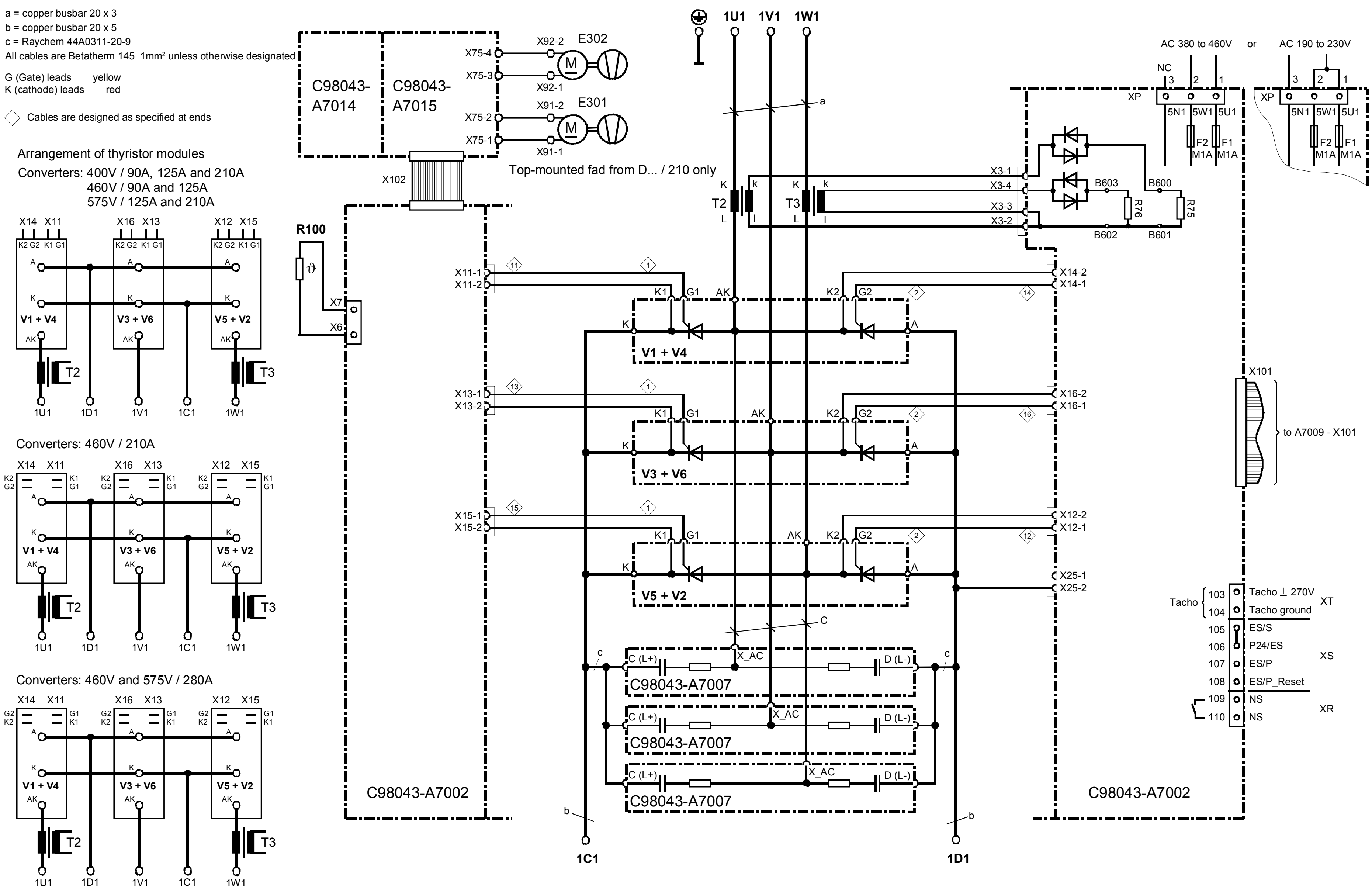
6.4.1 Converters: 30A, 1Q



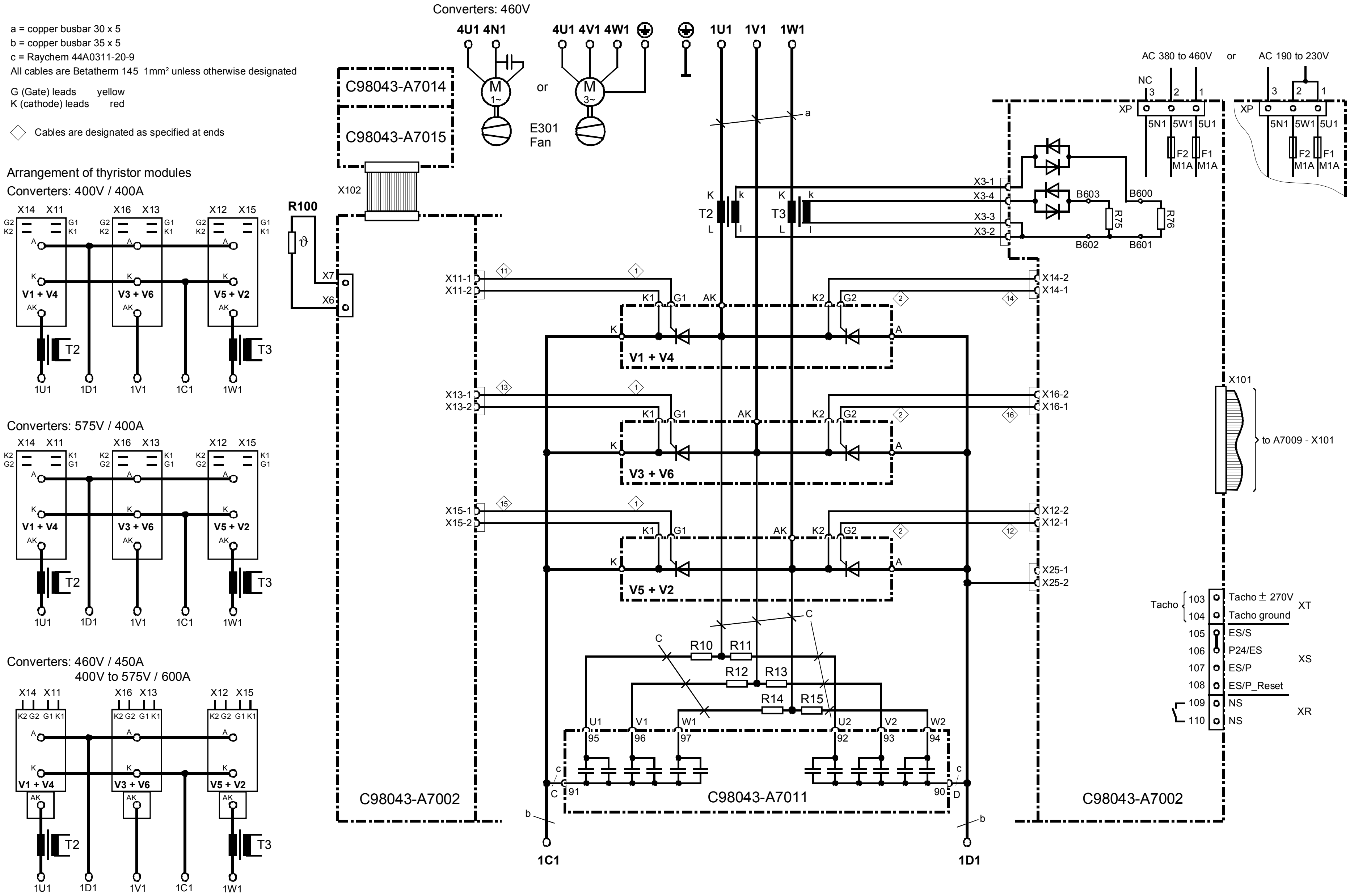
6.4.2 Converters: 60A, 1Q



6.4.3 Converters: 90A to 280A, 1Q



6.4.4 Converters: 400A to 600A, 1Q

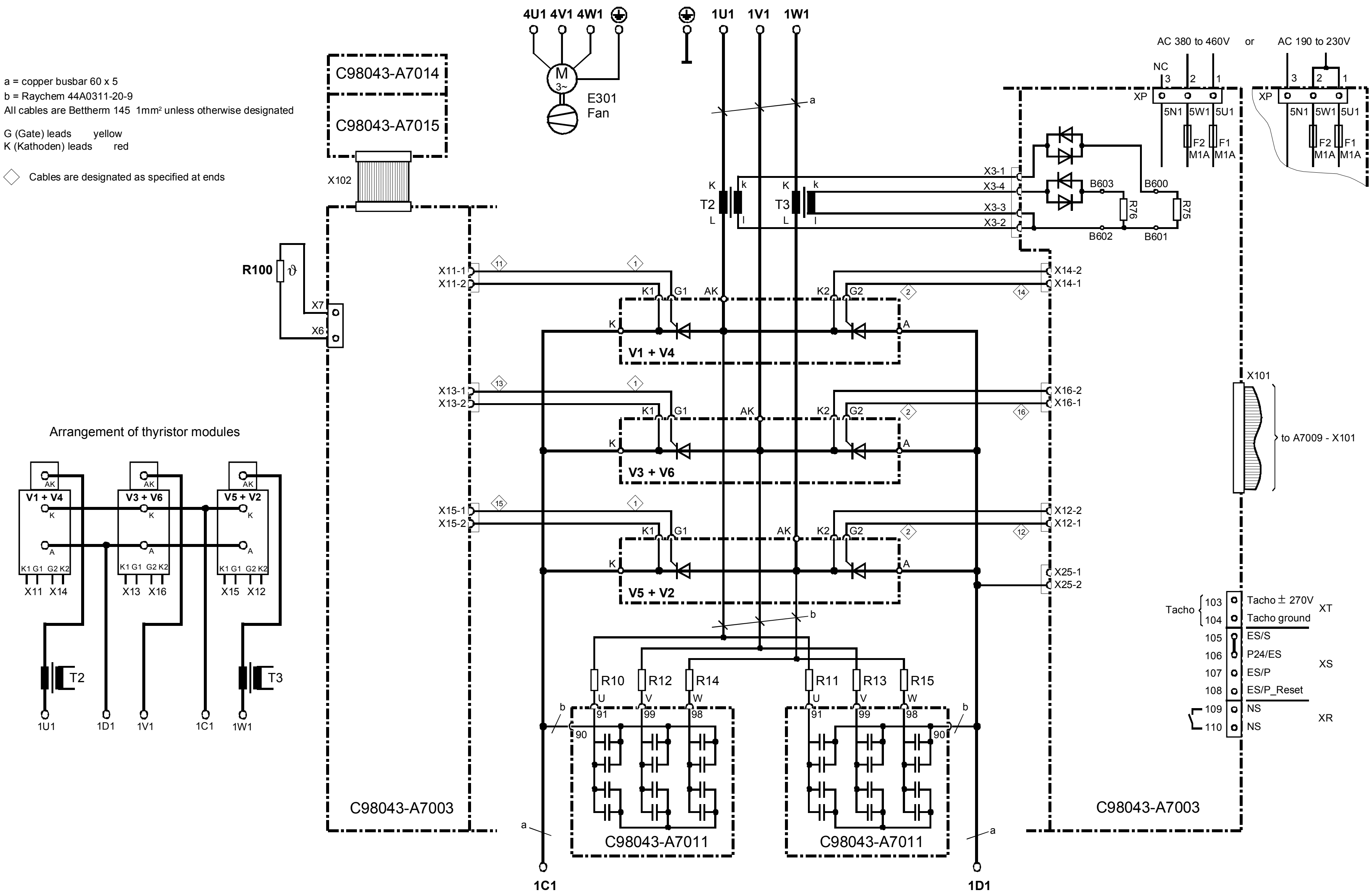


6.4.5 Converters: 720A, 1Q

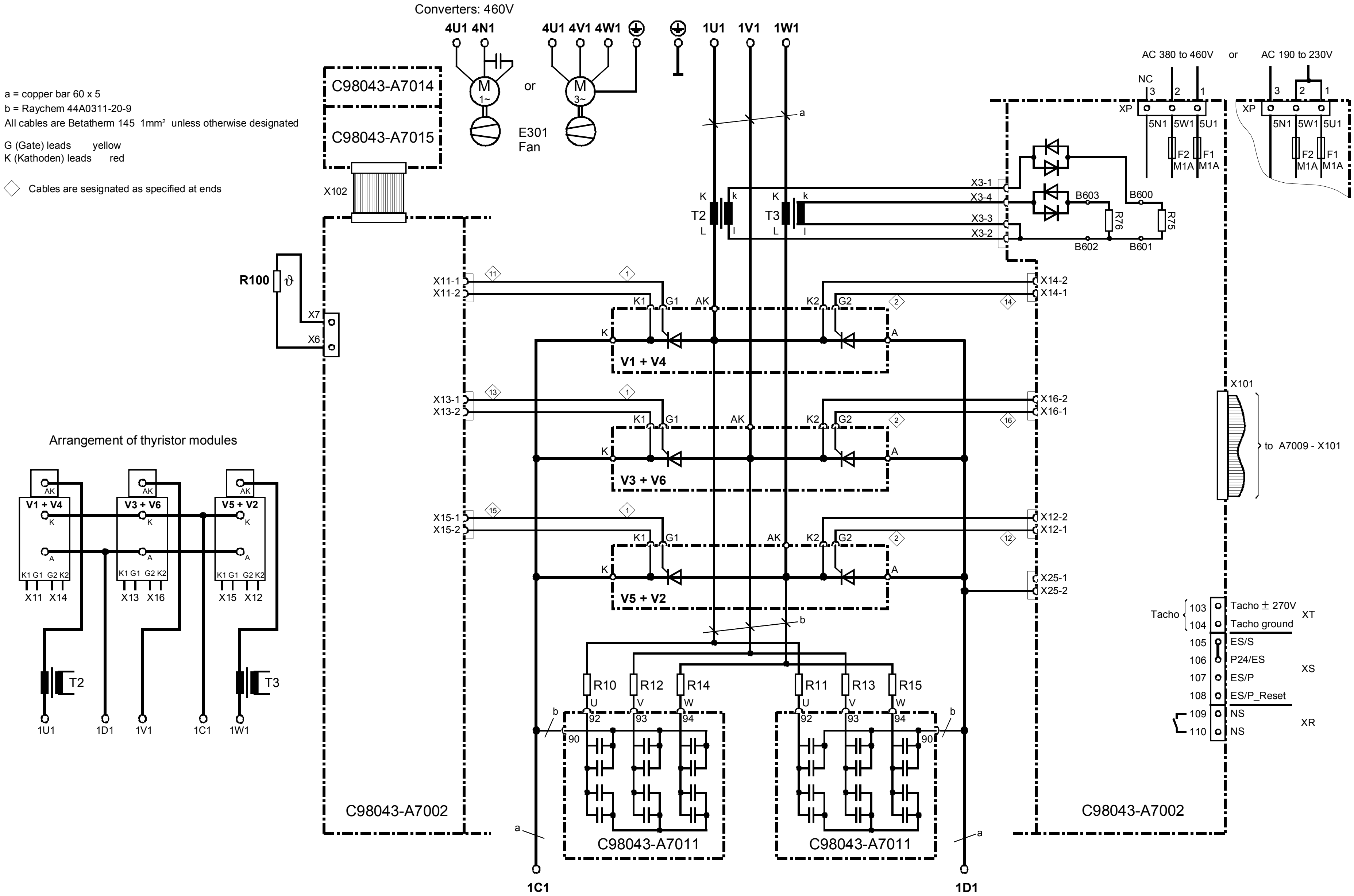
a = copper busbar 60 x 5
b = Raychem 44A0311-20-9
All cables are Bettherm 145 1mm² unless otherwise designated

G (Gate) leads yellow
K (Kathoden) leads red

◇ Cables are designated as specified at ends



6.4.6 Converters: 800 to 850A, 1Q

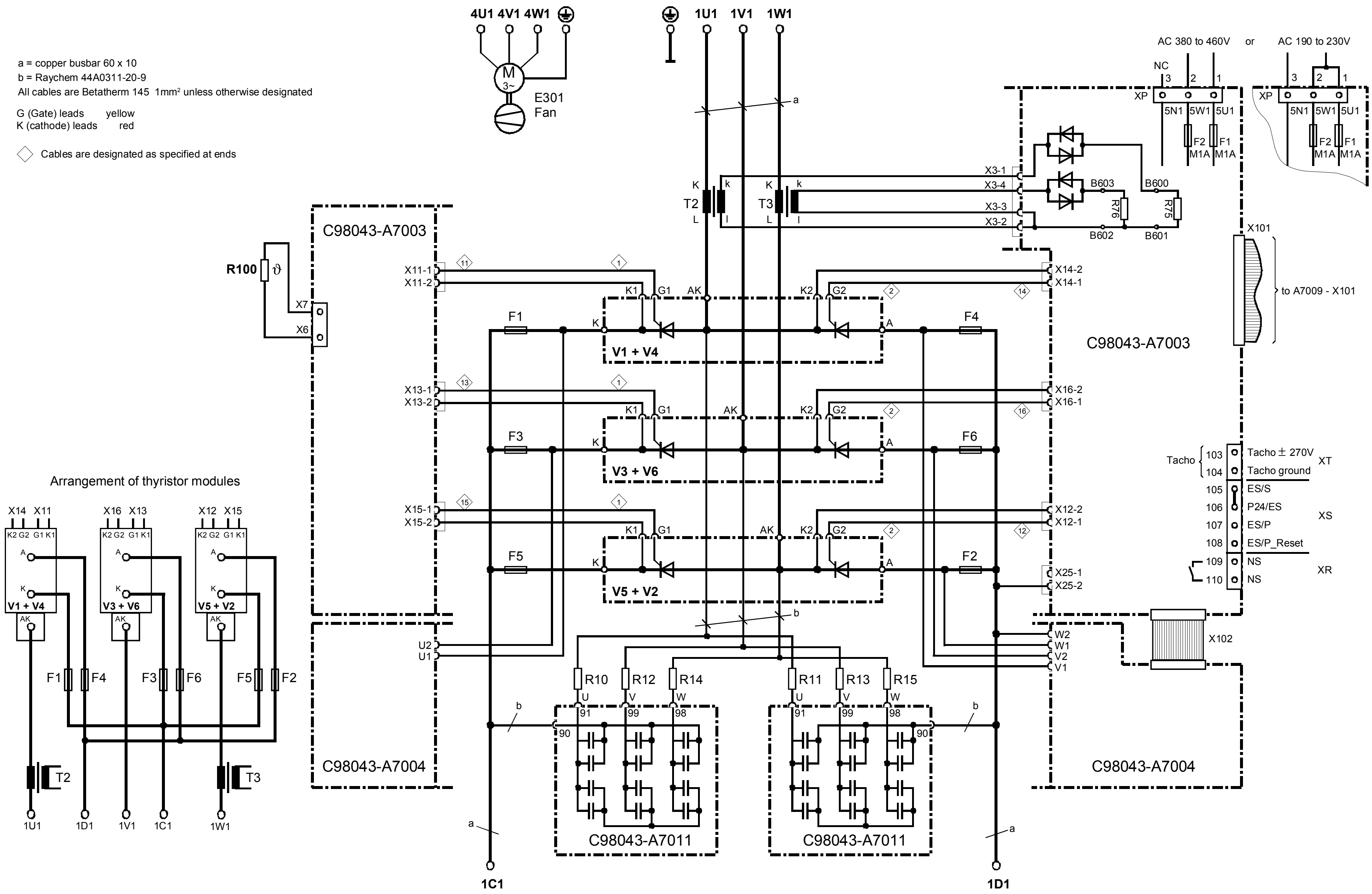


6.4.7 Converters: 900A to 950A, 1Q

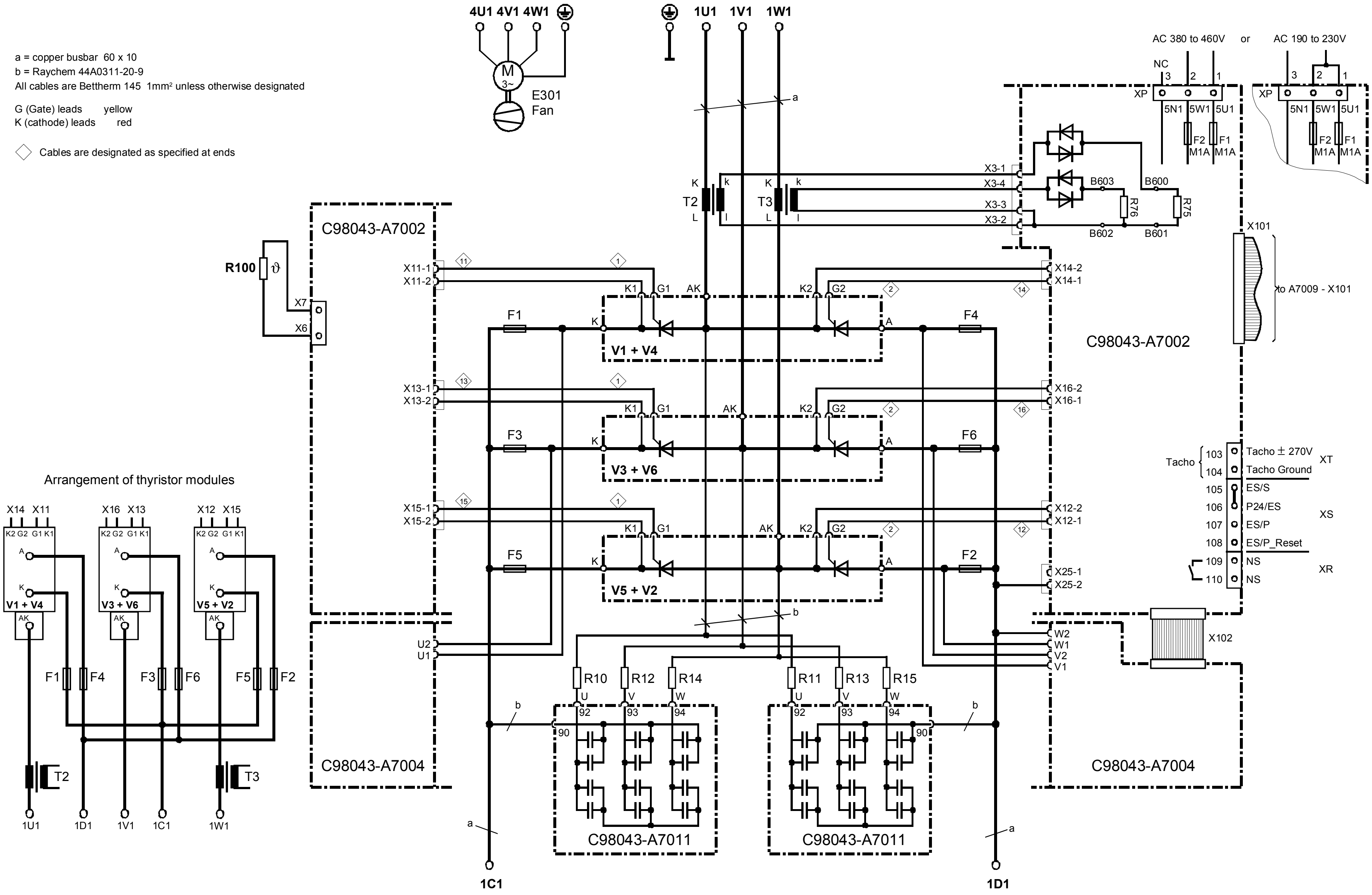
a = copper busbar 60 x 10
b = Raychem 44A0311-20-9
All cables are Betatherm 145 1mm² unless otherwise designated

G (Gate) leads yellow
K (cathode) leads red

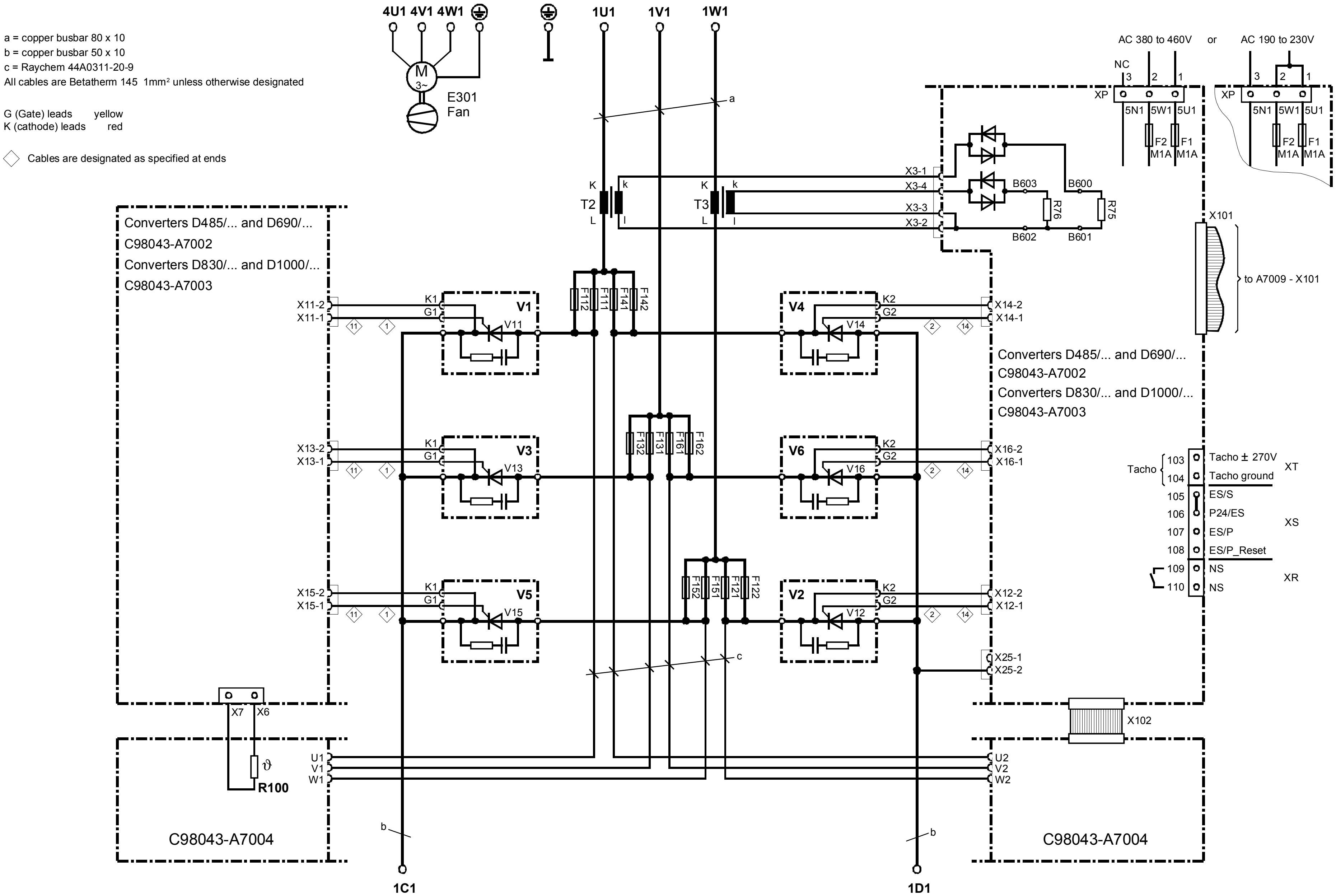
◇ Cables are designated as specified at ends



6.4.8 Converters: 1000 to 1200A, 1Q



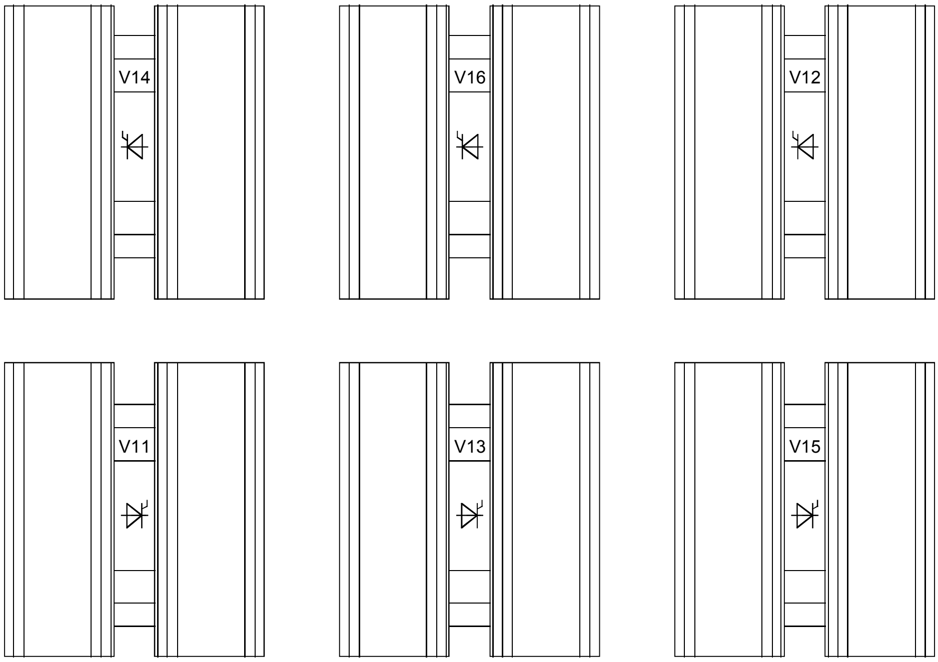
6.4.9 Converters: 1500 to 2200A, 1Q



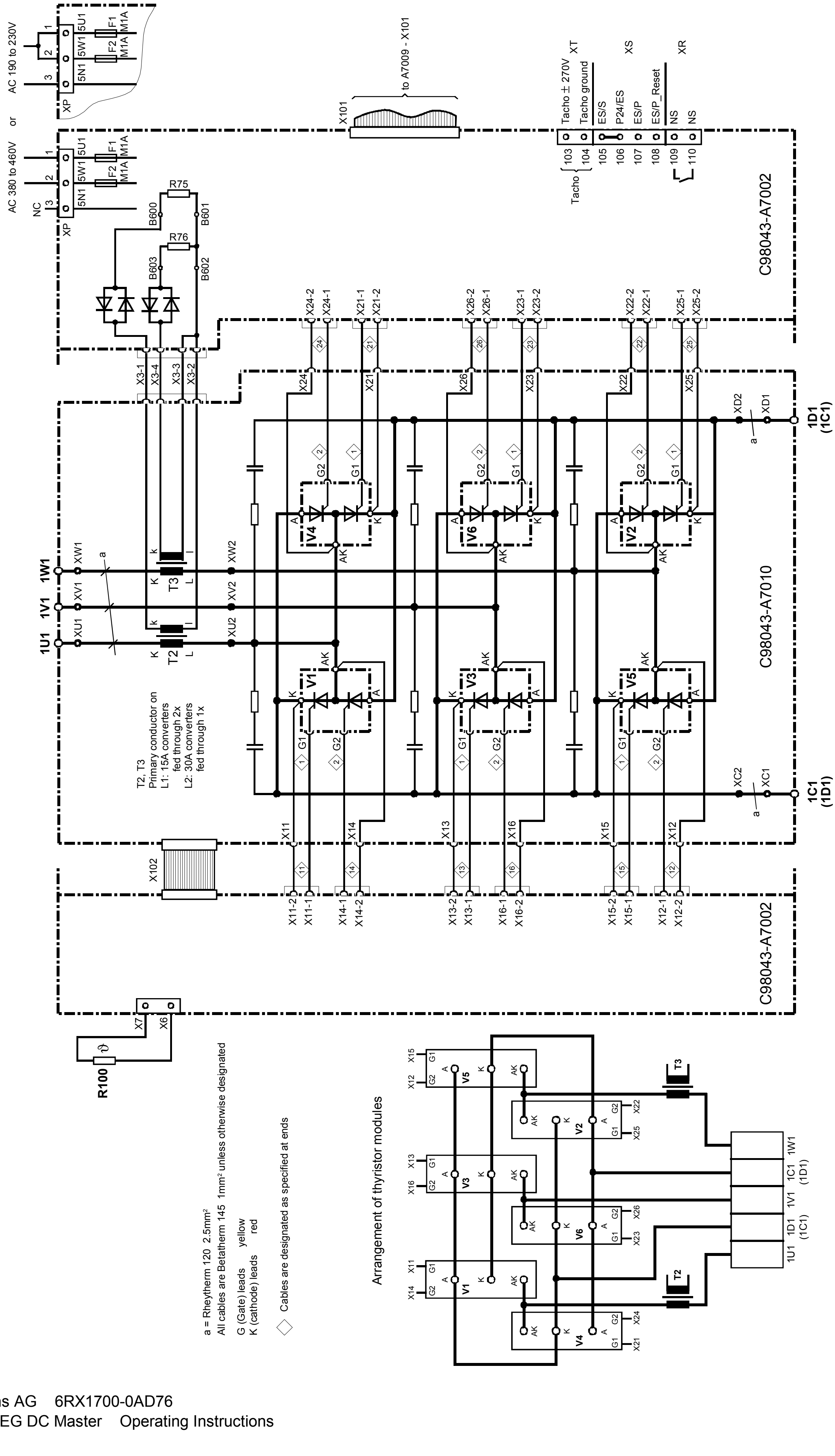
Arrangement of thyristor blocks

At rear

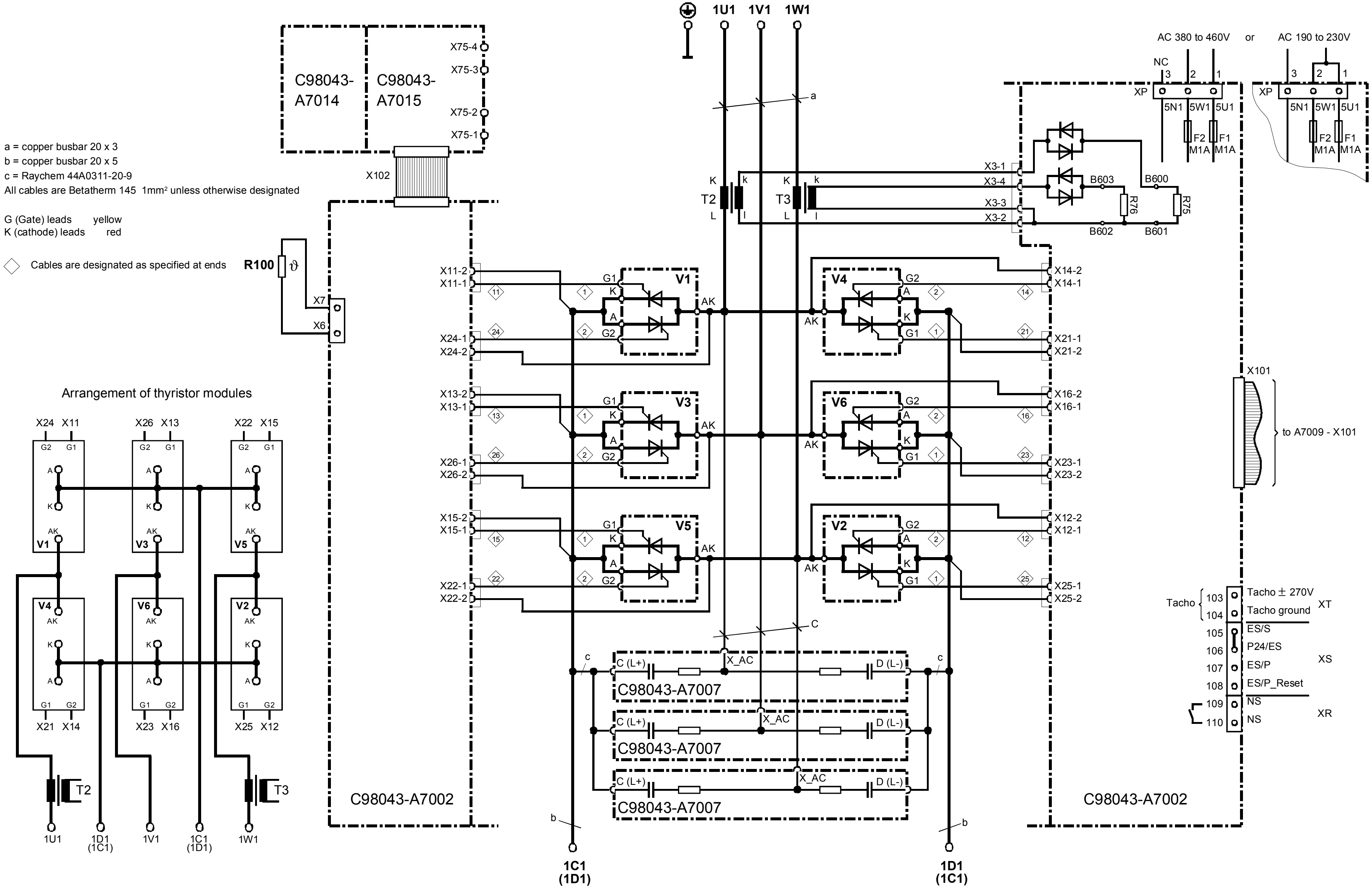
At front



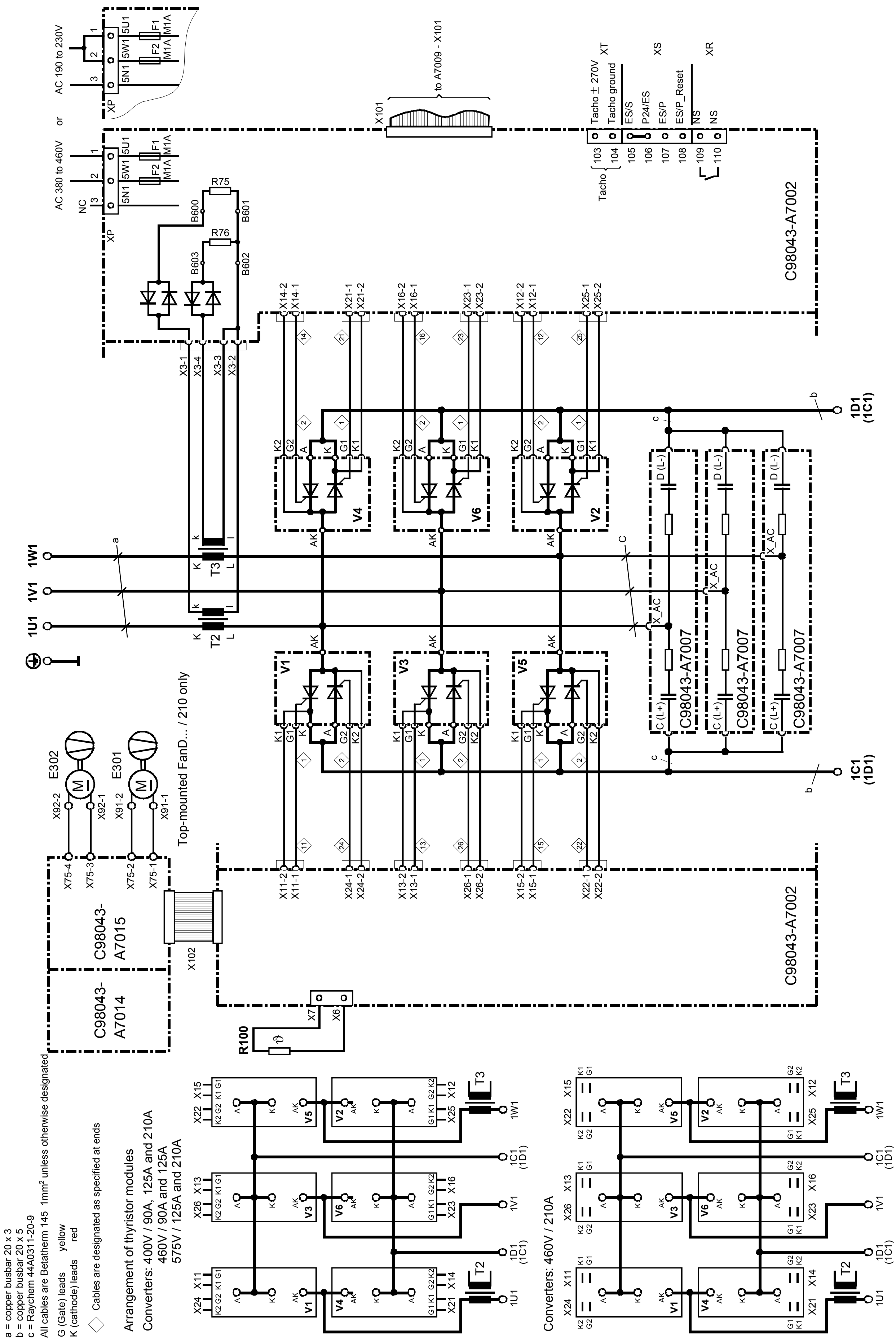
6.4.10 Converters: 15 to 30A, 4Q



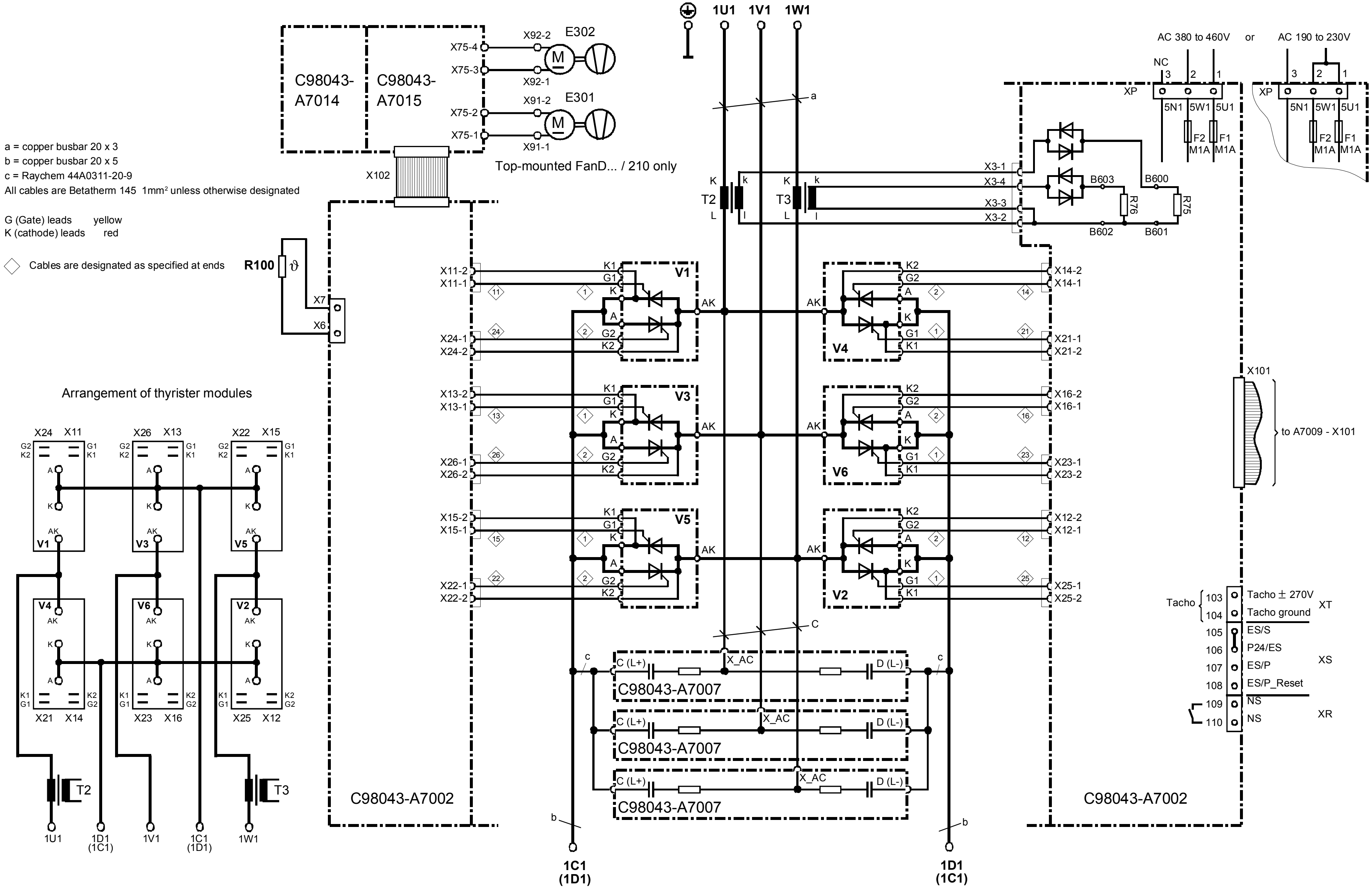
6.4.11 Converters: 60A, 4Q



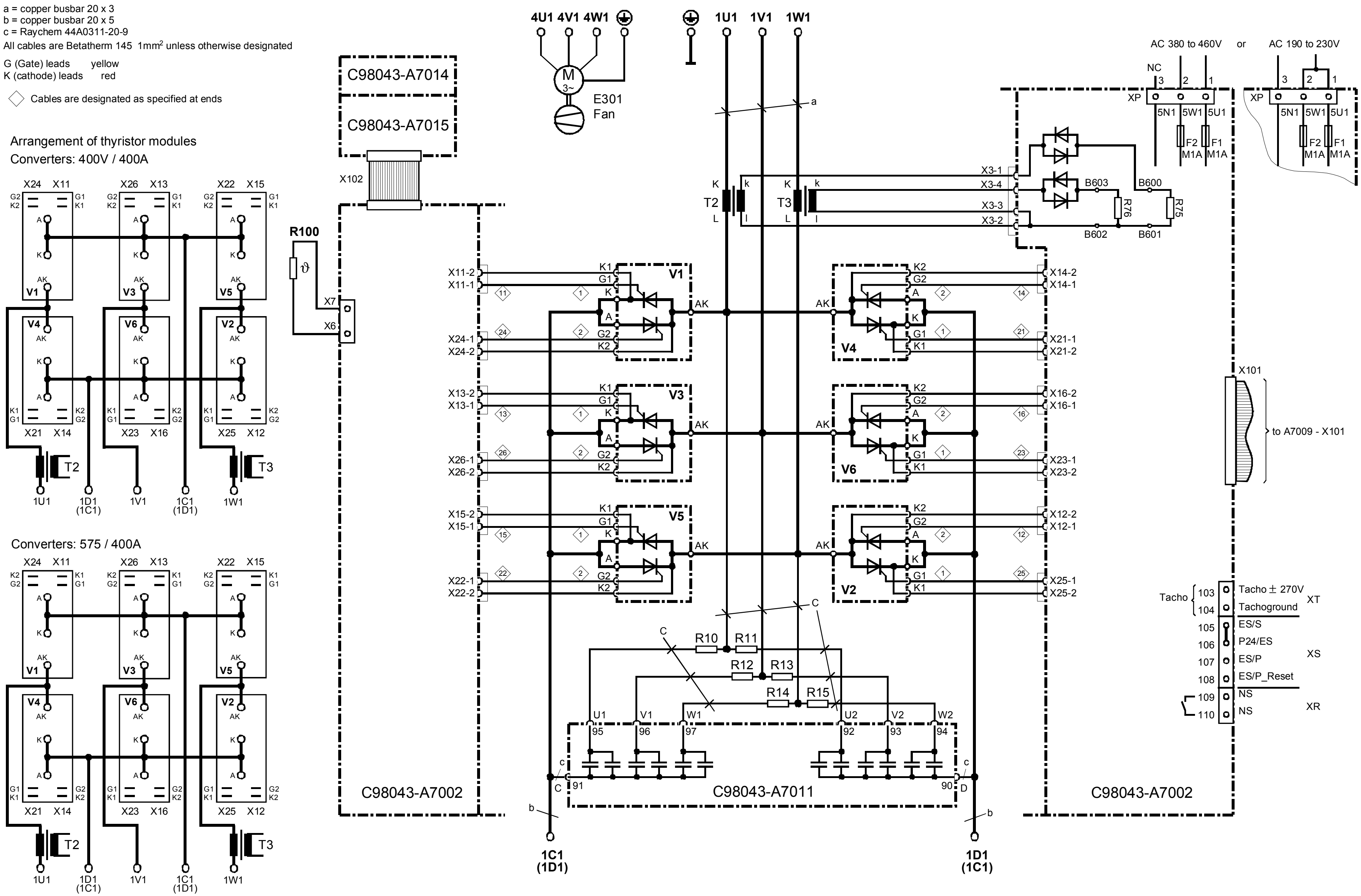
6.4.12 Converters: 90A to 210A, 4Q



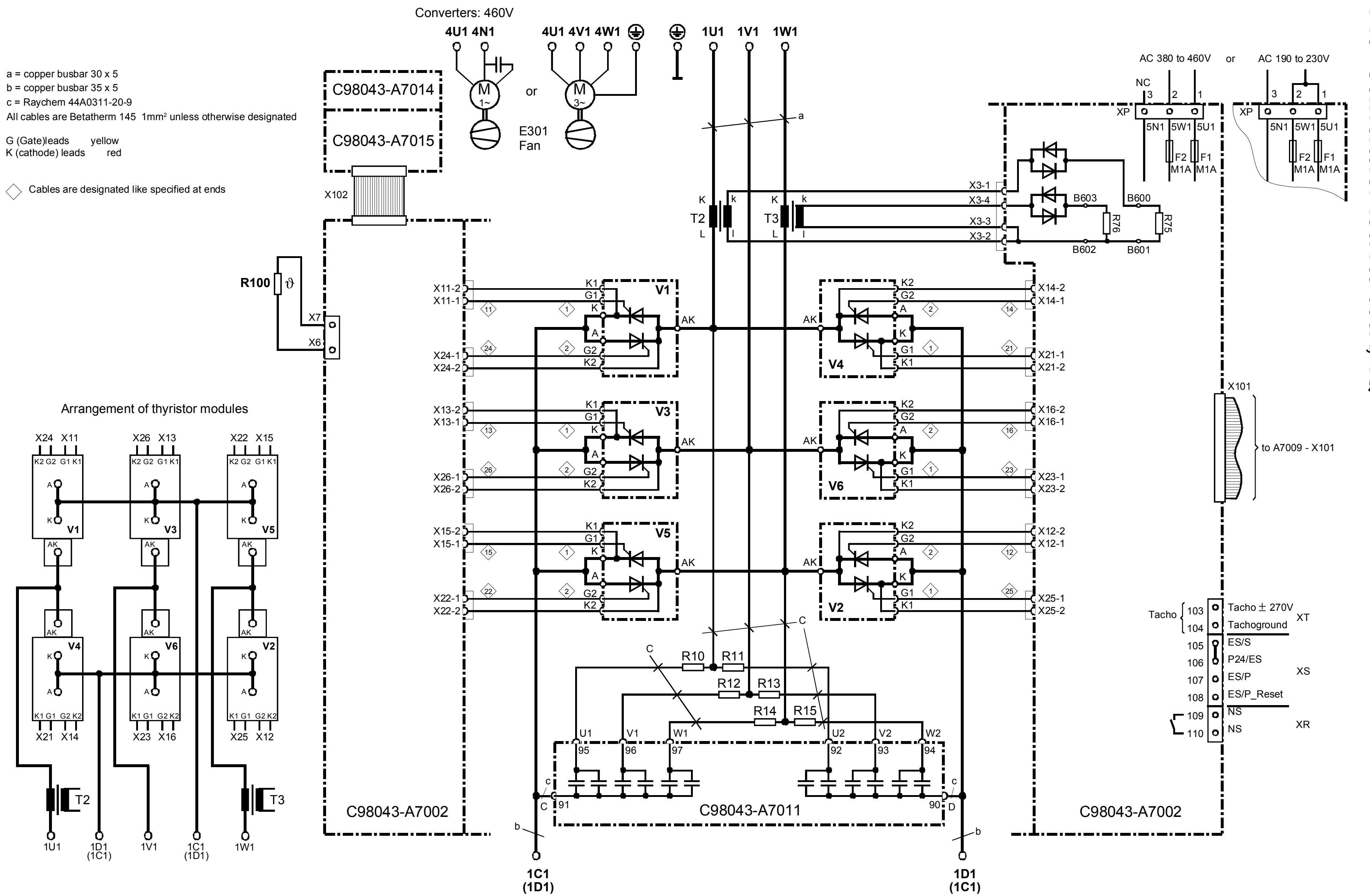
6.4.13 Converters: 280A, 4Q



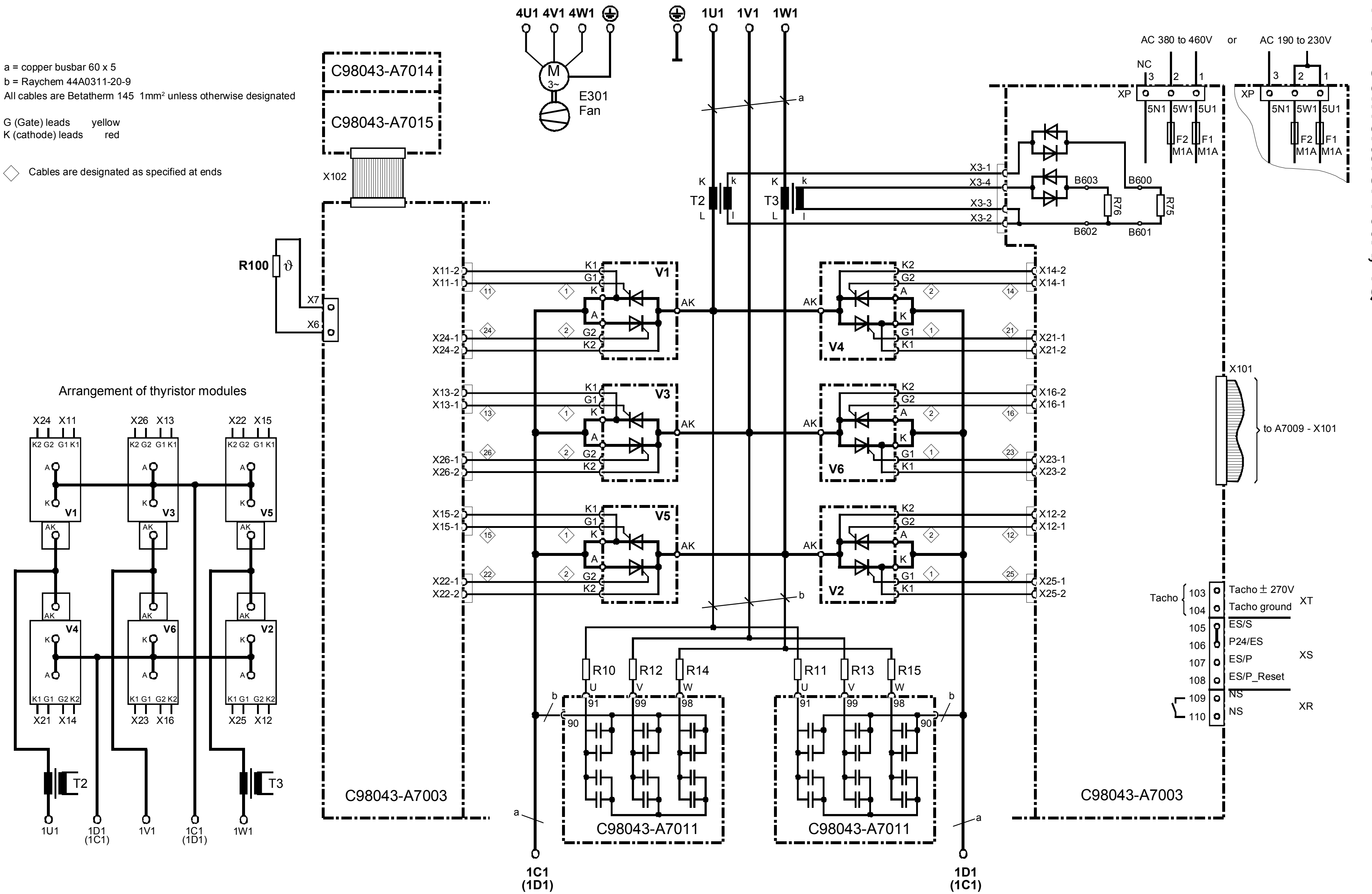
6.4.14 Converters: 400A, 4Q



6.4.15 Converters: 450A to 600A, 4Q



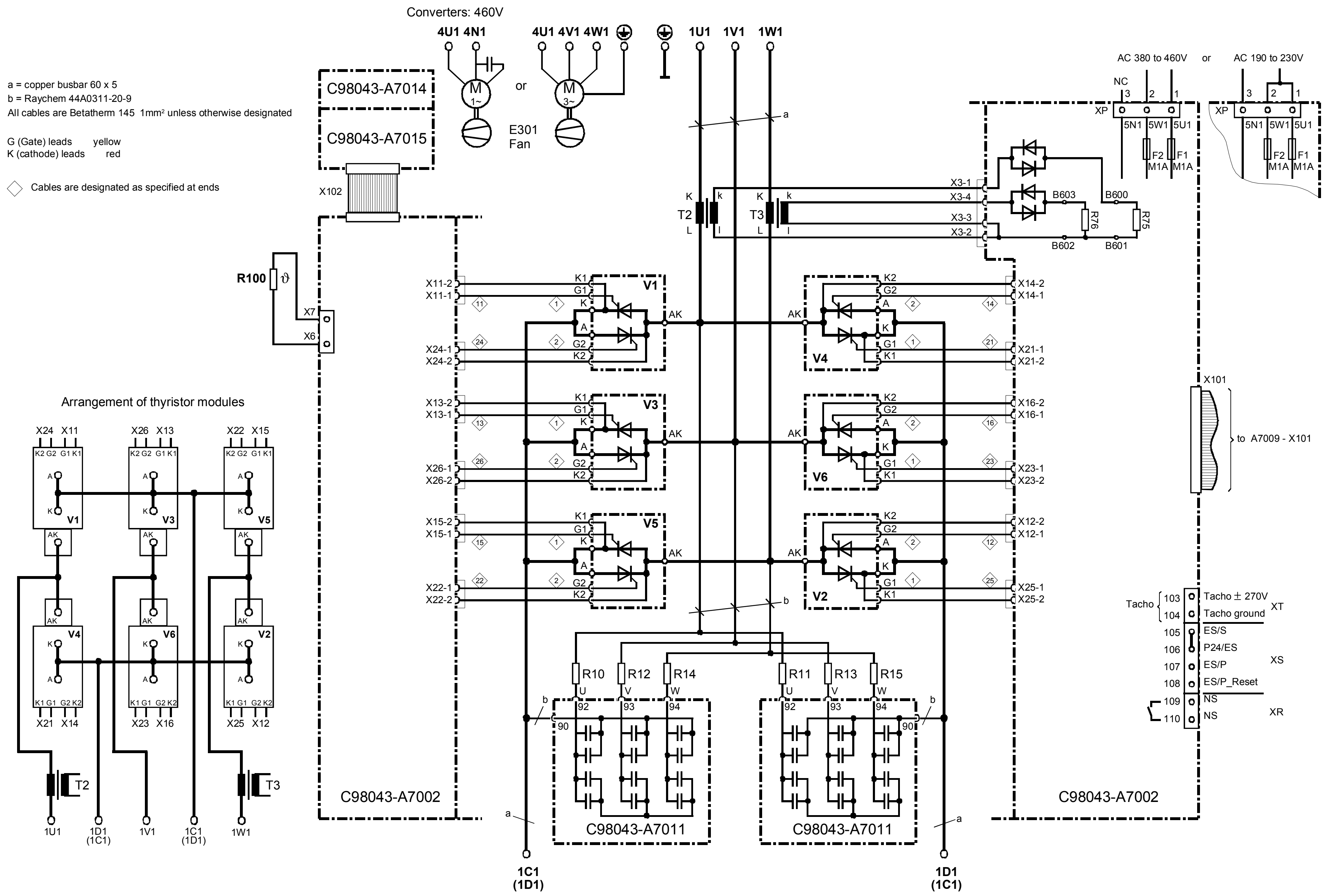
6.4.16 Converters: 760A, 4Q



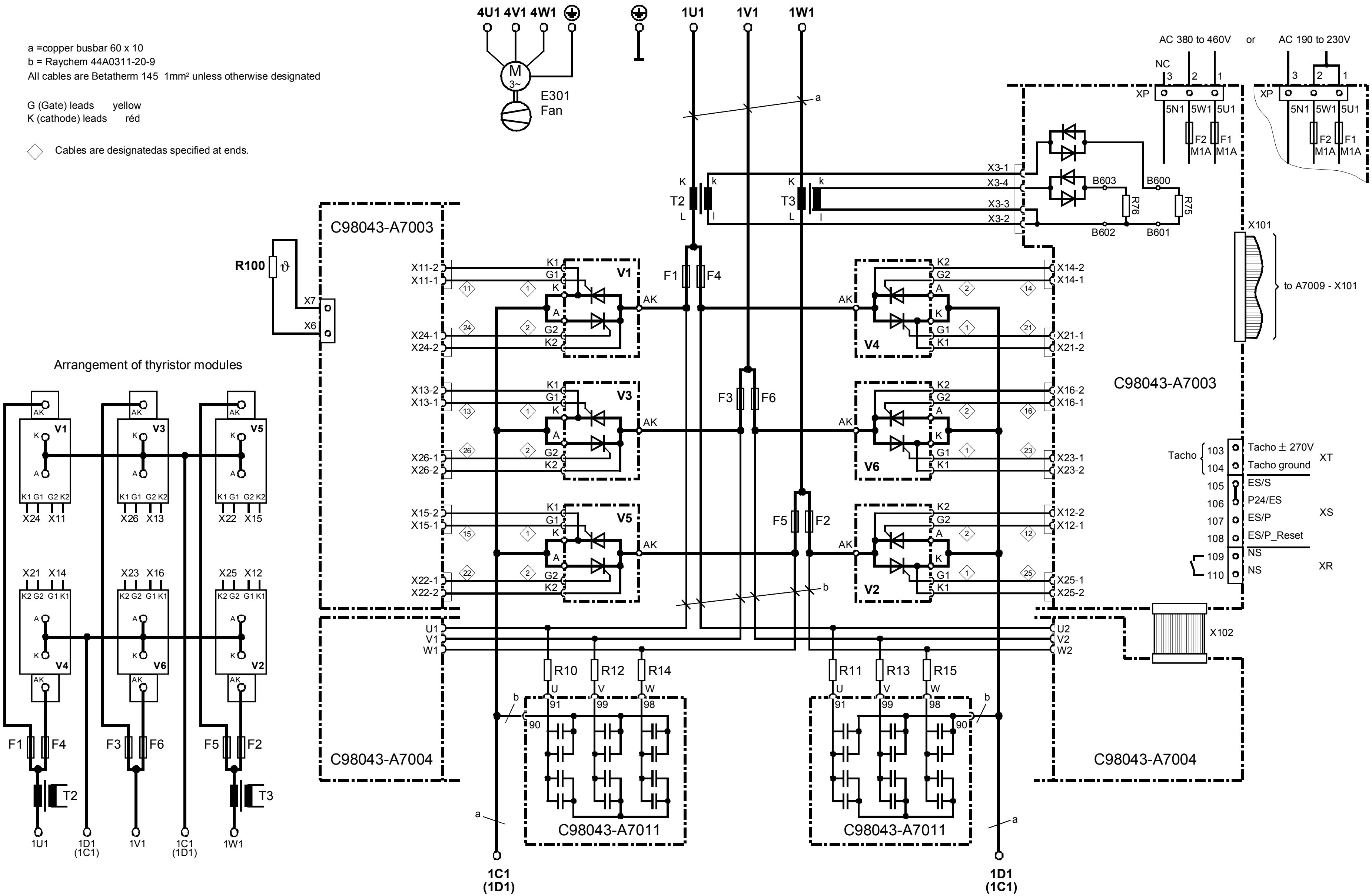
a = copper busbar 60 x 5
b = Raychem 44A0311-20-9
All cables are Betatherm 145 1mm² unless otherwise designated

G (Gate) leads yellow
K (cathode) leads red

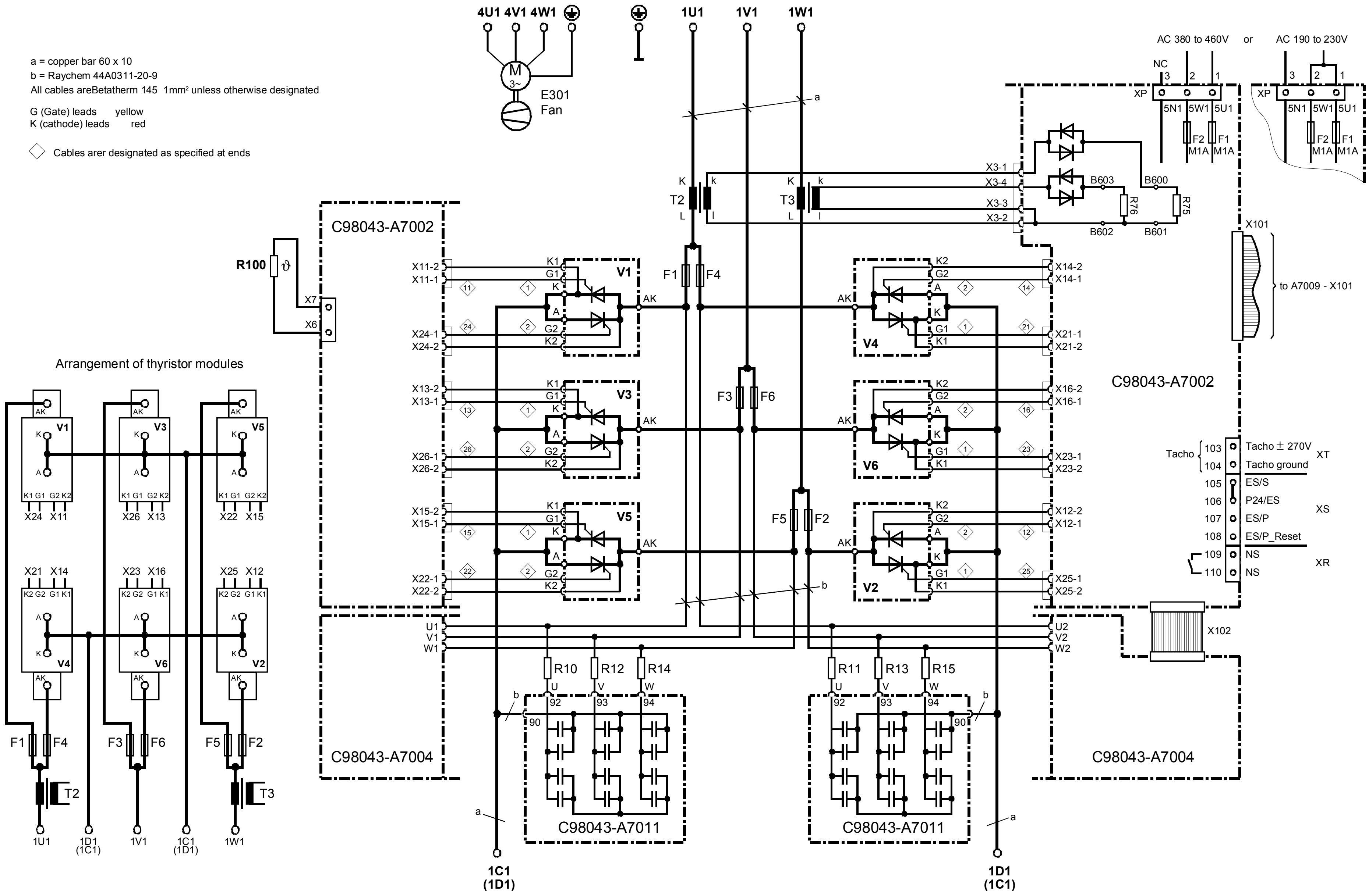
◇ Cables are designated as specified at ends



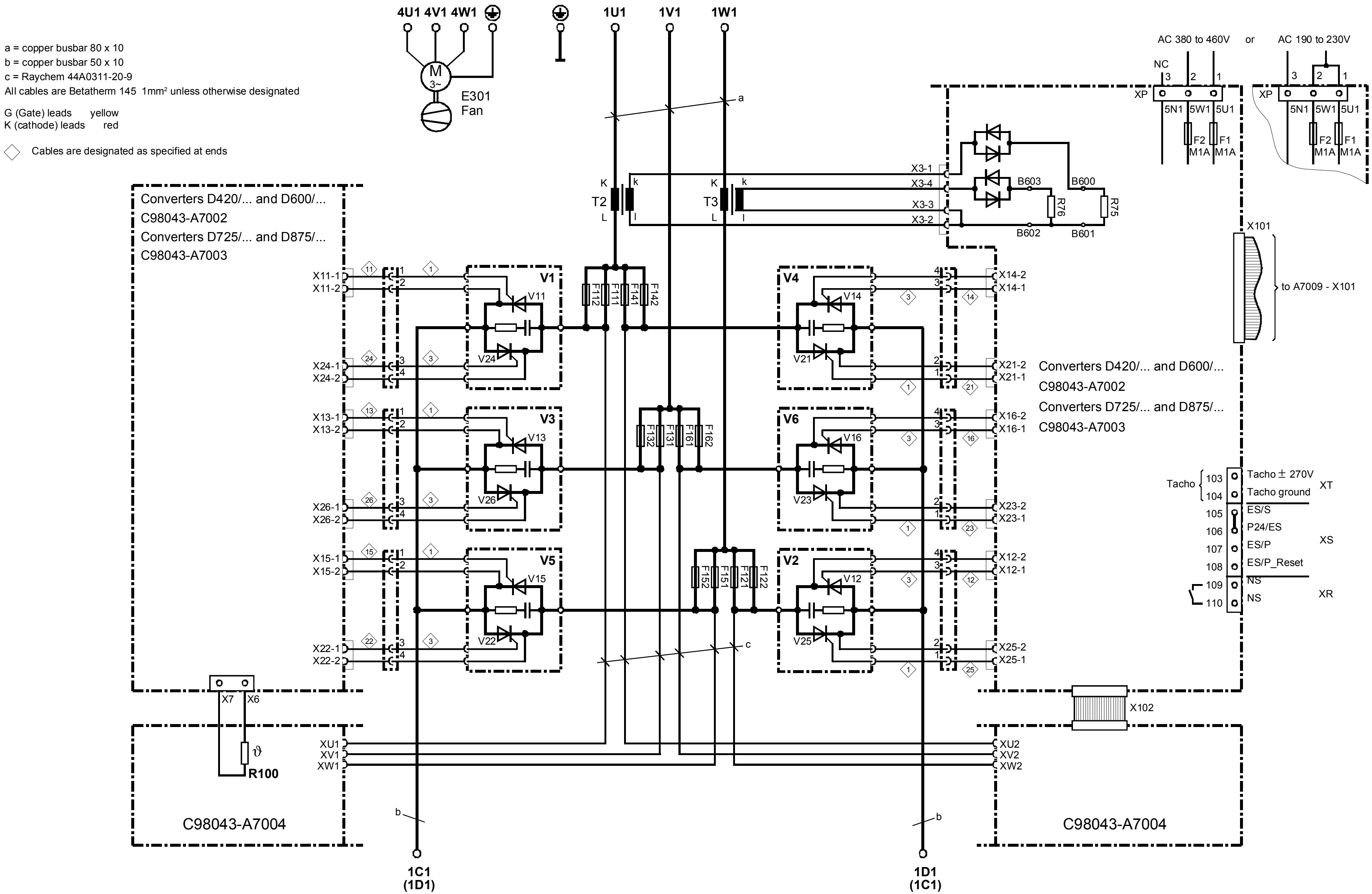
6.4.18 Converters: 950A to 1000A, 4Q



6.4.19 Converters: 1100 to 1200A, 4Q



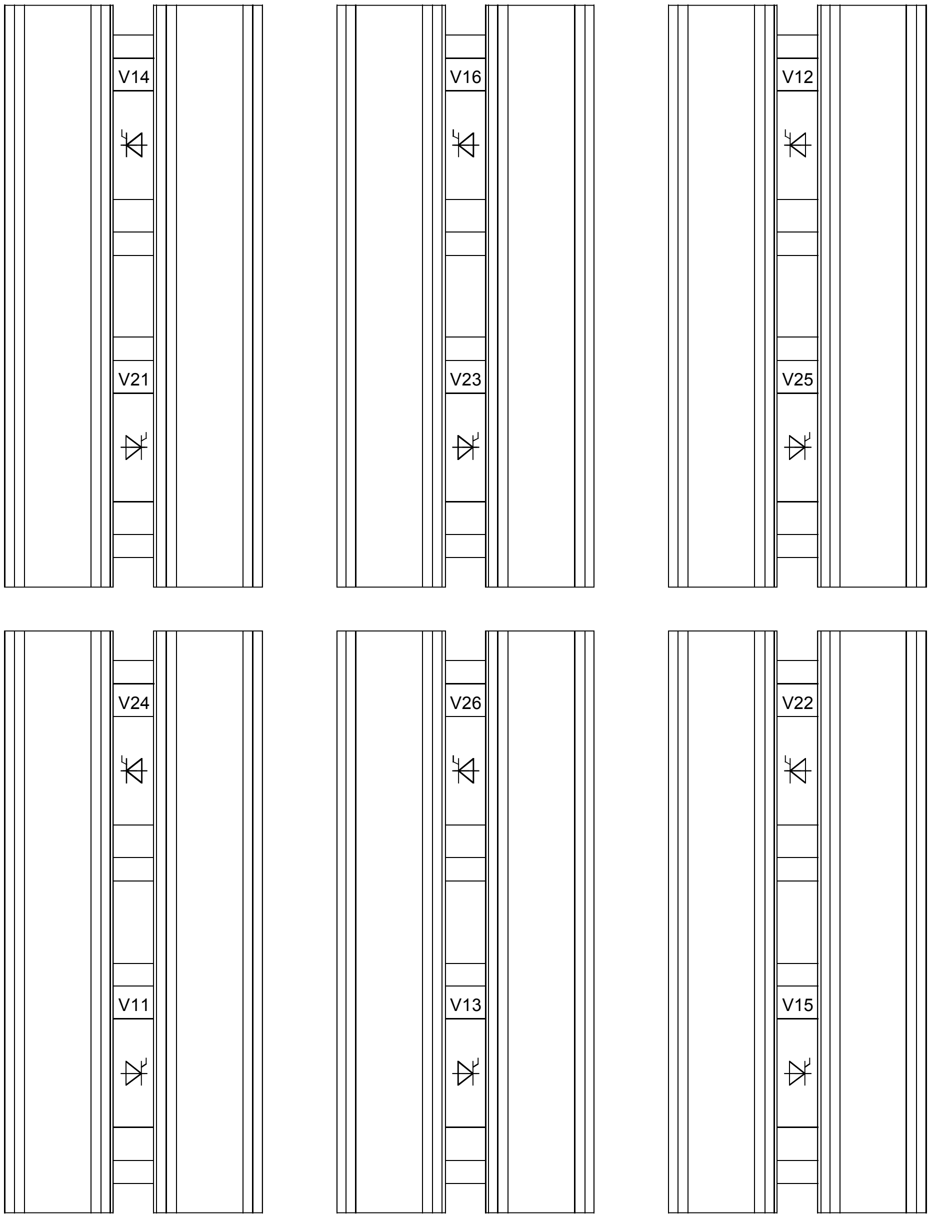
6.4.20 Converters: 1500 to 2200A, 4Q



Arrangement of thyristor blocks

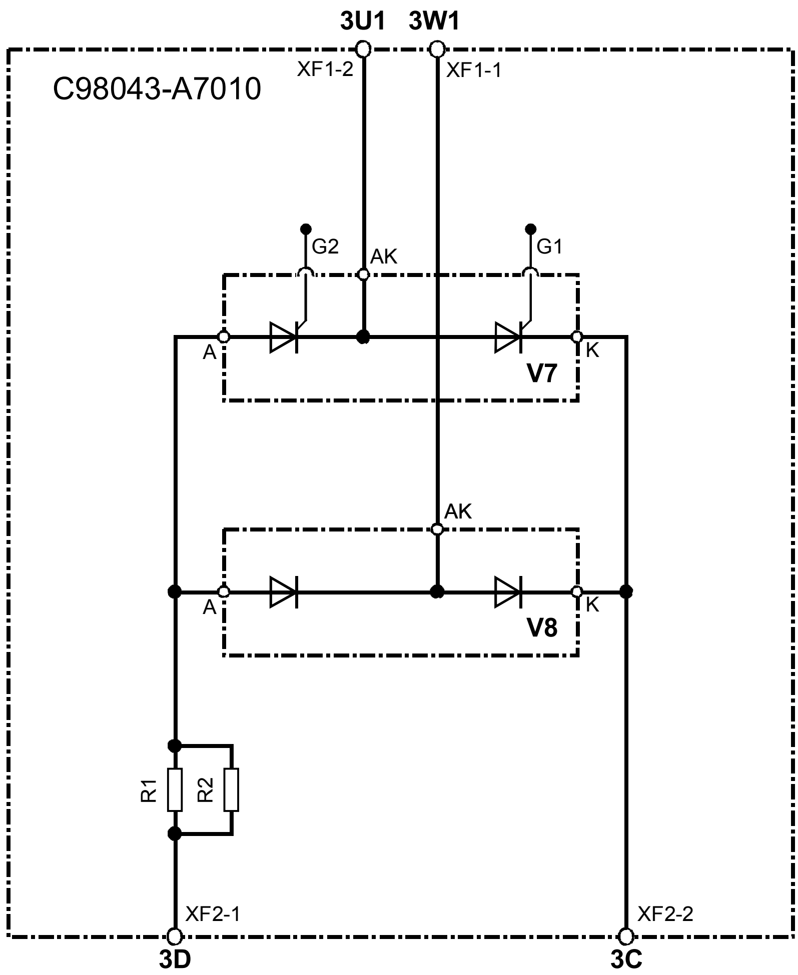
At rear

At front



6.5 Field supply

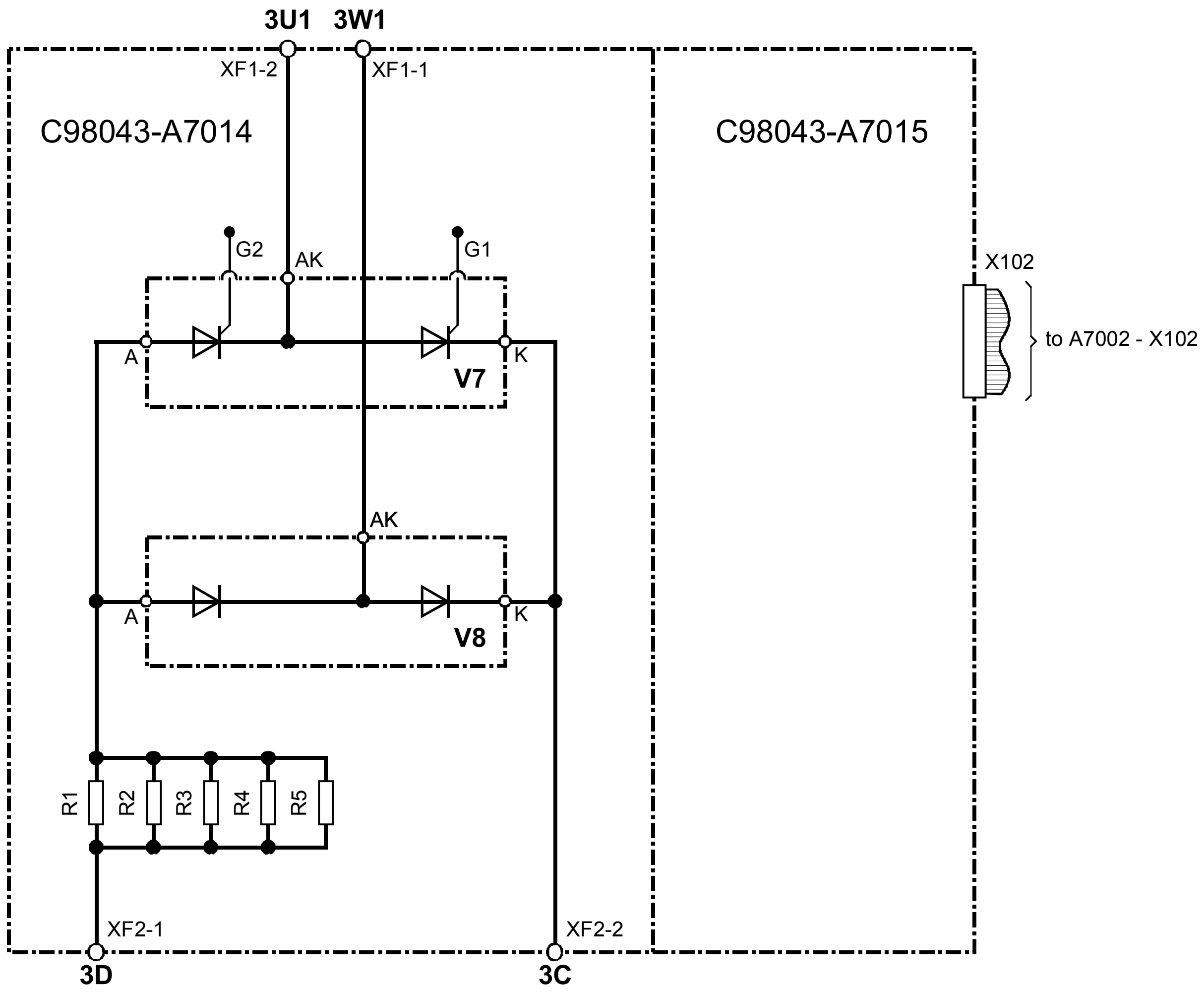
Converter type D . . . / 15 to 30



Gating leads are Betatherm 145 1mm²

Module	Rated DC current armature	Rated DC current field	R1	R2
A7010-L1	15A	3A	0R1	0R1
A7010-L2	30A	5A	0R1	0R05

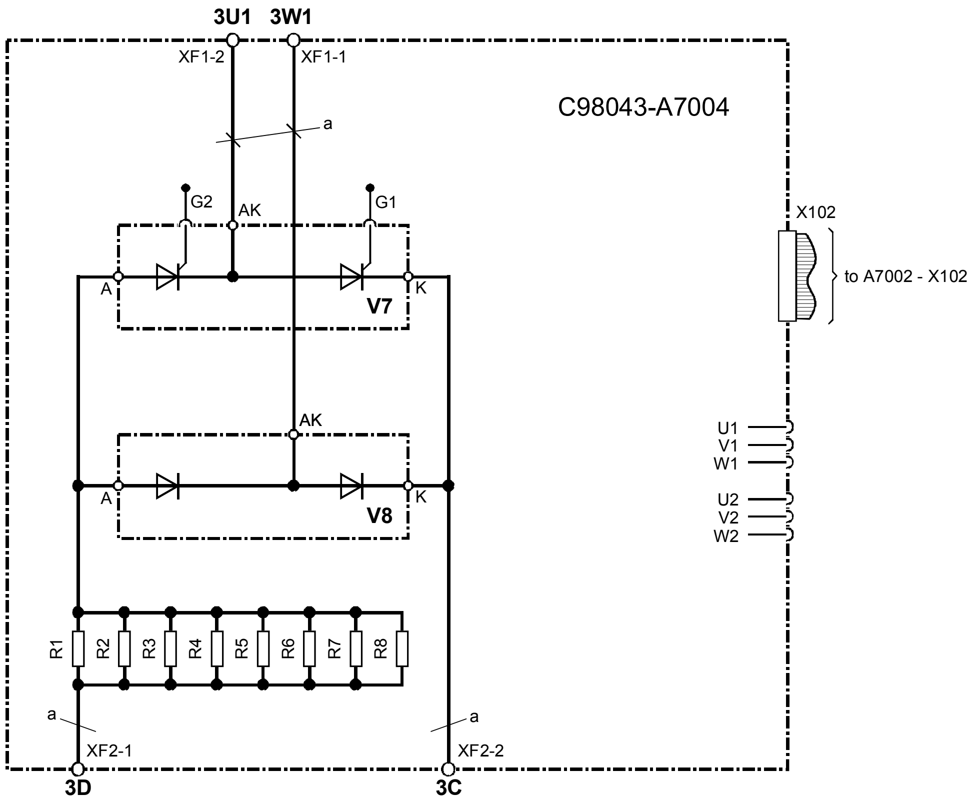
Converter type D . . . / 60 to 850



Gating leads are 145 1mm²

Module	Rated DC current armature	Rated DC current field	R1	R2	R3	R4	R5
A7014-L1	60A to 125A	10A	0R04	0R04	—	—	—
A7014-L2	210A to 280A	15A	0R04	0R04	0R04	0R04	0R04
A7014-L2	400A to 600A	25A	0R04	0R04	0R04	0R04	0R04
A7014-L2	720A to 850A	30A	0R04	0R04	0R04	0R04	0R04

Converter type D . . . / 900 to 2200



a = Betatherm 145 6mm²
Gating leads are Betatherm 145 1mm²

Module	Rated DC current armature	Rated DC current field	R1	R2	R3	R4	R5	R6	R7	R8
A7004-L1/-L2	900A to 1200A	30A	0R04	0R04	0R04	0R04	0R04	0R04	0R04	0R04
A7004-L1/-L2	1500A to 2000A	40A	0R04	0R04	0R04	0R04	0R04	0R04	0R04	0R04
A7004-L3	2200A	85A	0R01	0R01	0R01	0R01	0R01	0R01	0R01	0R01

6.6 Fuses and commutating reactors

6.6.1 Commutating reactors

Commutating reactors can be selected from Catalog DA93.1.
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 (subject to local regulations).

6.6.2 Fuses

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

It is essential to use "UL-listed" or "UL-recognized" fuses for protection of devices in accordance with UL standards.

6.6.2.1 Recommended fuses for field circuit

Converter unit Rated DC current	Max. permissible field current	1 Siemens fuse		1 Bussmann fuse FWP 700V ЯU	
A	A	Order No.	A	Order No.	A
15	3	5SD420	16	FWP-5B	5
30	5	5SD420	16	FWP-5B	5
60 to 125	10	5SD420	16	FWP-15B	15
210 to 280	15	5SD440	25	FWP-20B	20
400 to 600	25	5SD440	25	FWP-30B	30
710 to 1200	30	5SD480	30	FWP-35B	35
1500 to 2000	40	3NE1802-0 1)	40	FWP-50B	50
2200	85	3NE8021-1 1)	100	FWP- 100B	100

1) UL-recognized

6.6.2.2 Fuses for armature circuit

6.6.2.2.1 Converters 1Q: 400V, 575V, 690V and 830V

Converter Order No.	C / V A / V	3 line fuses Siemens ЯU	
		Order No.	C / V A / V
6RA7018-6DS22	30 / 400	3NE8003-1	35 / 690
6RA7025-6DS22	60 / 400	3NE1817-0	50 / 690
6RA7025-6GS22	60 / 575	3NE1817-0	50 / 690
6RA7028-6DS22	90 / 400	3NE1820-0	80 / 690
6RA7031-6DS22	125 / 400	3NE1021-0	100 / 690
6RA7031-6GS22	125 / 575	3NE1021-0	100 / 690
6RA7075-6DS22	210 / 400	3NE3227	250 / 1000
6RA7075-6GS22	210 / 575	3NE3227	250 / 1000
6RA7078-6DS22	280 / 400	3NE3231	350 / 1000
6RA7081-6DS22	400 / 400	3NE3233	450 / 1000
6RA7081-6GS22	400 / 575	3NE3233	450 / 1000
6RA7085-6DS22	600 / 400	3NE3336	630 / 1000
6RA7085-6GS22	600 / 575	3NE3336	630 / 1000
6RA7087-6DS22	850 / 400	3NE3338-8	800 / 800
6RA7087-6GS22	800 / 575	3NE3338-8	800 / 800
6RA7086-6KS22	720 / 690	3NE3337-8	710 / 900

Converter Order No.	C / V A / V	Branch fuses Siemens ᴙU		
		Qty.	Order No.	C / V A / V
6RA7091-6DS22	1200 / 400	6	3NE3338-8	800 / 800
6RA7090-6GS22	1000 / 575	6	3NE3337-8	710 / 900
6RA7088-6KS22	950 / 690	6	3NE3337-8	710 / 900
6RA7088-6LS22	900 / 830	6	3NE3337-8	710 / 900
6RA7093-4DS22	1600 / 400	6	6RY1702-0BA02	1000 / 660
6RA7093-4GS22	1600 / 575	6	6RY1702-0BA02	1000 / 660
6RA7093-4KS22	1500 / 690	6	6RY1702-0BA03	1000 / 1000
6RA7093-4LS22	1500 / 830	6	6RY1702-0BA03	1000 / 1000
6RA7095-4DS22	2000 / 400	6	6RY1702-0BA01	1250 / 660
6RA7095-4GS22	2000 / 575	6	6RY1702-0BA01	1250 / 660
6RA7095-4KS22	2000 / 690	12	6RY1702-0BA04	630 / 1000
6RA7095-4LS22	1900 / 830	12	6RY1702-0BA04	630 / 1000
6RA7096-4GS22	2200 / 575	6	6RY1702-0BA05	1500 / 660

Branch fuses are included in converter, external semiconductor fuses are not needed.

6.6.2.2.2 Converters 1Q: 460V

Converter Order No.	C / V A / V	3 line fuses Siemens ᴙU		3 line fuses Bussmann ᴙU		3 line fuses Bussmann ᴙU	
		Order No.	C / V A / V	Order No.	C / V A / V	Order No.	C / V A / V
6RA7018-6FS22	30 / 460	3NE1815-0	25 / 690	170M1562	32 / 660	FWH-35B	35 /500
6RA7025-6FS22	60 / 460	3NE1817-0	50 / 690	170M1565	63 / 660	FWH-60B	60 /500
6RA7028-6FS22	90 / 460	3NE1820-0	80 / 690	170M1567	100 / 660	FWH-100B	100 /500
6RA7031-6FS22	125 / 460	3NE1021-0	100 / 690	170M1568	125 / 660	FWH-125B	125 /500
6RA7075-6FS22	210 / 460	3NE3227	250 / 1000	170M3166	250 / 660	FWH-225A	225 /500
6RA7078-6FS22	280 / 460	3NE3231	350 / 1000	170M3167	315 / 660	FWH-275A	275 /500
6RA7082-6FS22	450 / 460	3NE3233	450 / 1000	170M3170	450 / 660	FWH-450A	450 /500
6RA7085-6FS22	600 / 460	3NE3336	630 / 1000	170M4167	700 / 660	FWH-600A	600 /500
6RA7087-6FS22	850 / 460	3NE3338-8	800 / 800	170M5165	900 / 660	FWH-800A	800 /500

FWH-... and FWP-... fuses are not mechanically compatible with the 3NE... or 170M... fuses.

Converter Order No.	C / V A / V	Branch fuses Siemens ᴙU		
		Qty.	Order No.	C / V A / V
6RA7091-6FS22	1200 / 460	6	3NE3338-8	800 / 800

Branch fuses are included in converter, external semiconductor fuses are not needed.

6.6.2.2.3 Converters 4Q: 400V, 575V, 690V and 830V

Converter Order No.	C / V A / V	3 line fuses Siemens ЯU Order No.	I / U A / V	1 DC fuse Siemens ЯU Order No.	C / V A / V
6RA7013-6DV62	15 / 400	3NE1814-0	20 / 690	3NE1814-0	20 / 690
6RA7018-6DV62	30 / 400	3NE8003-1	35 / 690	3NE4102	40 / 1000
6RA7025-6DV62	60 / 400	3NE1817-0	50 / 690	3NE4120	80 / 1000
6RA7025-6GV62	60 / 575	3NE1817-0	50 / 690	3NE4120	80 / 1000
6RA7028-6DV62	90 / 400	3NE1820-0	80 / 690	3NE4122	125 / 1000
6RA7031-6DV62	125 / 400	3NE1021-0	100 / 690	3NE4124	160 / 1000
6RA7031-6GV62	125 / 575	3NE1021-0	100 / 690	3NE4124	160 / 1000
6RA7075-6DV62	210 / 400	3NE3227	250 / 1000	3NE3227	250 / 1000
6RA7075-6GV62	210 / 575	3NE3227	250 / 1000	3NE3227	250 / 1000
6RA7078-6DV62	280 / 400	3NE3231	350 / 1000	3NE3231	350 / 1000
6RA7081-6DV62	400 / 400	3NE3233	450 / 1000	3NE3233	450 / 1000
6RA7081-6GV62	400 / 575	3NE3233	450 / 1000	3NE3233	450 / 1000
6RA7085-6DV62	600 / 400	3NE3336	630 / 1000	3NE3336	630 / 1000
6RA7085-6GV62	600 / 575	3NE3336	630 / 1000	3NE3336	630 / 1000
6RA7087-6DV62	850 / 400	3NE3338-8	800 / 800	3NE3334-0B 1)	500 / 1000
6RA7087-6GV62	850 / 575	3NE3338-8	800 / 800	3NE3334-0B 1)	500 / 1000
6RA7086-6KV62	760 / 690	3NE3337-8	710 / 900	3NE3334-0B 1)	500 / 1000

1) Two fuses connected in parallel

Converter Order No.	C / V A / V	Branch fuses Siemens ЯU Qty.	Order No.	C / V A / V
6RA7091-6DV62	1200 / 400	6	3NE3338-8	800 / 800
6RA7090-6GV62	1100 / 575	6	3NE3338-8	800 / 800
6RA7090-6KV62	1000 / 690	6	3NE3337-8	710 / 900
6RA7088-6LV62	950 / 830	6	3NE3337-8	710 / 900
6RA7093-4DV62	1600 / 400	6	6RY1702-0BA02	1000 / 660
6RA7093-4GV62	1600 / 575	6	6RY1702-0BA02	1000 / 660
6RA7093-4KV62	1500 / 690	6	6RY1702-0BA03	1000 / 1000
6RA7093-4LV62	1500 / 830	6	6RY1702-0BA03	1000 / 1000
6RA7095-4DV62	2000 / 400	6	6RY1702-0BA01	1250 / 660
6RA7095-4GV62	2000 / 575	6	6RY1702-0BA01	1250 / 660
6RA7095-4KV62	2000 / 690	12	6RY1702-0BA04	630 / 1000
6RA7095-4LV62	1900 / 830	12	6RY1702-0BA04	630 / 1000
6RA7096-4GV62	2200 / 575	6	6RY1702-0BA05	1500 / 660

Branch fuses are included in converter, external semiconductor fuses are not needed.

6.6.2.2.4 Converters 4Q: 460V

Converter Order No.	C / V A / V	3 line fuses Siemens ЯU		3 line fuses Bussmann ЯU		3 line fuses Bussmann ЯU	
		Order No.	C / V A / V	Order No.	C / V A / V	Order No.	C / V A / V
6RA7018-6FV62	30 / 460	3NE1815-0	25 / 690	170M1562	32 / 660	FWH-35B	35 /500
6RA7025-6FV62	60 / 460	3NE1817-0	50 / 690	170M1565	63 / 660	FWH-60B	60 /500
6RA7028-6FV62	90 / 460	3NE1820-0	80 / 690	170M1567	100 / 660	FWH-100B	100 /500
6RA7031-6FV62	125 / 460	3NE1021-0	100 / 690	170M1568	125 / 660	FWH-125B	125 /500
6RA7075-6FV62	210 / 460	3NE3227	250 / 1000	170M3166	250 / 660	FWH-225A	225 /500
6RA7078-6FV62	280 / 460	3NE3231	350 / 1000	170M3167	315 / 660	FWH-275A	275 /500
6RA7082-6FV62	450 / 460	3NE3233	450 / 1000	170M3170	450 / 660	FWH-450A	450 /500
6RA7085-6FV62	600 / 460	3NE3336	630 / 1000	170M4167	700 / 660	FWH-600A	600 /500
6RA7087-6FV62	850 / 460	3NE3338-8	800 / 800	170M5165	900 / 660	FWH-800A	800 /500

Converter Order No.	C / V A / V	1 DC fuse Siemens ЯU		1 DC fuse Bussmann ЯU	
		Order No.	C / V A / V	Order No.	C / V A / V
6RA7018-6FV62	30 / 460	3NE4102	40 / 1000	FWP-35B	35 / 660
6RA7025-6FV62	60 / 460	3NE4120	80 / 1000	FWP-70B	70 / 660
6RA7028-6FV62	90 / 460	3NE4122	125 / 1000	FWP-125A	125 / 660
6RA7031-6FV62	125 / 460	3NE4124	160 / 1000	FWP-150A	150 / 660
6RA7075-6FV62	210 / 460	3NE3227	250 / 1000	FWP-250A	250 / 660
6RA7078-6FV62	280 / 460	3NE3231	350 / 1000	FWP-350A	350 / 660
6RA7082-6FV62	450 / 460	3NE3334-0B	500 / 1000	FWP-500A	500 / 660
6RA7085-6FV62	600 / 460	3NE3336	630 / 1000	FWP-700A	700 / 660
6RA7087-6FV62	850 / 460	3NE3334-0B 1)	500 / 1000	FWP-1000A	1000 / 660

FWH-... and FWP-... fuses are not mechanically compatible with the 3NE... or 170M... fuses.

1) Two fuses connected in parallel

Converter Order No.	C / V A / V	Branch fuses Siemens ЯU		
		Qty.	Order No.	C / V A / V
6RA7091-6FV62	1200 / 460	6	3NE3338-8	800 / 800

Branch fuses are included in converter, external semiconductor fuses are not needed.

6.6.2.3 F1 and F2 fuses in the power interface

Only UL listed or UL recognized fuses must be used for UL listed converters.

Wickmann 198 1A / 250 V 5 x 20 mm time lag

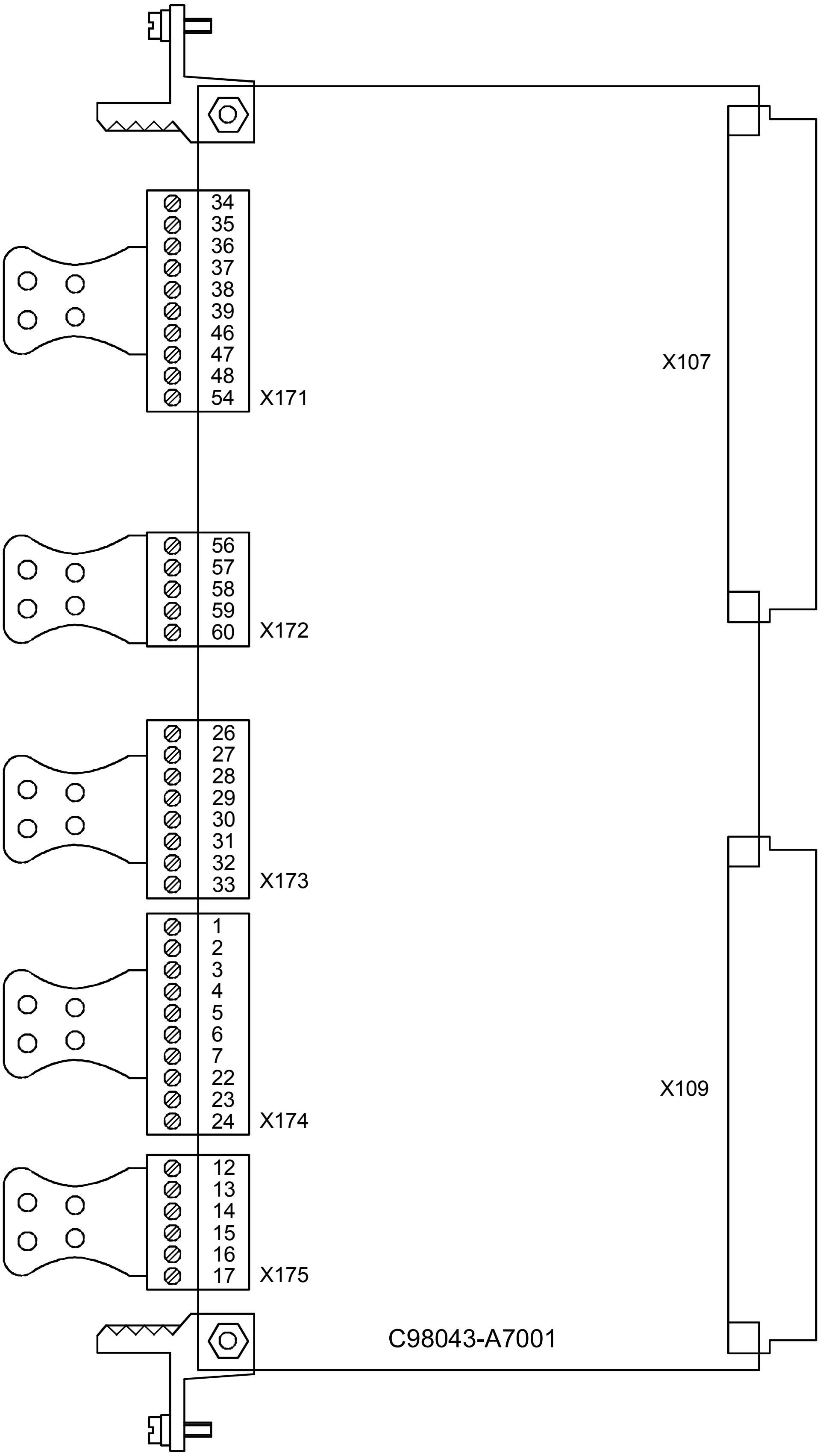
Wickmann 343 1A / 250 V 6,3 x 32 mm time lag

Schurter FSD 1A / 250 V 5 x 20 mm time lag Ordering Code 0034.3987

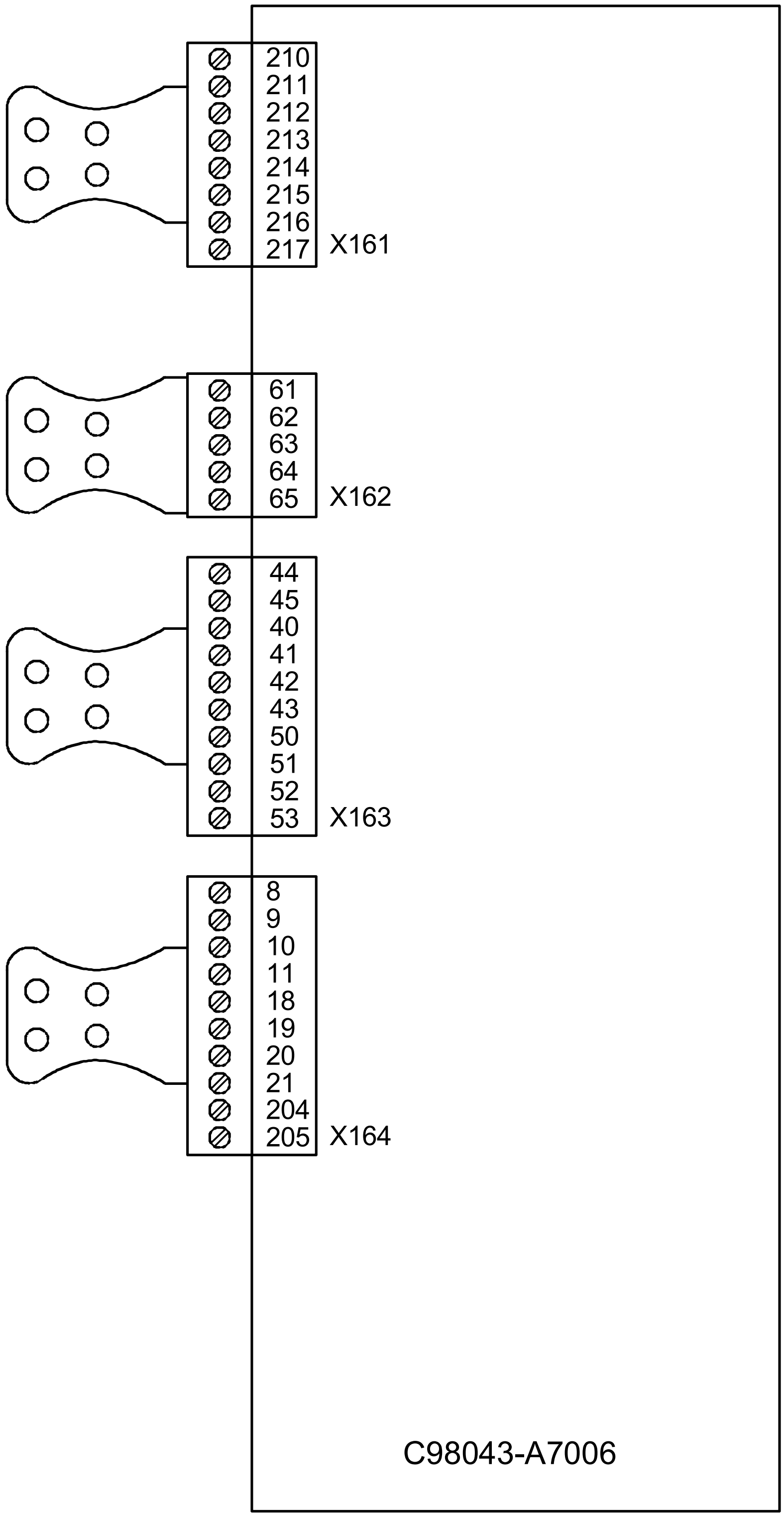
Schurter FST 1A / 250 V 5 x 20 mm time lag Ordering Code 0034.3117

6.7 Terminal arrangement

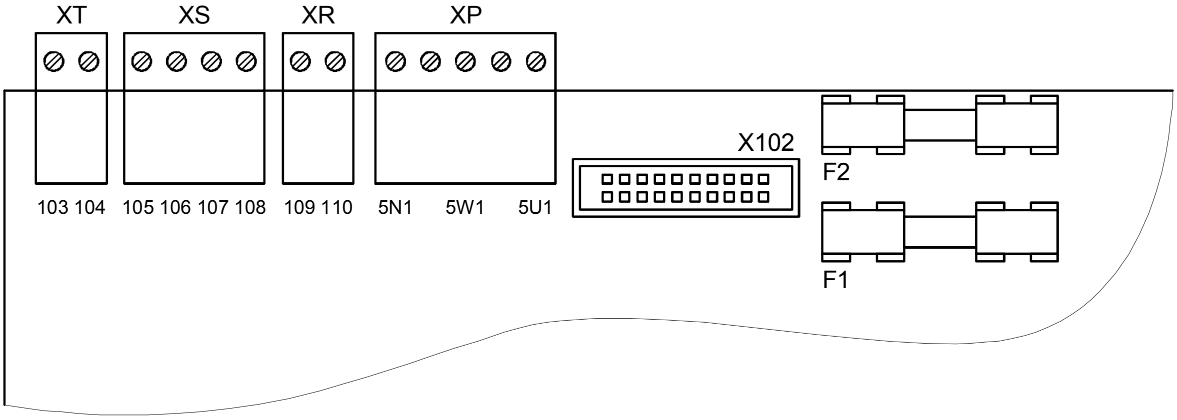
Module C98043-A7001 (CUD1)



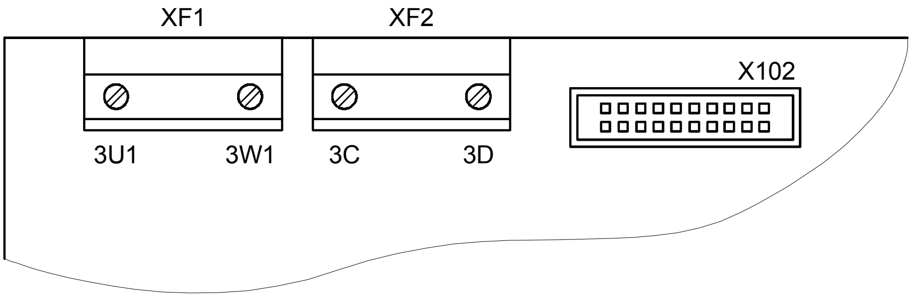
Module C98043-A7006 (CUD2)



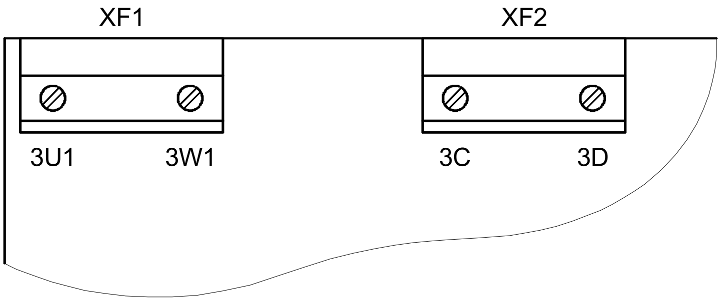
Module C98043-A7002 or C98043-A7003



Module C98043-A7010



Module C98043-A7014



6.8 Terminal assignments

WARNING

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

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

Power section

	Terminal type:
15A and 30A units	KDS10 PCB feed-through terminal (screw-type terminal) Maximum cross-section 10mm^2, finely stranded
60A to 280A units	1U1,1V1,1W1: Through-hole for M8 (3x20 copper bus) 1C1,1D1: Through-hole for M8 (5x20 copper bus)

400A and 600A units	1U1,1V1,1W1: Through-hole for M10 (5x30 copper bus) 1C1,1D1: Through-hole for M10 (5x35 copper bus)
710A to 850A units	Through-hole for M12 (5x60 copper bus)
950A to 1200A units	Through-hole for M12 (10x60 copper bus)
1500A to 2200A units	1U1,1V1,1W1: Through-hole for M12 (10x80 copper bus) 1C1,1D1: Through-hole for M12 (10x50 copper bus)

The converters are designed for a permanent power supply connection according to DIN VDE 0160 Section 6.5.2.1.
PE conductor connection: Minimum cross-section 10mm^2. (see Section 5.1 for connection options).

The connection cross-sections must be determined according to the applicable regulations, e.g. DIN VDE 100 Part 523, DIN VDE 0276 Part 1000.

Function	Terminal	Connection values/Remarks
Armature supply input	1U1 1V1 1W1	see technical data in Section 3.4
PE conductor	⏚	
Armature circuit motor connection	1C1 (1D1) 1D1 (1C1)	

Field circuit

	Terminal type:
15A to 850A units	MKDS terminal block (screw-type terminal) Maximum connection cross-section 4mm^2, finely stranded
1200A to 2000A units	G10/4 converter terminal (screw-type terminal) Maximum connection cross-section 10mm^2, finely stranded
2200A units	UK16N converter terminal (screw-type terminal) Maximum connection cross-section 16mm^2, finely stranded

Function	Terminal		Connection values/Remarks
Supply connection	XF1-2	3U1	2AC 400 (– 20%), 2AC 460 (+10%)
	XF1-1	3W1	
Field winding connection	XF2-2	3C	Rated DC voltage 325V / 373V
	XF2-1	3D	For 2AC 400 / 460 supply connection

Electronics power supply

Terminal type: Type 49 plug-in terminal
Maximum cross-section 1.5mm^2, finely stranded

Function	Connection	Terminal XP	Connection values/Remarks
Incoming supply 400V	1 2 NC 3	5U1 5W1 5N1	2AC 380 to 460 (+15% / – 25%); I_n=1A (– 35% for 1min) Internal fuse protection with F1, F2 on board C98043-A7002 or -A7003 (see Section 6.6.2.3) external fuse protection 6A, characteristic C recommended
or			
Incoming supply 230V	1 2 3	5U1 5W1 5N1	1AC 190 (– 25%) to 230 (+15%); I_n=2A (– 35% for 1min) Internal fuse protection with F1, F2 on board C98043-A7002 or -A7003 (see Section 6.6.2.3) external fuse protection 6A, characteristic C recommended

NOTE

In the case of line voltages which exceed the tolerance range specified in Section 3.4, the electronics supply voltage, field circuit mains supply connection and converter fan 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.

Fan

(for forced-cooled converters ≥ 400A)

Terminal type: DFK-PC4 plug-in terminal (screw-type)
Maximum connection cross-section 4mm² , finely stranded

The insulation on the supply cables must be taken up to the terminal housing.

Function	Terminal	Connection values/Remarks
Incoming supply 400V to 460V	4U1 4V1 4W1	3AC 400 to 460 For further details, see technical data in Section 3.4
PE conductor	⏚	
or		
Incoming supply 230V	4U1 4N1	1AC 230 For further details, see technical data in Section 3.4

WARNING

The converter might overheat if the incorrect phase sequence is connected (incorrect direction of rotation of fan).

Check:

- On converters up to 850A (fan at bottom), check whether fan is rotating in direction of arrow
- On converters of > 850A (fan at top), check whether fan is rotating in counter-clockwise direction (to left) when viewed from above

Caution: Rotating parts can cause physical injuries!

Open-loop and closed-loop control section

Terminal type: **X171 to X175** Plug-in terminal (screw-type)
Maximum connection cross-section 1.5mm²

XR, XS, XT MSTB2.5 plug-in terminal
Maximum connection cross-section 2.5mm²

Analog inputs - setpoint inputs, reference voltage (see also Section 8, sheet G113)

Function		Terminal X174	Connection values/Remarks
Reference	M P10 N10	1 2 3	±1% at 25°C (stability 0.1% per 10°K); 10mA short-circuit-proof
Select input	main setpoint + main setpoint –	4 5	Differential input Parameter settings: ±10V; 150kΩ Resolution can be parameterized up to approx. 555µV (±14bits) Parameter settings: 0 - 20mA; 300Ω 4 - 20mA; 300Ω Common mode suppression: ±15V
Select input	analog 1 + analog 1 –	6 7	

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

Function	Terminal XT	Connection values/Remarks
Tacho connection 8V to 270V	103	±270V; >143kΩ
Ground analog M	104	

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

Function		Terminal X173	Connection values/Remarks	
Supply (+13,7V to+15,2V)		26	200mA; short-circuit-proof (electronic protection) Overload response: Fault message F018	
Ground pulse encoder M		27		
Track 1	Positive terminal	28	Load:	≤5.25mA at 15V
	Negative terminal	29	(w/o switching losses, see below for cable, cable length, shield connection)	
Track 2	Positive terminal	30	Switching hysteresis:	See below
	Negative terminal	31	Pulse/pause ratio:	1:1
Zero marker	Positive terminal	32	Level of input pulses:	See below
	Negative terminal	33	Track offset:	Table 1 see below
			Pulse frequency:	Table 2 see below
			Cable length:	See below

Characteristic data of pulse tacho evaluation electronics

Level of input pulses:

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

Electronic adaptation of evaluation electronics to signal voltage of encoder:

– Rated input voltage range **5V** P142=0 (see also Section 8, sheet 17):
  Low level: Differential voltage <0.8V
  High level: Differential voltage >2.0V
  Hysteresis: >0.2V
  Common-mode control range: ±10V

– Rated input voltage range **15V** P142=1 (see also Section 8, sheet 17):
  Low level: Differential voltage <5.0V
  High level: Differential voltage >8.0V Restriction: See switching frequency
  Hysteresis: >1V
  Common-mode control range: ±10V

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 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)	2V	>2.5V	8V	10V	>14V
T_{min} 2)	630ns	380ns	630ns	430ns	380ns

1) Differential voltage at terminals of evaluation electronics
2) The phase error L_G (deviating from 90°), which may occur as the result of encoder and cable, can be calculated from T_{min} :
   $L_G = \pm (90° - f_p * T_{min} * 360° * 10^{-6})$
   L_G [°] = phase error
   f_p [kHz] = pulse frequency
   T_{min} [ns] = 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 3)	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 over the largest possible surface area.

Temperature sensor inputs (motor interface 1) (see also Section 8, sheet G185)

Function	**Terminal X174**	**Connection values/Remarks**
Motor temperature Connection of the temperature sensor	22 23	Sensor acc. to P490 index 1
Ground analog M	24	

Analog outputs (see also Section 8, sheet G115)

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

Binary control inputs (see also Section 8, sheet G110)

Function	Terminal X171	Connection values/Remarks
Supply (output)	34	24V DC, internal short-circuit-proof supply referred to internal ground. The sum of the currents drawn from terminals 34, 44 and 210 must not exceed 200 mA. Overload response: Fault message F018
Ground digital M	35	
Select input binary 1	36	H signal:+13V to +33V L signal:– 33V to +3V or terminal open 8.5mA at 24V
Power On / Shutdown H signal: Power ON Line contactor CLOSED + (with H signal at terminal 38), acceleration along ramp-function generator ramp to operating speed. L signal: Shutdown Deceleration along ramp-function generator ramp to $n < n_{min}$ (P370) + , controller disable + line contactor OPEN. See Section 9.3 for exact function description.	37	
Enable operation H signal: Controller enabled L signal: Controller disabled See Section 9.3.4 for exact function description	38	
Select input binary 2	39	

Safety shutdown (E-STOP, see also Section 9.8)

Function	Terminal XS	Connection values/Remarks
Supply for safety shutdown (output)	106	24V DC, max. load 50mA, short-circuit-proof Overload response: Fault message F018
Safety shutdown switch	105	I_e = 20mA
Safety shutdown pushbutton	107	NC contact I_e = 30mA
Safety shutdown Reset	108	NO contact I_e = 10mA

NOTICE

Either terminal 105 or terminals 107 + 108 may be used!

Terminal 105 is connected to terminal 106 in the delivery state.

Binary control outputs (see also Section 8, sheet G112)

Function	Terminal X171	Connection values/Remarks
Select output binary 1 Ground M	46 47	H signal: +20V to +26V L signal: 0 to +2V Short-circuit-proof 100mA Internal snubber circuit (free-wheeling diode) Overload response: Fault message F018
Select output binary 2 Ground M	48 54	

Binary control outputs (isolated relay outputs)

Function	Terminal XR	Connection values/Remarks
Relay for line contactor	109 110	Load capability: ≤250V AC, 4A; cosΦ=1 ≤250V AC, 2A; cosΦ=0,4 ≤30V DC, 2A External fuse protection 4A, characteristic C recommended

Serial interface 1 RS232 (9-pin SUBMIN D socket connector)
X300
Use a shielded connecting cable! Ground shield at both ends!

Con. pin X300	Function
1	Housing earth
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 to a PLC or PC can be made using connector X300 on the PMU, allowing the converter to be controlled and operated from a central control center or room.

Serial interface 2 RS485

Function	**Terminal 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, 2-wire send/receive cable, positive differential input
RX-/TX-	59	RS485, 4-wire receive cable, negative differential input, 2-wire send/receive cable, negative differential input
M	60	Ground

Cable length: For transmission rate =187.5kBd 600m
For transmission rate ≤93.75kBd 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.

Activation of interface 1 or 2:

– Set the baud rate in parameter P783 or P793.

– Set the protocol in parameter P780 or P790.

Options:

Terminal expansion CUD2 (C98043-A7006)

Terminal type: Plug-in terminal (screw-type)
Max. connection cross-section 1.5mm^2

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

Function	Terminal X164	Connection values/Remarks
Motor temp. positive terminal Motor temp. negative terminal	204 205	Sensor acc. to P490 index 2
	Terminal X161	
Supply binary inputs (output)	210	24V DC, internal short-circuit-proof supply referred to internal ground. The sum of the currents drawn from terminals 34, 44 and 210 must not exceed 200 mA. Overload response: Fault message F018
Binary input Binary input Binary input Binary input	211 212 213 214	H signal:+13V to +33V L signal:– 33V to +3V or terminal open Input resistance = 2.8kΩ
Ground for binary inputs Ground for binary inputs M	215 216 217	can be isolated from internal ground (open wire jumper between terminals 216 and 217)

Analog inputs (see also Section 8, sheet G114)

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

Analog outputs (see also Section 8, sheet G116)

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

Binary inputs (see also Section 8, sheet G111)

Function		Terminal X163	Connection values/Remarks
Supply Ground digital M		44 45	24V DC, internal short-circuit-proof supply referred to internal ground. The sum of the currents drawn from terminals 34, 44 and 210 must not exceed 200 mA. Overload response: Fault message F018
Select input	binary 3	40	H signal:+13V to +33V L signal:– 33V to +3V or terminal open 8.5mA at 24V
Select input	binary 4	41	
Select input	binary 5	42	
Select input	binary 6	43	

Binary outputs (see also Section 8, sheet G112)

Function		Terminal X163	Connection values/Remarks
Select output	binary 3	50	H signal:+20V to +26V L signal:0 to +2V Short-circuit-proof 100mA Internal snubber circuit (free-wheeling diode) Overload response: Fault message F018
Ground M		51	
Select output	binary 4	52	
Ground M		53	

Serial interface 3 RS485

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

Cable length: For transmission rate =187.5kBd 600m
For transmission rate ≤93.75kBd 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 commencing with start-up on the converters (90A to 600A), make sure that the transparent terminal cover is mounted in the correct position (see Section 5.1).

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

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.

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.

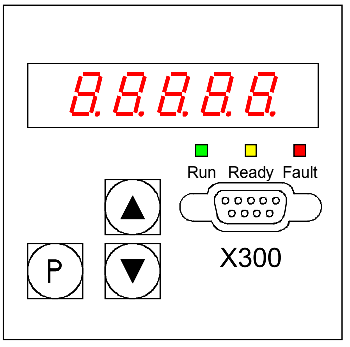
7.2 Operator control panels

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	**r**xxx, **P**xxx	(0)xxx
	Uxxx, **n**xxx	**2**xxx
Technology board parameter	**H**xxx, **d**xxx	**1**xxx
	Lxxx, **c**xxx	**3**xxx

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.

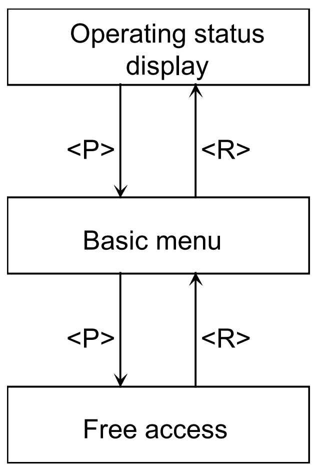
This automatic skipping over missing numbers does not work for technology board parameters. In this case, the numbers of existing parameters must be entered directly.

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 Z12) 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 Z12) 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 (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.

<u>Connection of control signals from the OP1S for the suggested functions:</u>

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 33
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 14 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 ≥o1.0 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 1st 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 2nd position in the parameter value.

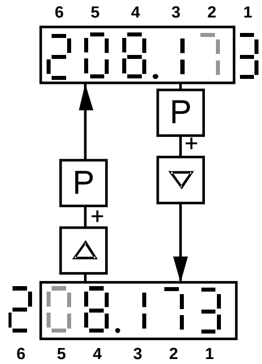


Fig. 7.1 Shifting the PMU display for parameter values with more than 5 digits

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 e. g.	**Index** e. g.	**Parameter value** e. g.
Display parameters	**Basic unit**	r000 or n000	001	°009
	Technology	d000 or c000		
Setting parameters	**Basic unit**	P051 or U051	001	-2.08
	Technology	H002 or L002		

Table7.1 Display of visualization and setting parameters on the PMU

	Actual value	**Parameter value not (currently) possible**	**Alarm**	**Fault**
Display	-2.08	---- ----	A022	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 **Drive Monitor** 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 Adjustment of converter rated currents

NOTICE

On North American manufactured Base Drive assemblies (Type 6RA70xx-2xxxx) the US rating must be set in Parameter P067.

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

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

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

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

3 Adjustment to actual converter supply voltage

P078.001 . . . Supply voltage for armature circuit (in volts)
P078.002 . . . Supply voltage for field circuit (in volts)

4 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) (if necessary: activate fault signal F037 with P820!)	see also Section 9.14

5 Actual speed sensing data

5.1 Operation with analog tacho

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

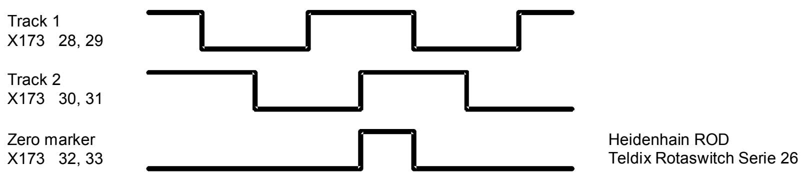
P741 Tacho voltage at maximum speed (– 270,00V to +270,00V)

5.2 Operation with pulse encoder

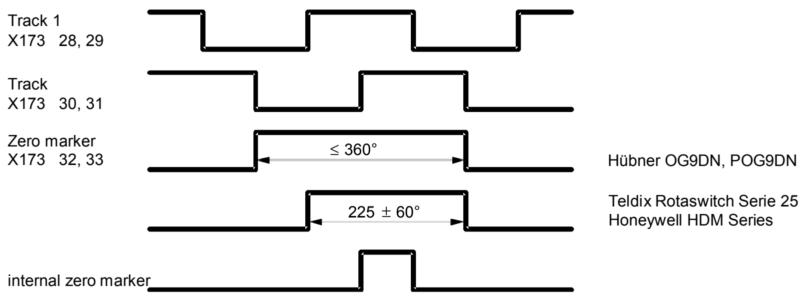
P083 = 2: The actual speed is supplied by the pulse encoder (K0040)

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

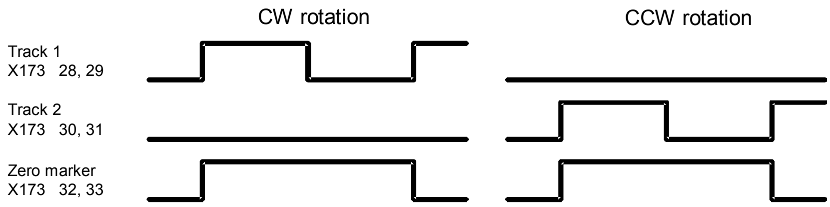
1. Pulse encoder type 1
   Encoder with two pulse tracks mutually displaced by 90° (with/without zero marker)



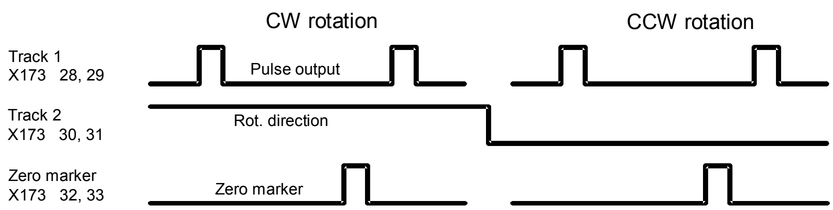
2. Pulse encoder type 1a
   Encoder with two pulse tracks mutually displaced by 90° (with/without zero marker). The zero marker is converted internally to a signal in the same way as on encoder type 1.



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 is 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%.

5.3 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)).

5.4 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.

6 Field data

6.1 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

6.2 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
EMFset (K289) = P101 – P100 * P110.

7 Selection of basic technological functions

7.1 Current limits

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

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

7.2 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)

7.3 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)

8 Execution of optimization runs

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

8.2 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.

8.3 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.

8.4 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 < 20ms, 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).

WARNING

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)).

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

WARNING

The drive accelerates up to maximum speed during this optimization run.

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.

WARNING

This optimization run must not 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).

8.5 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).

9 Checking and possible fine adjustment of maximum speed

After the optimization runs have been executed, the maximum speed must be checked and its 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.

10 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.

11 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.

12 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^2t 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.

13 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:

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

– 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 be 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^{st} board (e.g. the 1^{st} EB1) of this particular type and the board with the higher letter the 2^{nd} board (e.g. 2^{nd} EB1).
The 1^{st} board is parameterized via index 1 and the 2^{nd} 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^{st} EB1 and parameter U755.002 for the 2^{nd} 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 runup 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.

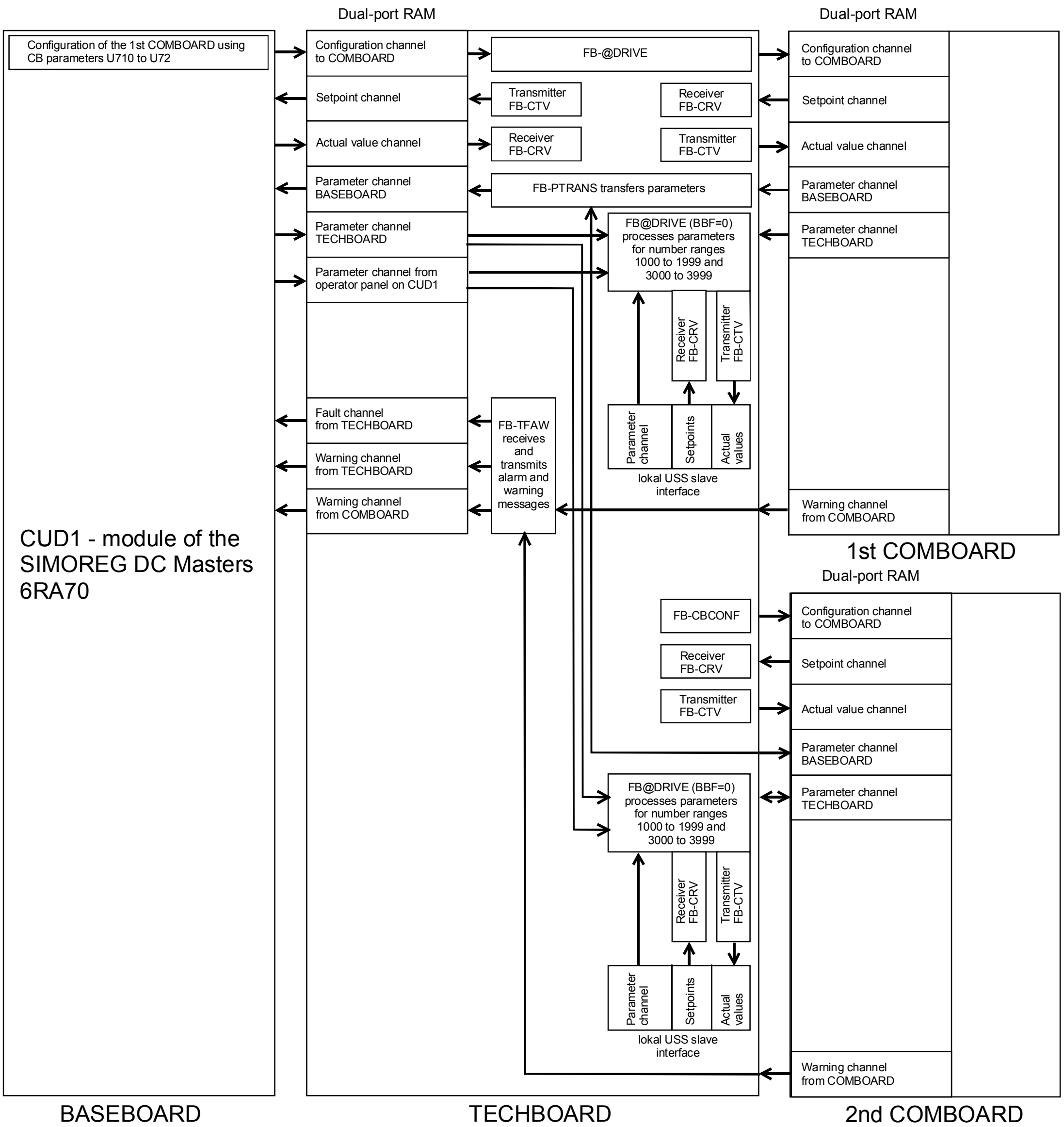
Module T100 comprising software submodule MS100 already contains several technology functions and arithmetic, control, and logic modules, which are freely configurable using parameters. This software can be expanded with customized components, if required.

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^{nd} 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 DC Master 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):

1 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.

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

3 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

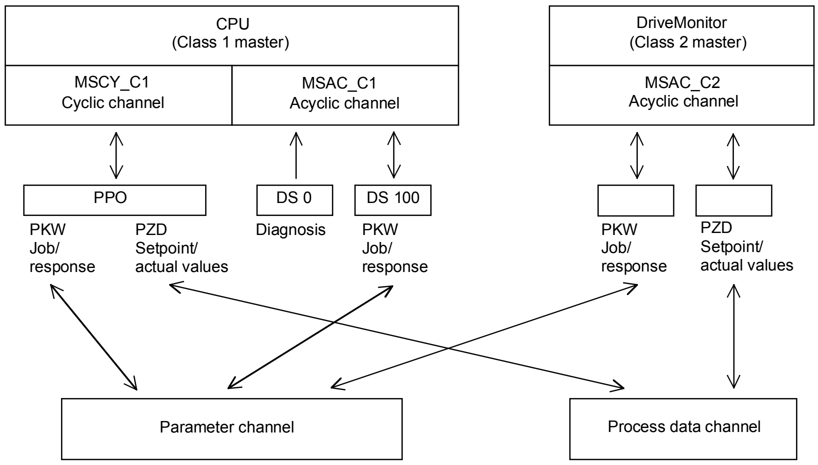
This initialization process will interrupt the communication of any supplementary board that has already been started up.

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. CBP, CB1) may only respond to received messages and are referred to as **passive nodes**.

PROFIBUS (**Pro**cess **Fi**eld 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** (**D**istributed **P**eripherals) 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 STW 1 ZSW 1	PZD2 HSW HIW	PZD3	PZD4	PZD5	PZD6	PZD7	PZD8	PZD9	PZD 10
	1st word	2nd word	3rd word	4th word	1st word	2nd word	3rd word	4th word	5th word	6th word	7th word	8th word	9th word	10th word
PPO 1														
PPO 2														
PPO 3														
PPO 4														
PPO 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 PKE	Index IND	Parameter value 1 PWE1 (H word)	Paramter value 2 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 DC MASTER 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 (1st CB) or n732.033 to n732.064 (2nd CB).
The values of the indices are as follows:

Index	Meaning for CBP2
001/033	CBP_Status Bit0: "CBP Init", CBP is being initialized or waiting to be initialized by the basic unit (not set in normal operation) Bit1: "CBP Online", CBP is selected by basic unit (set in normal operation) Bit2: "CBP Offline", CBP not selected by basic unit (not set in normal operation) Bit3: Illegal bus address (P918) (not set in normal operation) Bit4: Diagnostic mode activated (U711 <> 0) (not set in normal operation) Bit8: Incorrect identifier bytes transferred (incorrect configuring message from PROFIBUS Master) (not set in normal operation) Bit9: Incorrect PPO type (incorrect configuring message from PROFIBUS Master) (not set in normal operation) Bit10: Correct configuring data received from PROFIBUS_DP Master (set in normal operation) Bit12: Fatal error detected by DPS Manager software (not set in normal operation) Bit13: Program in endless loop in main.c (loop can only be exited by a Reset) Bit15: Program in communications online loop (loop can only be exited through re-initialization by basic unit)
002/034	SPC3_Status Bit0: Offline/Passive Idle (0=SPC3 is operating in normal mode (offline) 1=SPC3 is operating in Passive Idle) Bit2: Diag flag (0=diagnostic buffer has been picked up by master 1= diagnostic buffer has not been picked up by master) Bit3: RAM Access Violation, memory access >1.5kB (0=no address violation, 1=for addresses > 1536 bytes, 1024 is subtracted from address and access made to the new address) Bit4+5: DP state (00=Wait_Prm, 01=Wait_Cfg, 10=Data_Ex, 11=not possible) Bit6+7: WD state (00=Baud search, 01=Baud_Control, 10=DP_Control, 11=not possible) 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) Bit12-15: SPC3-Release (0000=Release 0)
003/035	SPC3_Global_Controls Bits remain set until the next DP global command Bit1: 1=Clear_Data message received Bit2: 1=Unfreeze message received Bit3: 1=Freeze message received Bit4: 1=Unsync message received Bit5: 1=Sync message received
004/036	L byte: No. of received error-free messages (DP Standard only) H byte: Reserved
005/037	L byte: "Timeout" counter H byte: Reserved
006/038	L byte: "Clear Data" counter H byte: Reserved
007/039	L byte: "Heartbeat counter error" counter H byte: Reserved
008/040	L byte: No. bytes for special diagnosis H byte: Reserved
009/041	L byte: Mirroring of slot identifier 2 H byte: Mirroring of slot identifier 3
010/042	L byte: Mirroring of P918 (CB bus addr.) H byte: Reserved
011/043	L byte: "Re-config. by CUD" counter H byte: "Initialization runs" counter
012/044	L byte: Error ID DPS manager error H byte: Reserved

Index	Meaning for CBP2
013/045	L byte: PPO type found 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 H byte: Reserved
017/049	L byte: DPV1:DS_Write, neg. ack. counter H byte: Reserved
018/050	L byte: DPV1:DS_Read, pos. ack. counter H byte: Reserved
019/051	L byte: DPV1:DS_Read, neg. ack. counter H byte: Reserved
020/052	L byte: DP/T:GET DB99 pos. ack. counter H byte: DP/T:PUT DB99 pos. ack. counter
021/053	L byte: DP/T:GET DB100 ps. ack. counter H byte: DP/T:PUT DB100 ps. ack. counter
022/054	L byte: DP/T:GET DB101 ps. ack. counter H byte: DP/T:PUT DB101 ps. ack. counter
023/055	L byte: DP/T service neg. acknow. counter 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 (1st CB) or **alarm A089** (2nd 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 (1st CB) or **alarm A090** (2nd 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 (1st CB) or **alarm A091** (2nd 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 (1st CB) or **alarm A092** (2nd 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 (1st CB) or **alarm A093** (2nd CB)
Error in the DPS software of the communication board.
Effect: Fault message F081 is generated.

Alarm A086 (1st CB) or **alarm A094** (2nd CB)
Failure of heartbeat counter detected by SIMOREG DC master.
Effect: Interruption in communication with PROFIBUS.

Alarm A087 (1st CB) or **alarm A095** (2nd CB)
DP slave software has detected serious fault, fault number in diagnostic parameter n732.08.
Effect:Total communication failure (secondary fault F082).

Alarm A088 (1st CB) or **alarm A096** (2nd 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):

1 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.

2 The following are important communication parameters. Index 1 of each parameter is set for the 1^{st} communication board (1^{st} CB) and index 2 for the 2^{nd} communication board (2^{nd} CB):
Exception: In parameter U721, i001 to i005 are applicable to the 1^{st} CB and i006 to i010 to the 2^{nd} 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^{st} Receive-PDO
U712	Basic identifier for PZD Receive	2^{nd} Receive-PDO
U713	Basic identifier for PZD Send	3^{rd} Receive-PDO
U714	Number of PZD for PZD Send	4^{th} Receive-PDO
U715	Updating rate for PZD Send	1^{st} Transmit-PDO
U716	Basic identifier for PZD Receive-Broadcast	2^{nd} Transmit-PDO
U717	Basic identifier for PZD Receive-Multicast	3^{rd} Transmit-PDO
U718	Basic identifier for PZD Receive-Internode	4^{th} Transmit-PDO
U719	Basic identifier for PKW Request-Broadcast	Response to Life Time Event
U720	Baud rate when U721.002 or U721.007 = 0: 0=10kbit/s, 1=20kbit/s, 2=50kbit/s, 3=100kbit/s, 4=125kbit/s, 5=250kbit/s, 6=500kbit/s, 7=Reserved, 8=1Mbit/s	Baud rate when U721.002 or U721.007 = 0: 0=10kbit/s, 1=20kbit/s, 2=50kbit/s, 3=100kbit/s, 4=125kbit/s, 5=250kbit/s, 6=500kbit/s, 7=Reserved, 8=1Mbit/s
U721.01 or 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 or 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^{st} or 2^{nd} 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.

3 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** (**C**ommunication **Ob**jects), 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 then 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).

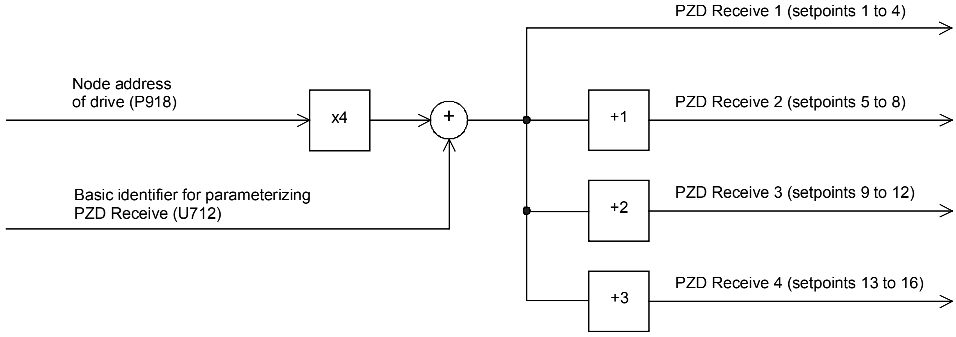
Functionality according to layer 7 (CANopen)
Process data are exchanged rapidly by means of so-called PDOs (**P**rocess **D**ata **O**bjects) analogous to the transmission method used for layer 2.
Parameter data are exchanged by means of so-called SDOs (**S**ervice **D**ata **O**bjects).

			CAN protocol	Device net
Application		Device profile		Device net specification includes: - Device profile – Communication profile – Application layer
		Communication profile	CIA DS 301	
Communication	Layer 7	Application layer	CIA CAL DS 201 .. 205, 207 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

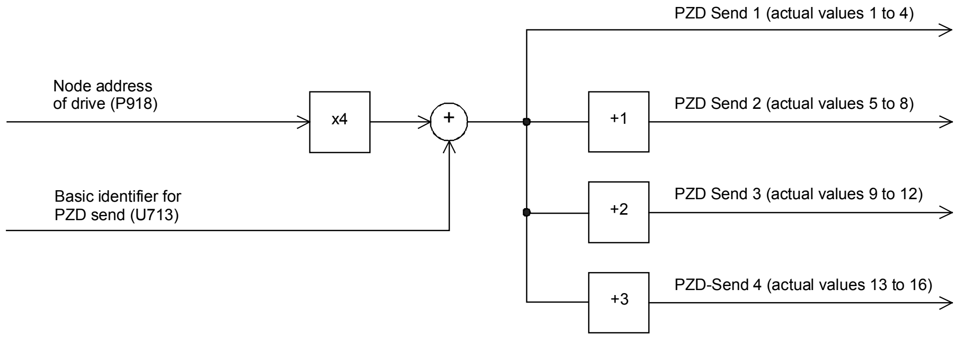
User data are exchanged between the CAN master and the CAN boards on the drives, i.e. the slaves. User data are categorized as either process data (control and status information, setpoints and actual values) or data which relate to parameters.
Process data (**PZD**s) are time-critical and therefore 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_d	0064_h	
1. Setpoint	40063_d	$9C7F_h$	control word 1
2. Setpoint	8192_d	2000_h	speed setpoint 50%
3. Setpoint	123_d	$007B_h$	
4. Setpoint	0_d	0_h	

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:

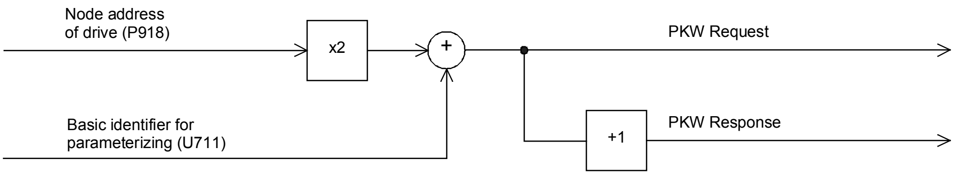
Control word 1 must always be transferred as the first PZD word for setpoints. If control word 2 is needed, then it must be transferred as the fourth PZD word.

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 U711 = 298	This setting assigns identifier 300 to the parameter job (request) 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_d	$012C_h$	For use of the IDs of the example above
Request code	7_d	7_h	"Change parameter value (array word)"
Parameter number	301_d	$012D_h$	=> PKE = $712D_h$
Index	2_d	0002_h	
Parameter value	9500_d	$DAE4_h$	

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 componentof 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" (**PDO**s) and the accessing of entries in the object directory via so-called "service data objects“ (**SDO**s). 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 CiaA 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 or n732.033	0	No fault Fault F080/fault value 5 is displayed under fault conditions:
		Fault values for CAN layer 2:
	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
		Fault values for CANopen:
	1	Incorrect bus address (P918)
	23	Invalid baud rate (U720)
	35	Incorrect CAN protocol type (U721)
	257	Invalid mapping of 1st Receive PDO (U711)
	258	Invalid transmission type of 1st Receive PDO (U711)
	273	Invalid mapping of 1st Transmit PDO (U715)
	274	Invalid transmission type of 1st Transmit PDO (U715)
	513	Invalid mapping of 2nd Receive PDO (U712)
	514	Invalid transmission type of 2nd Receive PDO (U712)
	529	Invalid mapping of 2nd Transmit PDO (U716)
	530	Invalid transmission type of 2nd Transmit PDO (U716)
	769	Invalid mapping of 3rd Receive PDO (U713)
	770	Invalid transmission type of 3rd Receive PDO (U713)
	785	Invalid mapping of 3rd Transmit PDO (U717)
	786	Invalid transmission type of 3rd Transmit PDO (U717)
	1025	Invalid mapping of 4th Receive PDO (U714)
	1026	Invalid transmission type of 4th Receive PDO (U714)
	1041	Invalid mapping of 4th Transmit PDO (U718)
	1042	Invalid transmission type of 4th Transmit PDO (U718)
	1092	Invalid Life Time Event or incorrect basic unit parameterized (U719)
n732.002 or n732.034		Number of correctly received PZD CAN telegrams since Power ON Irrelevant for CANopen
n732.003 or n732.035		Number of PZD telegrams lost since Power ON Telegrams will be lost if the CAN Bus master sends PZD telegrams faster than they can be processed by the slave. Irrelevant for CANopen

	Value	Meaning
n732.004 or n732.036		Counter of Bus Off states since Power ON (alarm A084)
n732.005 or n732.037		Counter of Error Warning states since Power ON (alarm A083)
n732.006 or n732.038		Status of the CAN controller
n732.007 or n732.039		Number of errors occurring during reception of PCD frames
n732.008 or n732.040		Type of error occurring during reception of PCD frames
n732.009 or n732.041		Value of error occurring during reception of PCD frames
n732.010 or n732.042		Number of correctly transmitted PZD CAN telegrams since Power ON Irrelevant for CANopen
n732.011 or n732.043		Number of errors during transmission of PZD telegrams PZD telegrams cannot be transmitted when the bus is overloaded Irrelevant for CANopen
n732.012 or n732.044		Type of error occurring during transmission of PCD frames
n732.013 or n732.045		Value of error occurring during transmission of PCD frames
n732.014 or n732.046		Number of correctly processed PKW requests and responses since Power ON Irrelevant for CANopen
n732.015 or n732.047		Number of PKW request processing errors, e.g. owing to bus overload or missing responses from CUD1 (see below for error type) Irrelevant for CANopen
n732.016 or n732.048	 0 9 11 12	Type of PKW request processing error: No error Error transmitting the PKW response (while waiting for a free channel) Timeout waiting for the PKW response from the CUD1 Timeout waiting for a free channel (bus overload) Irrelevant for CANopen
n732.017 or n732.049		Value of error occurring while processing PKW requests
n732.018 or n732.050		Number of lost PKW requests Irrelevant for CANopen
n732.026 or n732.058		Software version of CBC (e.g. "12“ = version 1.2, see also r060)
n732.027 or n732.059		Software identifier (extended software version identifier, see also r065)
n732.028 or n732.060		Date of generation of CBC software Day (H byte) and month (L byte)
n732.029 or n732.061		Date of generation of CBC software 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 SIMOLINK boards (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 1st SIMOLINK board (1st SLB) and index 2 for the 2nd SIMOLINK board (2nd SLB) (the use of a 2nd 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 minimum 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).

No. of addressable nodes = $$\left(\frac{U746[us]+3{,}18us}{6{,}36us}-2\right)*\frac{1}{U745}$$

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.

4 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 SIMOLINK Board: Receiving, Transmitting“).

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 U751.01 = 32 U751.02 = 33	means that node 1 in channel 0 transmits status word 1 (K0032) as word1 and status word 2 (K0033) as word2

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 (**S**iemens **M**otion **L**ink) 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.

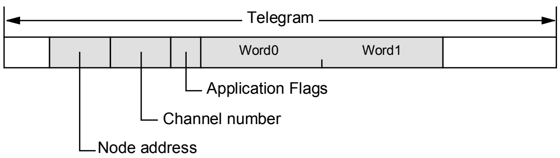
When an SLB is employed as the dispatcher, the task table is configured solely on the basis of drive parameters. The following restrictions apply as compared to the use of a SIMOLINK master as the dispatcher:

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.

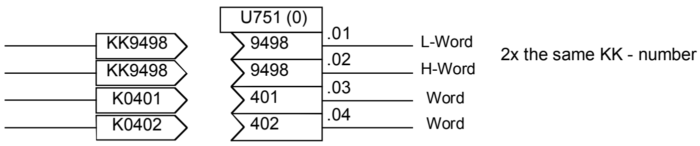
Active bus nodes receive and/or send telegrams (SIMOLINK master, dispatcher, transceivers).
Passive bus nodes simply forward received telegrams along the bus without changing their contents (separating filters, concentrators).

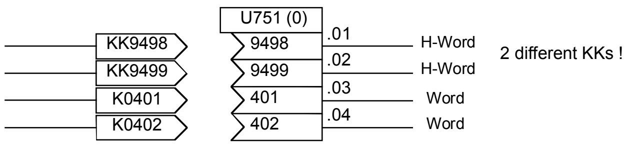
A separate address is assigned to each active bus node; the dispatcher is always assigned node address 0.
A maximum of 8 telegrams can be transferred per active node. The number of telegrams used per node is a parameterizable quantity.
Telegrams are identified by the node address and distinguished by 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).

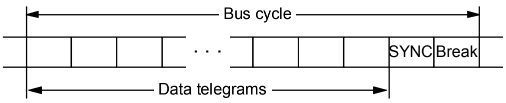
Transmission of double-word connectors:
The values of double-word connectors can be transmitted in the first four channels (selected with U749.01 to U749.04 in the receive direction or with U751.01 to U751.08 in the transmission direction). In the receive direction, the values of any two adjacent connectors (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 staring 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 **jumpers** (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 DC MASTER 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)

1 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)

2 Disconnect power supply and insert adapter with board into location. Please remember to insert a board in location 2 before you use location 3.

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)

4 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 DC MASTER 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 1st communication board (1st CBx) and index 2 to the 2nd communication board (2nd 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 1st or 2nd 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.

WARNING

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 (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^{st} and 2^{nd} 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^{th} 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 PKE	Parameter index IND	Parameter value1 PWE1	Parameter value2 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	IND		Parameter index, L byte
9			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 0x90	[Get/Set_Attribute_Single]
3	PKE		Parameter ID, L byte
4			Parameter ID, H byte
5	PWE1		Parameter value, L word, L byte
6			Parameter value, L word, H byte
7	PWE2		Parameter value, H word, L byte
8			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]	0x90	[Set_Attribute_Single]
3	PKE	0x63	Parameter ID, L byte
4		0x40	Parameter ID, H byte
5	PWE1	0xC8	Parameter value, L word, L byte
6		0x00	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 = 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.

<table>
<tr><th></th><th>Value</th><th>Meaning</th></tr>
<tr><td>n732.001
or
n732.033</td><td>0

1
2
3
17</td><td>Ok
Fault F080/fault value 5 is displayed under fault conditions:
DeviceNet MAC ID (P918 / slave address) incorrect
DeviceNet polled I/O produced connection path (U711) incorrect
DeviceNet polled I/O produced consumed path (U712) incorrect
Baud rate (U720) incorrect</td></tr>
<tr><td>n732.002
or
n732.034</td><td></td><td>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>
<table><tr><td>Thousands place:
(Idle Indicator)
0 = device not idle; A poll or bit strobe request with length other than 0 was last received
1 = device idle; A poll or bit strobe request with length equal to 0 was last received</td><td>Hundreds place:
(Channel Allocation)
The meaning of individual bits is as follows
Bit8: 1 = Explicit Channel allocated
Bit9: 1 = I/O Poll Channel allocated
Bit10: 1 = I/O Bit Strobe Channel allocated
Bit11: 1 = Reserved</td><td>Tens place:
Reserved</td><td>Units place:
(network status)
0 = CBD not online (Dup_MAC_ID test not yet complete)
1 = CBD online, but not assigned to a master
2 = CBD online and assigned to the master
3 = data cannot be exchanged via bus (multiple MAC IDs or Bus Off)</td></tr></table></td></tr>
<tr><td>n732.003
or
n732.035</td><td></td><td>Number of correctly received telegrams since Power ON. The value contains all Group2 DeviceNet messages including those that are not addressed to this CBD.</td></tr>
<tr><td>n732.008
or
n732.040</td><td></td><td>Number of correctly received PZD telegrams since Power ON</td></tr>
<tr><td>n732.009
or
n732.041</td><td></td><td>Number of Bus Off states since Power ON (alarm A084)</td></tr>
<tr><td>n732.019
or
n732.051</td><td></td><td>Number of correctly transmitted telegrams since Power ON</td></tr>
<tr><td>n732.026
or
n732.058</td><td></td><td>Software version of CBDs
(e.g. "12“ = Version 1.2, see also r060)</td></tr>
</table>

	Value	Meaning
n732.027 or n732.059		Software identifier (extended software version identifier, see also r065)
n732.028 or n732.060		Date of generation of CBD software (day and month) (e.g. "2508" = 25th August)
n732.029 or 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):

1 With the power supply disconnected, insert the SCB1 board into slot 2 (or, if you have installed a technology board, into slot 3).

2 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

3 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.

4 The SCB1 board is used in conjunction with the SIMOREG DC master 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.

5 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** (**S**erial **C**ommunication **B**oard **1**) is used to link the 6RA70 SIMOREG DC master to board **SCI1** or **SCI2** (**S**erial **C**ommunication **I**nterface) 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 DC master 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.

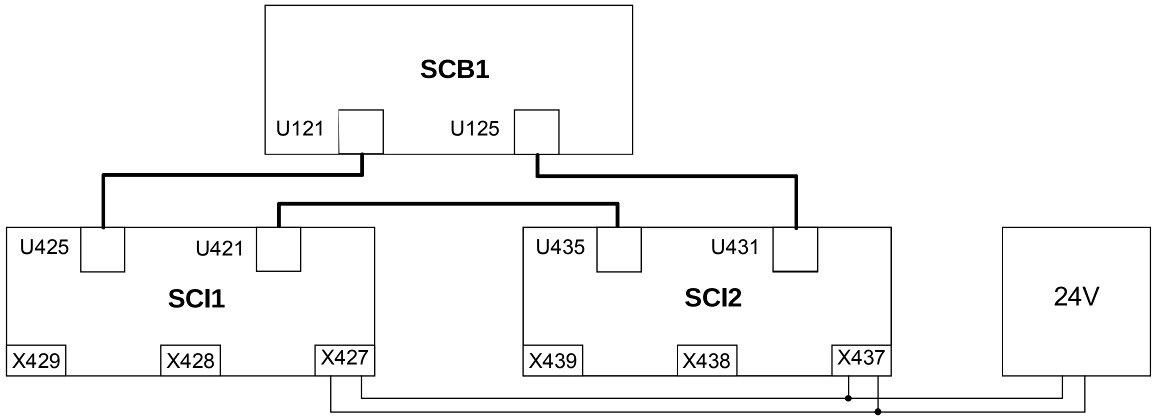
Analog outputs on SCI1: Only the voltage input or the current input may be used for each channel. The outputs are short-circuit-proof.

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	

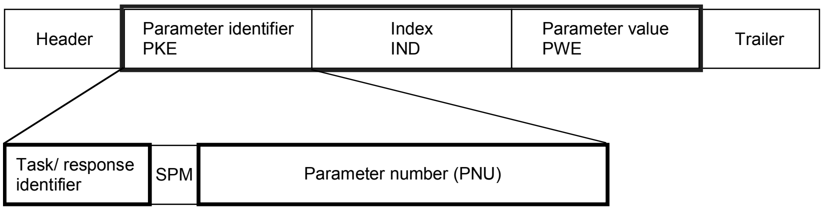
Details about fault or alarm messages which may occur in relation to SCB1 or SCI (F070 to F079 and A049 and A050) can be found in Section 10.

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 DC Master, 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 DC master.



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	**P**xxx, **r**xxx	0 - 999	0 - 999	0
	Uxxx, **n**xxx	2000 - 2999	0 - 999	1
Technology board	**H**xxx, **d**xxx	1000 - 1999	1000 - 1999	0
	Lxxx, **c**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:

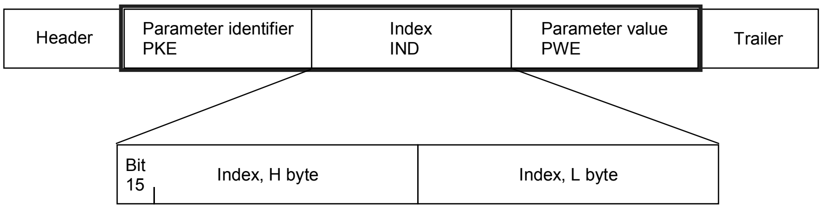
Request identifier	Meaning	Response identifier	
		positive	negative
0	No request	0	7 or 8
1	Request parameter value (word or double word)	1 or 2	
2	Modify parameter value (word)	1	
3	Modify parameter value (double word)	2	
4	Request descriptive element	3	
5	Reserved	-	
6	Request parameter value (array) (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	

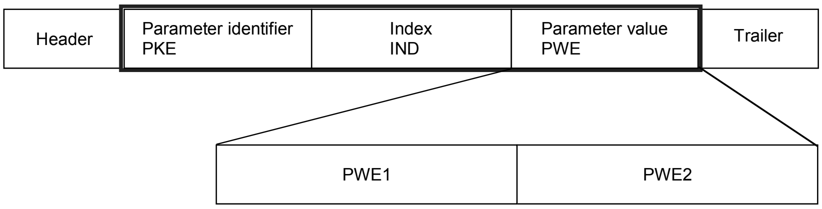
Error code	Meaning	
103	PKW number incorrect	Applies only to serial interfaces
104	Illegal parameter value	Applies to BiCo selection parameters
105	Indexed parameter	
106	Request not implemented in drive	
107	Text cannot be modified	
108	Incorrect number of parameter values	Applies to "Change all indices" 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").



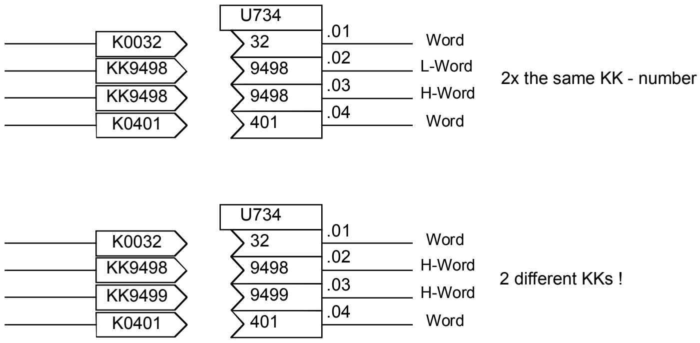
An index value of 255 means that the request applies to all indices of the relevant parameter. In the case of a modification request, the parameter values for all indices of the parameter must be transferred. Conversely, the drive supplies all index values in its response to a read request.

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

Basic functions

Page

Program structure

Control words, status words

Miscellaneous

Freely assignable function blocks

(Technology software in the basic converter, S00 option) Page

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

1	2	3	4	5	6	7	8

Key to symbols (see also Section 9.1)

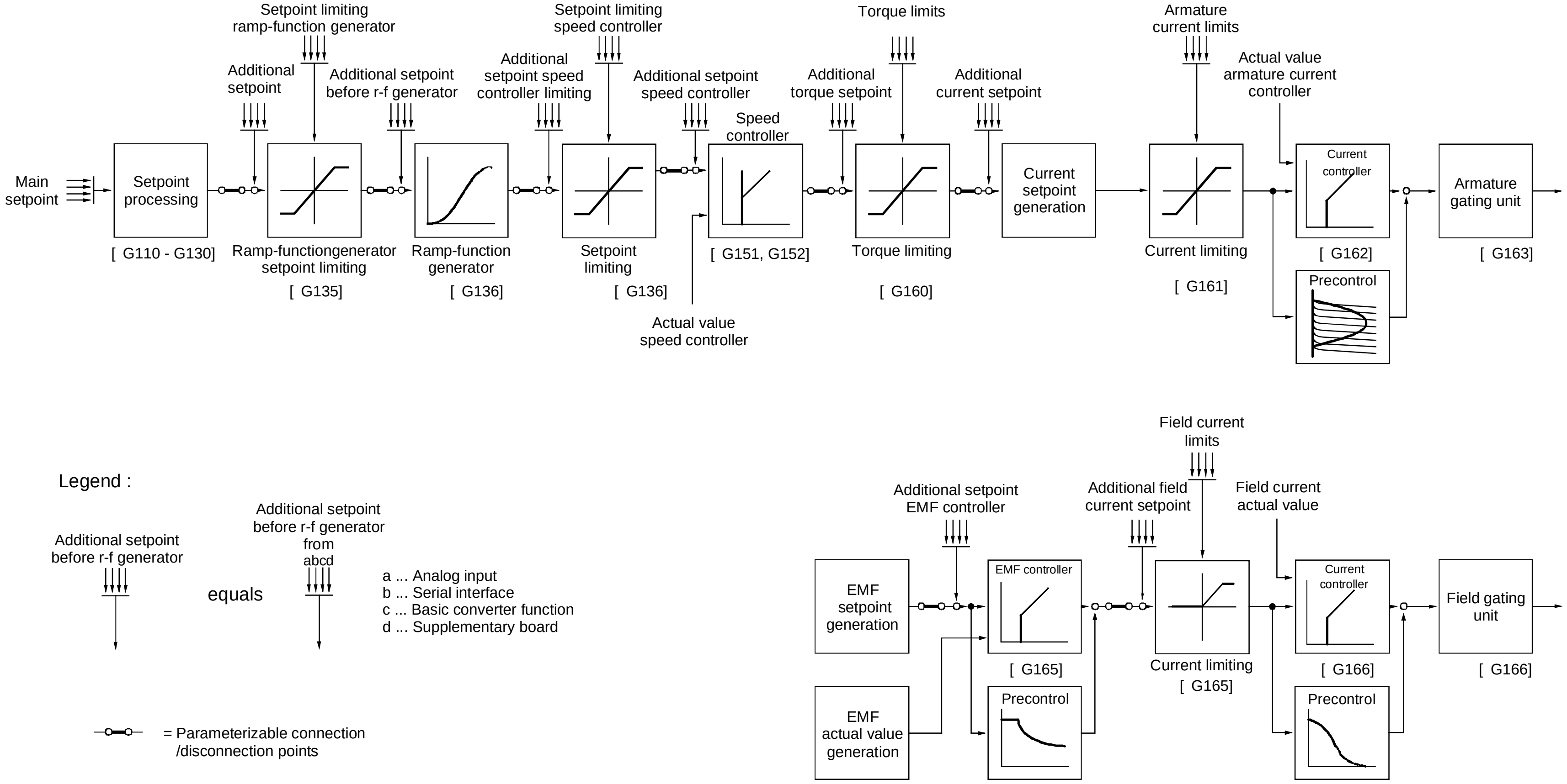
Symbol	Meaning
P462.F(10,00s) 0,01...300,00s Ramp-up time	Setting parameter Factory setting in parentheses ".F"= parameter in a function parameter set 0.00...300.00s = setting range
r045.02	Display parameter Parameter number = r045 .02 = index 2 of parameter
K0401	Connector (freely connectable 16-bit value)
KK9498	Double-word connector (freely connectable 32-bit value)
B0202	Binector (freely connectable binary signal)
K0040	Connector assigned to a fixed quantity (i.e. not optional)
B0161	Binector assigned to a fixed quantity (i.e. not optional)
6	Identifier for a freely assignable function block (Number of function block)
P818 (1) B	Selection of a binector Factory setting in parentheses Setting range = all binector numbers Selected binector can be specified in symbol
P697.B (1) B	Selection of a binector Factory setting in parentheses ".B" = Parameter in BICO data set Setting range = all binary numbers Selected binector can be specified in symbol
P046 (0) B .01, B .02, B .03, B .04	Selection of binectors via "indexed" parameter Factory setting in parentheses Setting range = all binector numbers Selected binectors for each index can be specified
U320 FS: B 500 .01, B 510 .02, B 1 .03	Selection of binectors via "indexed" parameter Factory settings differ for each index Setting range = all binector numbers Selected binectors for each index can be specified in symbol
P510 (2) K	Selection of a connector Factory setting in parentheses Setting range = all binector numbers Selected connector can be specified in symbol
P606 (9) K .01, K .02, K .03, K .04	Selection of connectors via "indexed" parameter Factory setting in parentheses Setting range = all connector numbers Selected connectors for each index can be specified in symbol
P601 FS: K 141 .01, K 0 .02	Selection of connectors via "indexed" parameter Factory settings differ for each index Setting range = all connector numbers Selected connectors for each index can be specified in symbol
P510 (0) KK	Selection of a double-word connector Factory setting in parentheses Setting range = all connector numbers Selected connector can be specified in symbol
[G152.1]	Reference to another sheet in function diagrams, destination symbol [Sheet.Column]

Selection of double-word connectors:

Symbol	Result
x KK9498 → U181 (0) KK**9498** → y	y - LOW word = LOW word of x (KK9498) y - HIGH word = HIGH word of x (KK9498)
x K0401 → U181 KK **401** → y	y - LOW word = 0 y - HIGH word = x (K0401)
x KK9498 → P044 K **9498** → y	y (Word) = HIGH word of x (KK9498)

1	2	3	4	5	6	7	8

Overview



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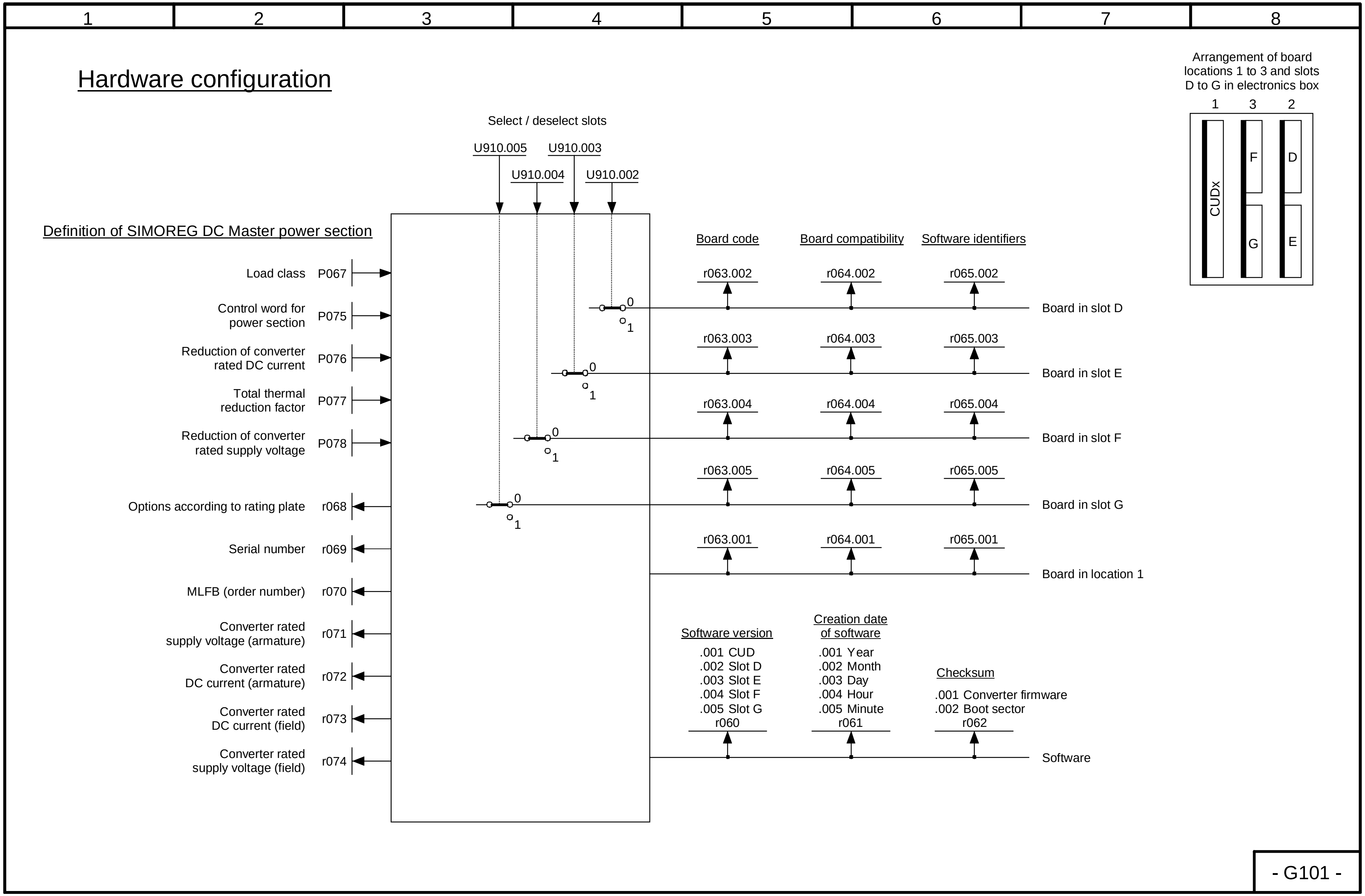
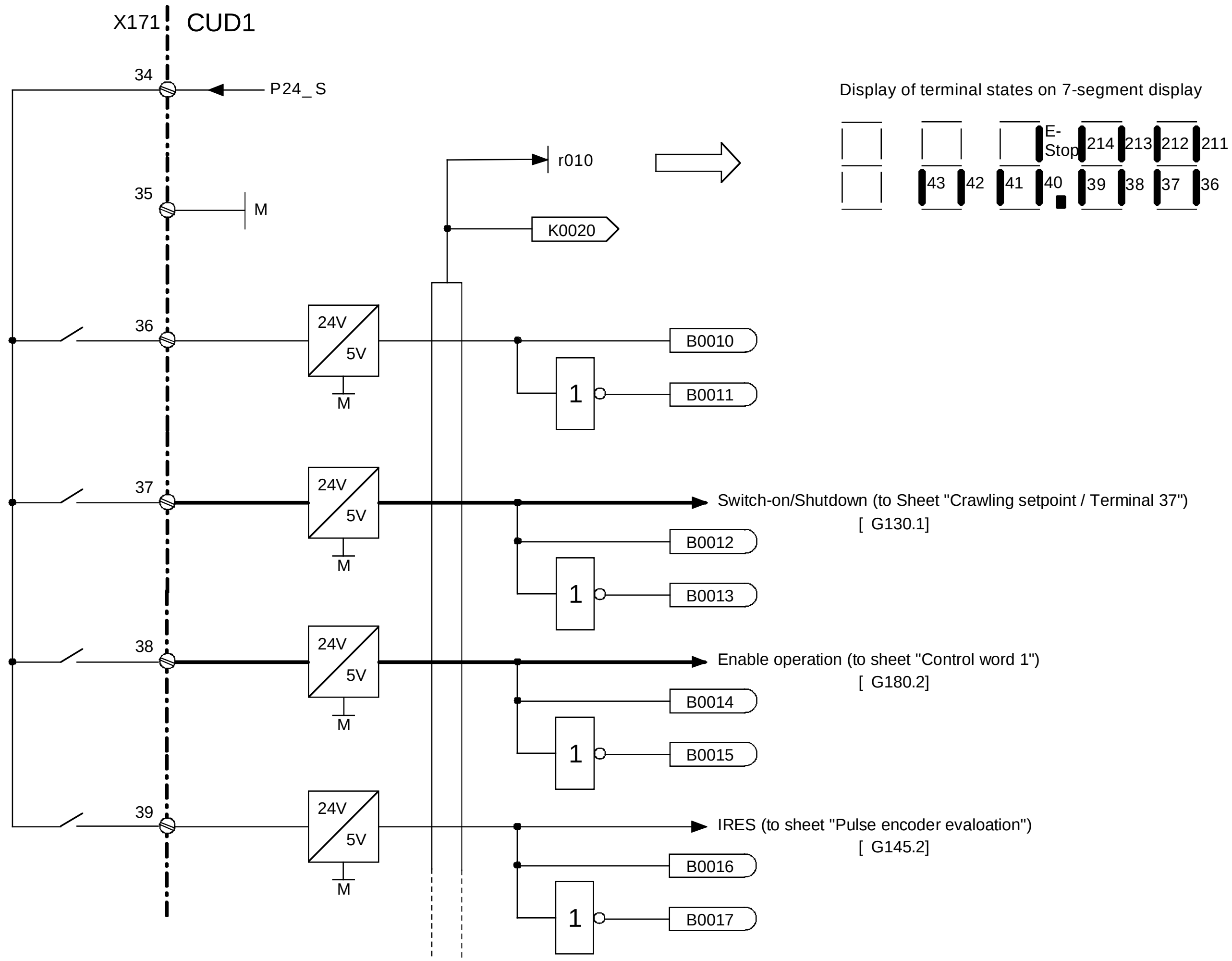
Hardware configuration



1	2	3	4	5	6	7	8

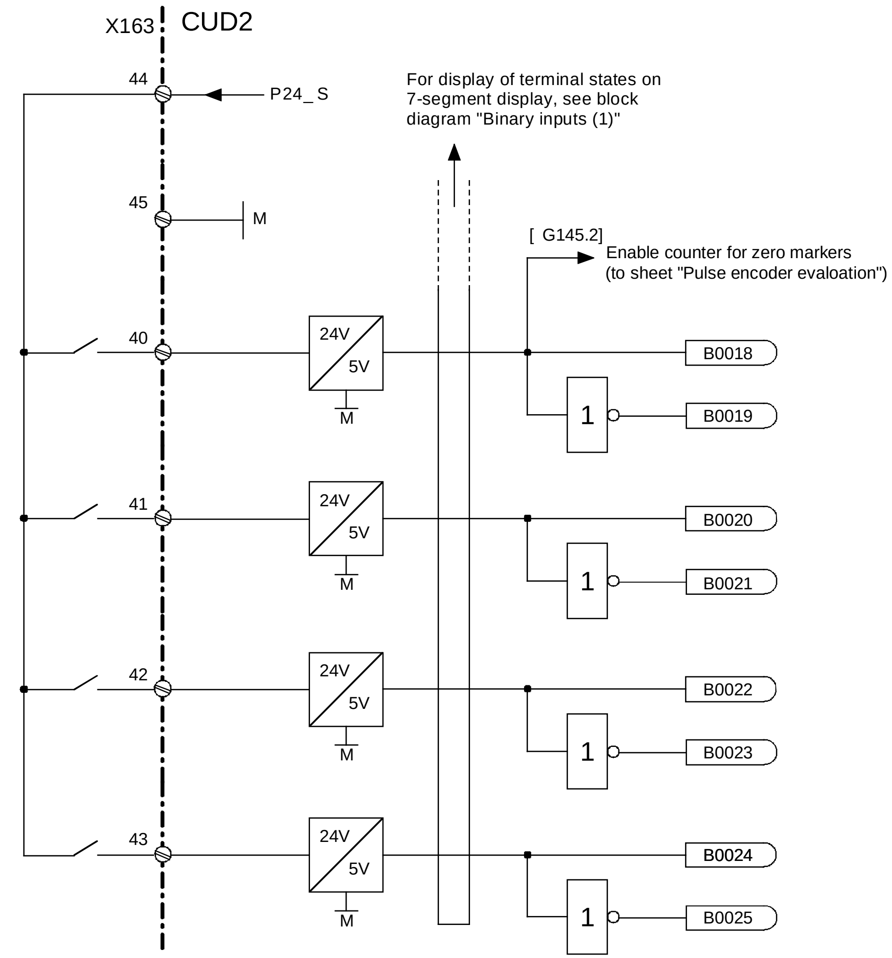
Binary inputs (1)



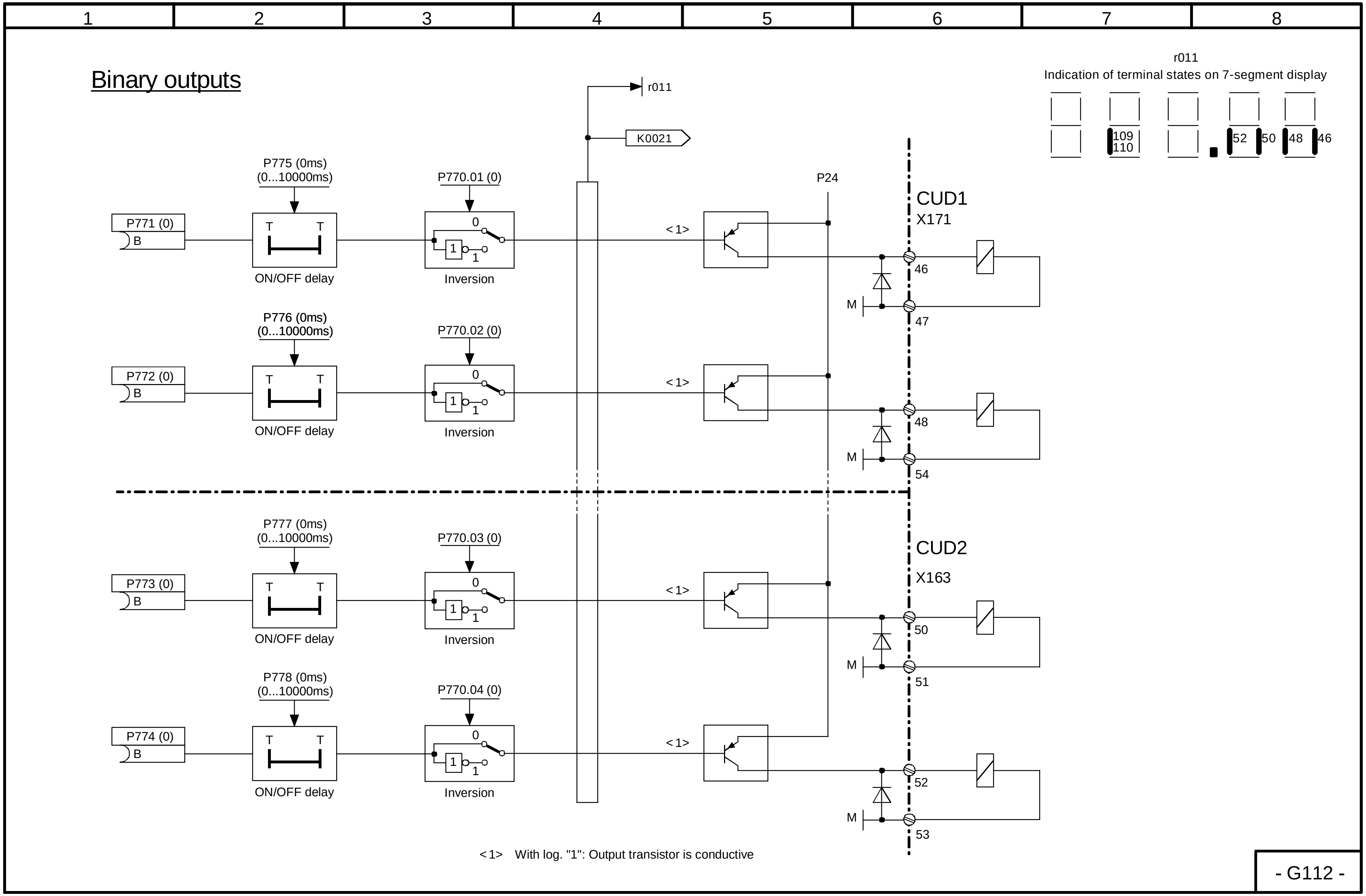
- G110 -

1	2	3	4	5	6	7	8

Binary inputs (2)



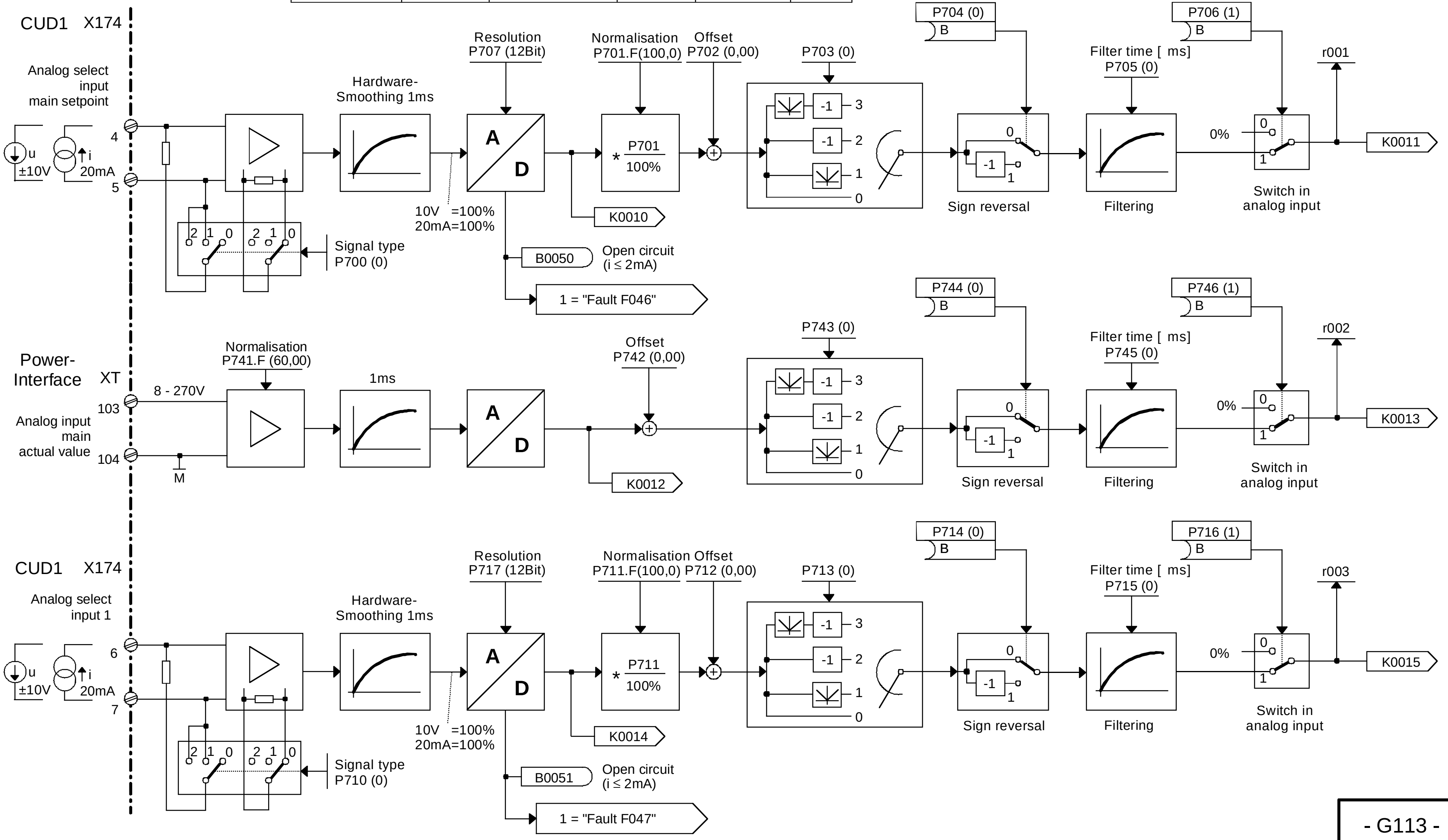
- G111 -


1
2
3
4
5
6
7
8
Binary outputs
r011
K0021
r011
Indication of terminal states on 7-segment display
109
110
52
50
48
46
P775 (0ms)
(0...10000ms)
P770.01 (0)
P24
CUD1
X171
P771 (0)
B
T
T
0
1
1
<1>
ON/OFF delay
Inversion
46
M
47
P776 (0ms)
(0...10000ms)
P770.02 (0)
P772 (0)
48
54
CUD2
X163
P777 (0ms)
(0...10000ms)
P770.03 (0)
P773 (0)
50
51
P778 (0ms)
(0...10000ms)
P770.04 (0)
P774 (0)
52
53
<1> With log. "1": Output transistor is conductive
- G112 -

1	2	3	4	5	6	7	8

Analog inputs (1)

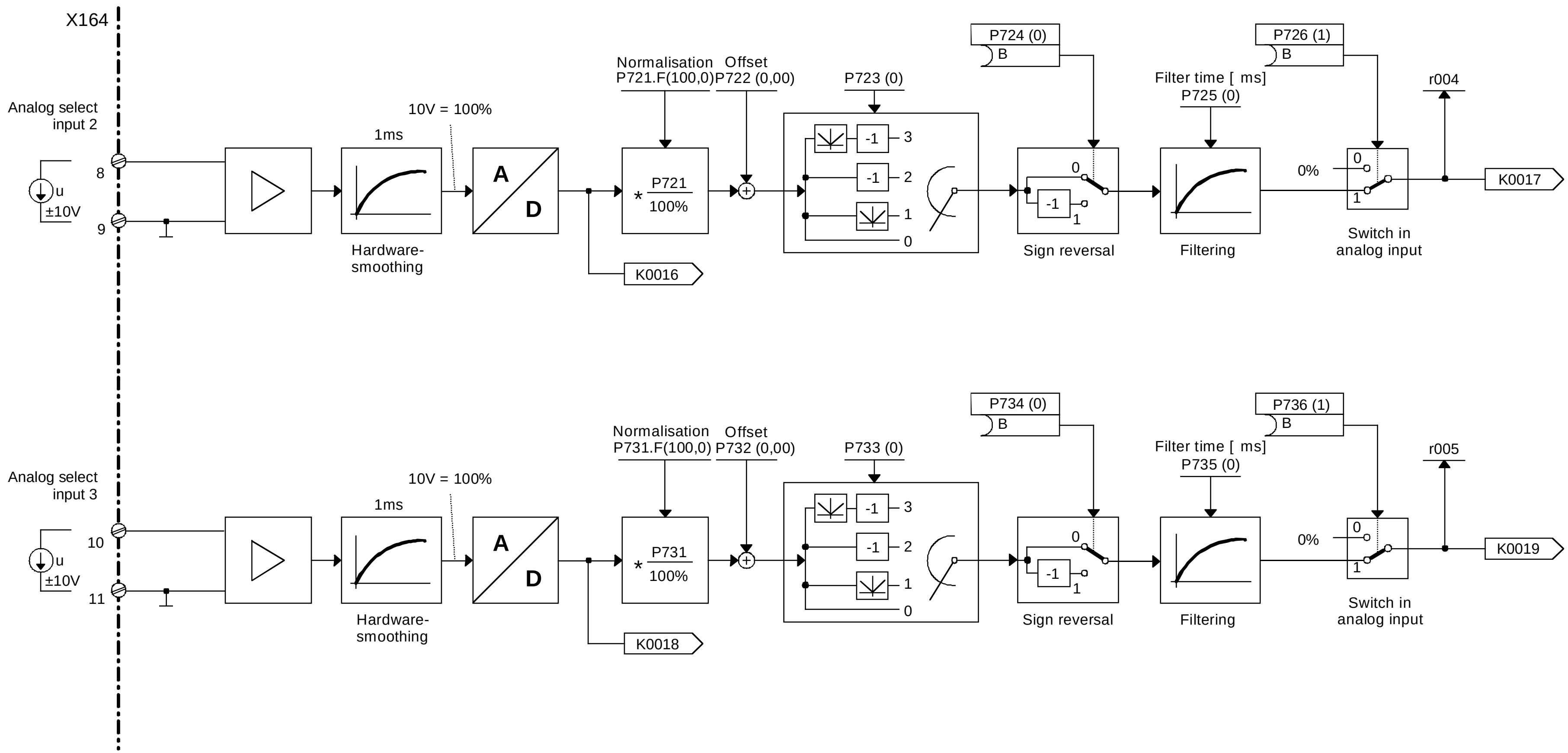
U	I	Kxxxx	Signal type	Normalisation	Offset
-10V ... +10V	---	-100%... +100%	0	100%	0%
---	0 ... 20mA	0 ... +100%	1	100%	0%
---	4 ... 20mA	0 ... +100%	2	100%	0%



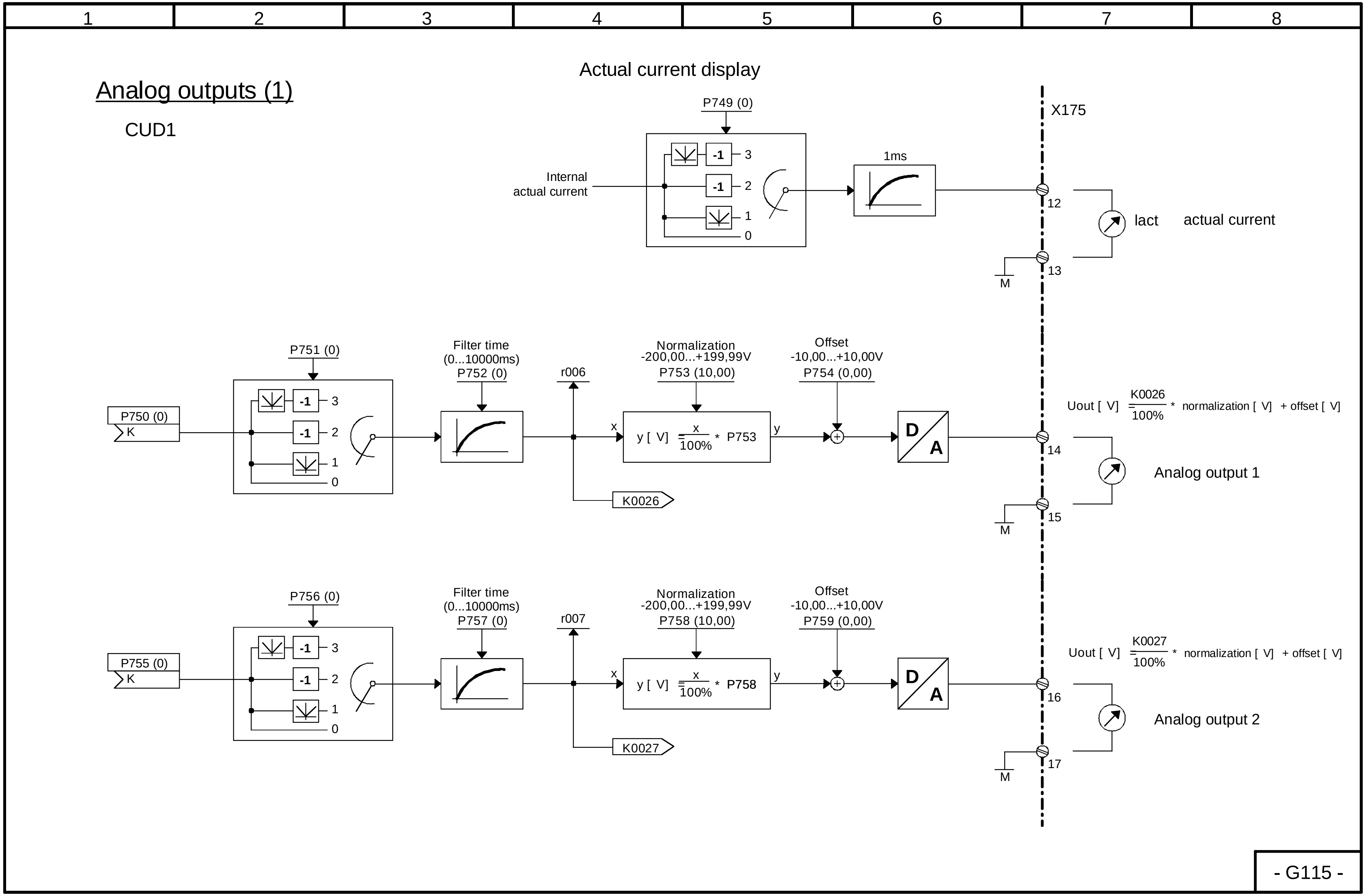
Analog inputs (2)

(to ground)

CUD2



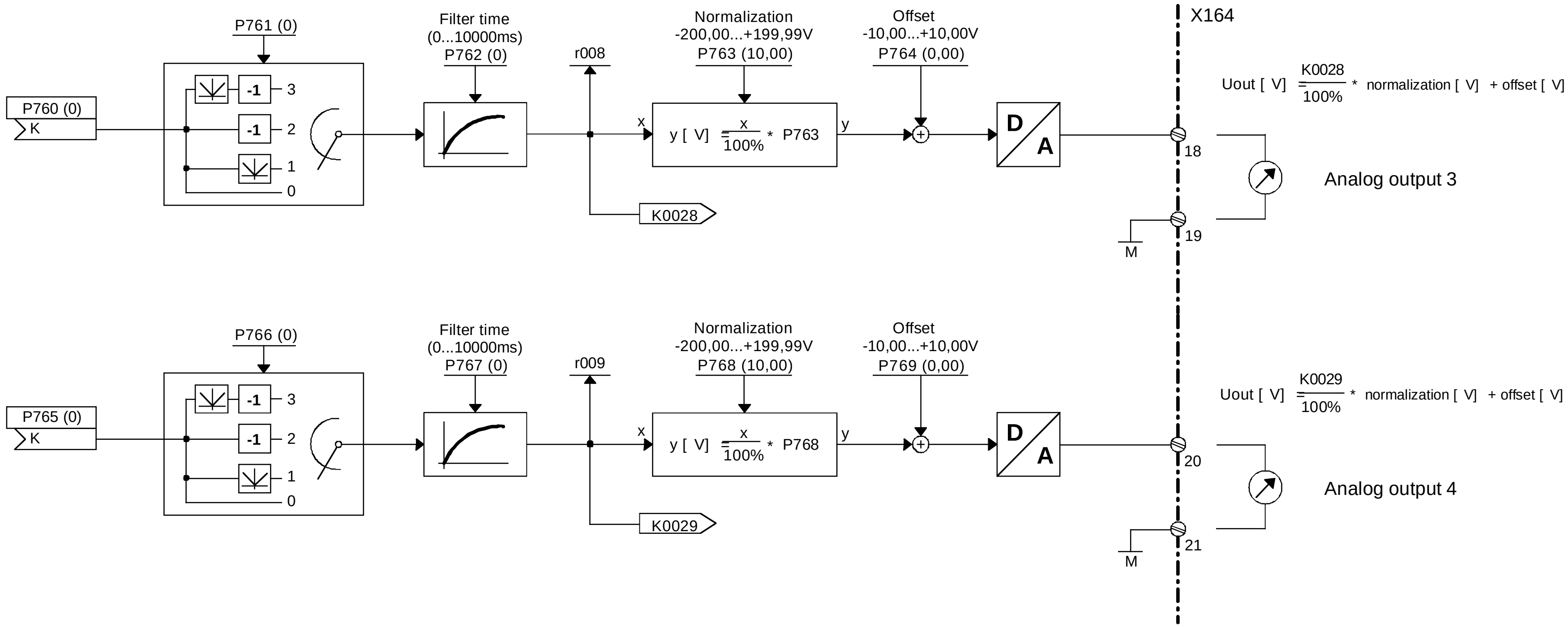
- G114 -


1
2
3
4
5
6
7
8
Analog outputs (1)
CUD1
Actual current display
P749 (0)
Internal
actual current
-1
3
2
1
0
1ms
X175
12
13
M
Iact
actual current
P751 (0)
Filter time
(0...10000ms)
P752 (0)
r006
Normalization
-200,00...+199,99V
P753 (10,00)
Offset
-10,00...+10,00V
P754 (0,00)
P750 (0)
K
x
y [V] = x / 100% * P753
y
D
A
K0026
Uout [V] = K0026 / 100% * normalization [V] + offset [V]
14
15
Analog output 1
P756 (0)
Filter time
(0...10000ms)
P757 (0)
r007
Normalization
-200,00...+199,99V
P758 (10,00)
Offset
-10,00...+10,00V
P759 (0,00)
P755 (0)
K
y [V] = x / 100% * P758
K0027
Uout [V] = K0027 / 100% * normalization [V] + offset [V]
16
17
Analog output 2
- G115 -

1	2	3	4	5	6	7	8

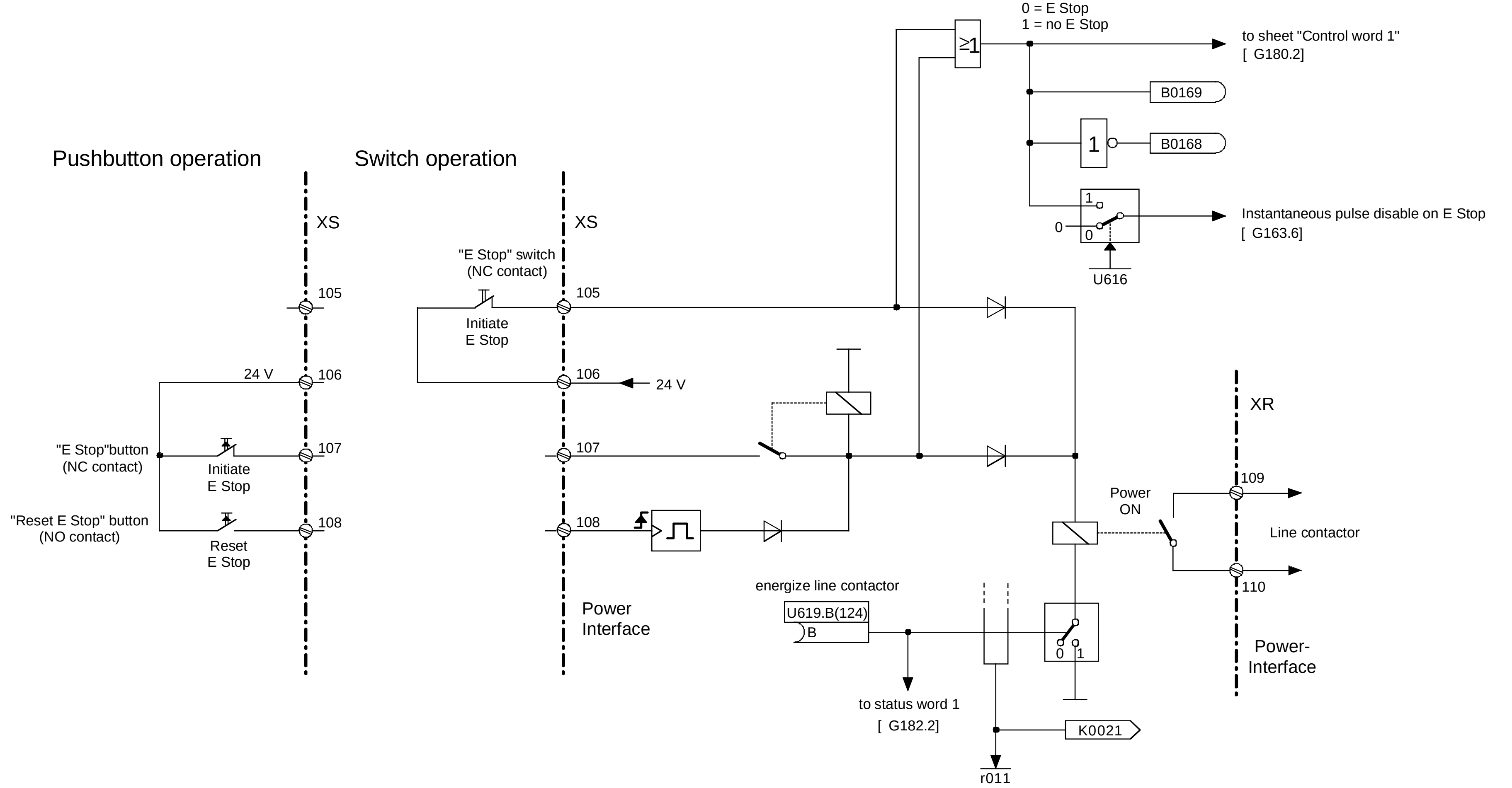
Analog outputs (2)

CUD2

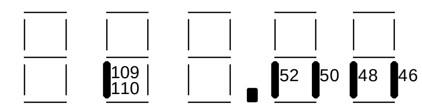


- G116 -

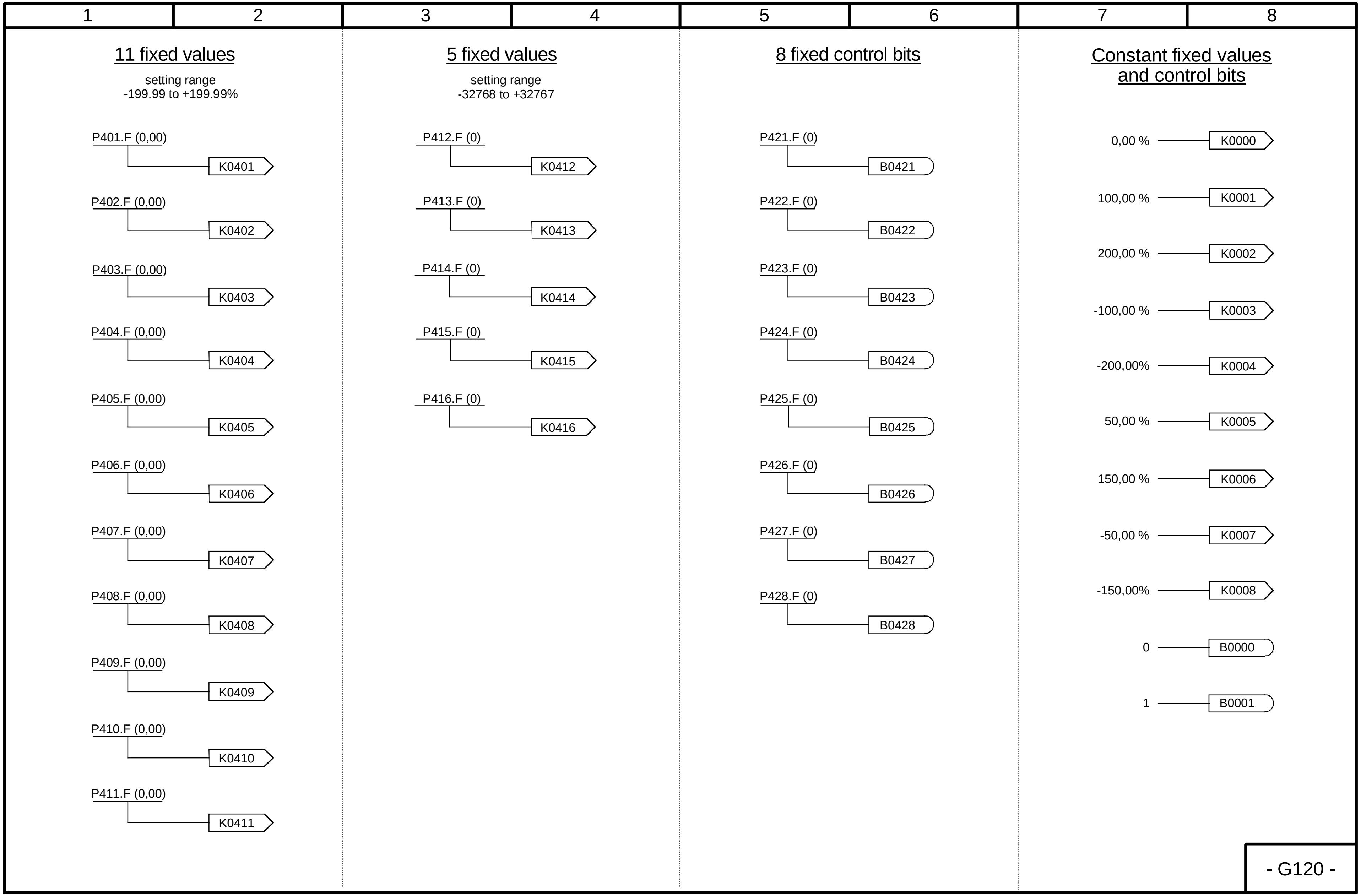
E-Stop, relay output line contactor



NOTICE
<u>Either</u> terminal 105 <u>or</u> terminals 107 + 108 may be used! Terminal 105 is connected to terminal 106 in the delivery state.

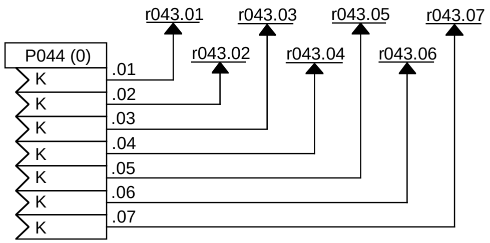


Sheet G120 Fixed values, fixed control bits, constant fixed values and control bits

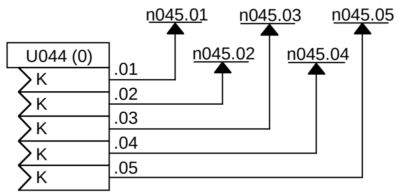


Connector displays

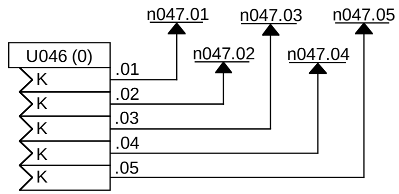
Display in % (-200.0 to 199.9 %)



Display decimal (-32768 to 32767)

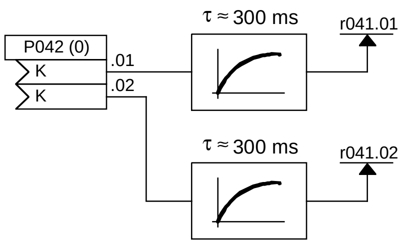


Display hexadecimal (0000h to FFFFh)

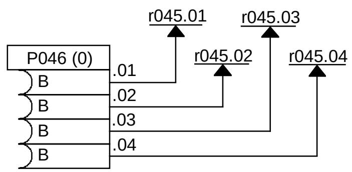


High-resolution connector displays with filtering

Display in % (-200.0 to 199.9 %)

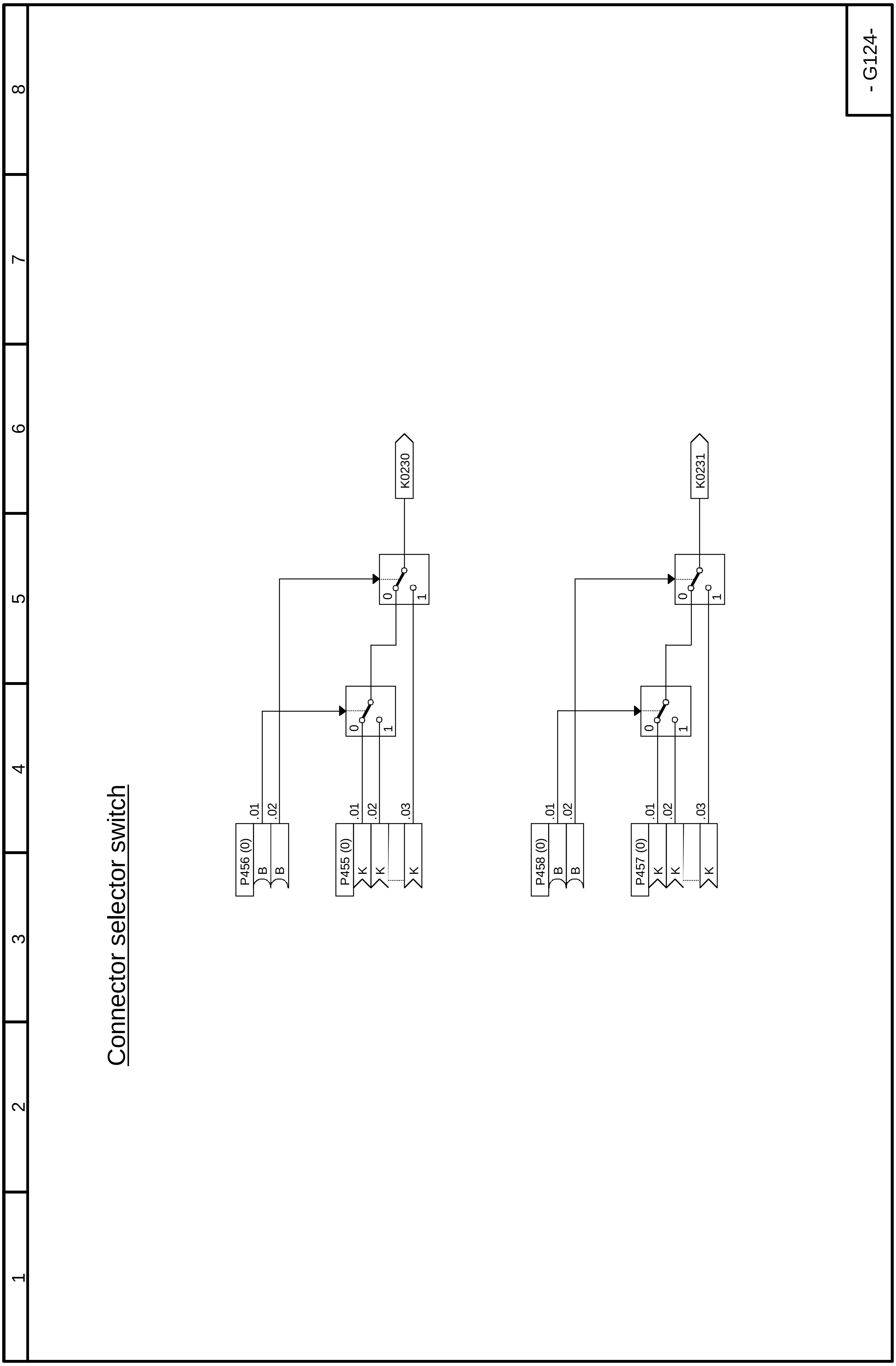


Binector displays



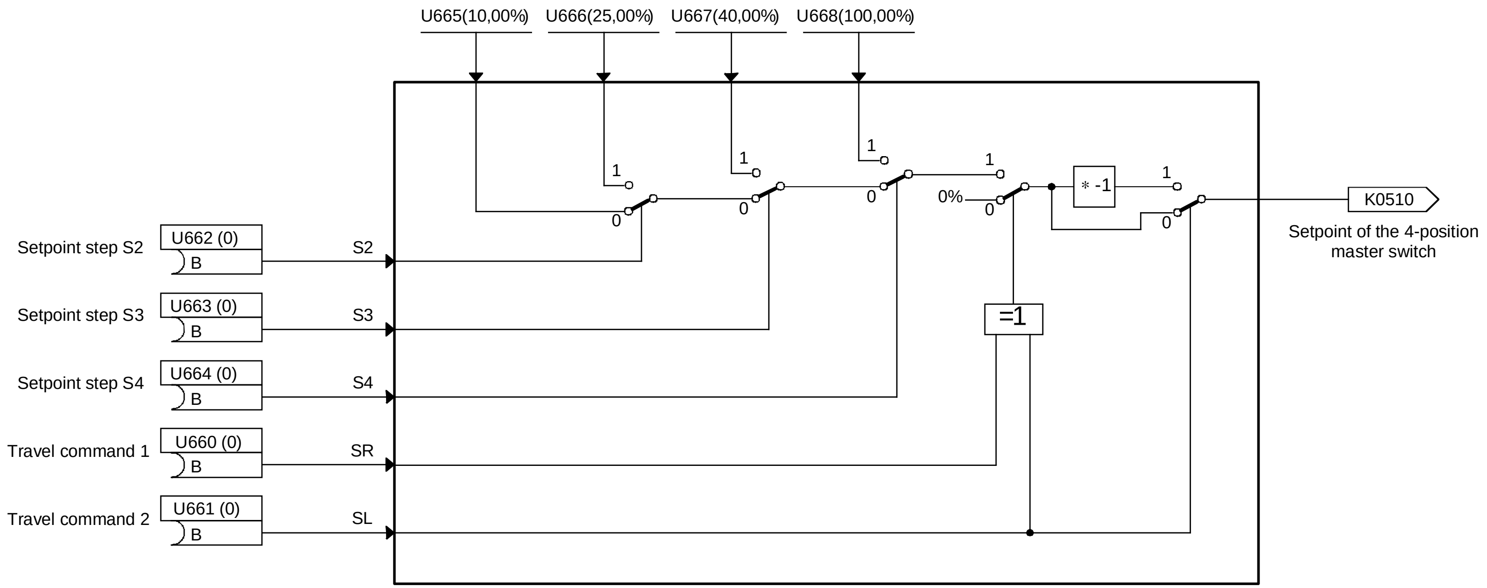
- G121 -

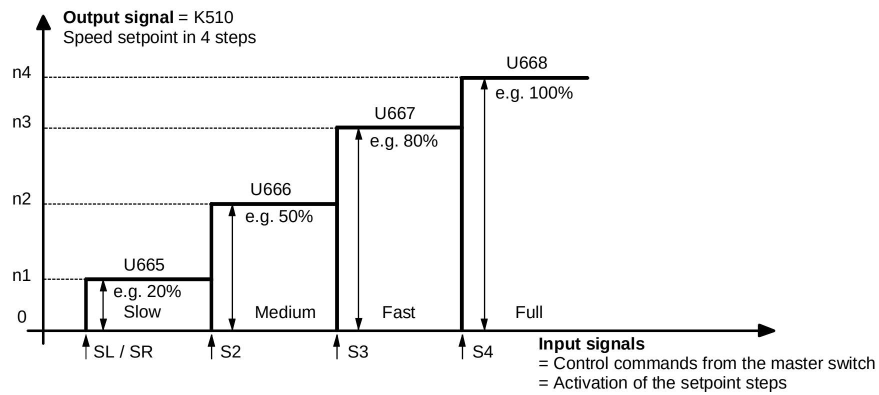
Sheet G124 Connector selector switch



1	2	3	4	5	6	7	8

Evaluation of a 4-step master switch



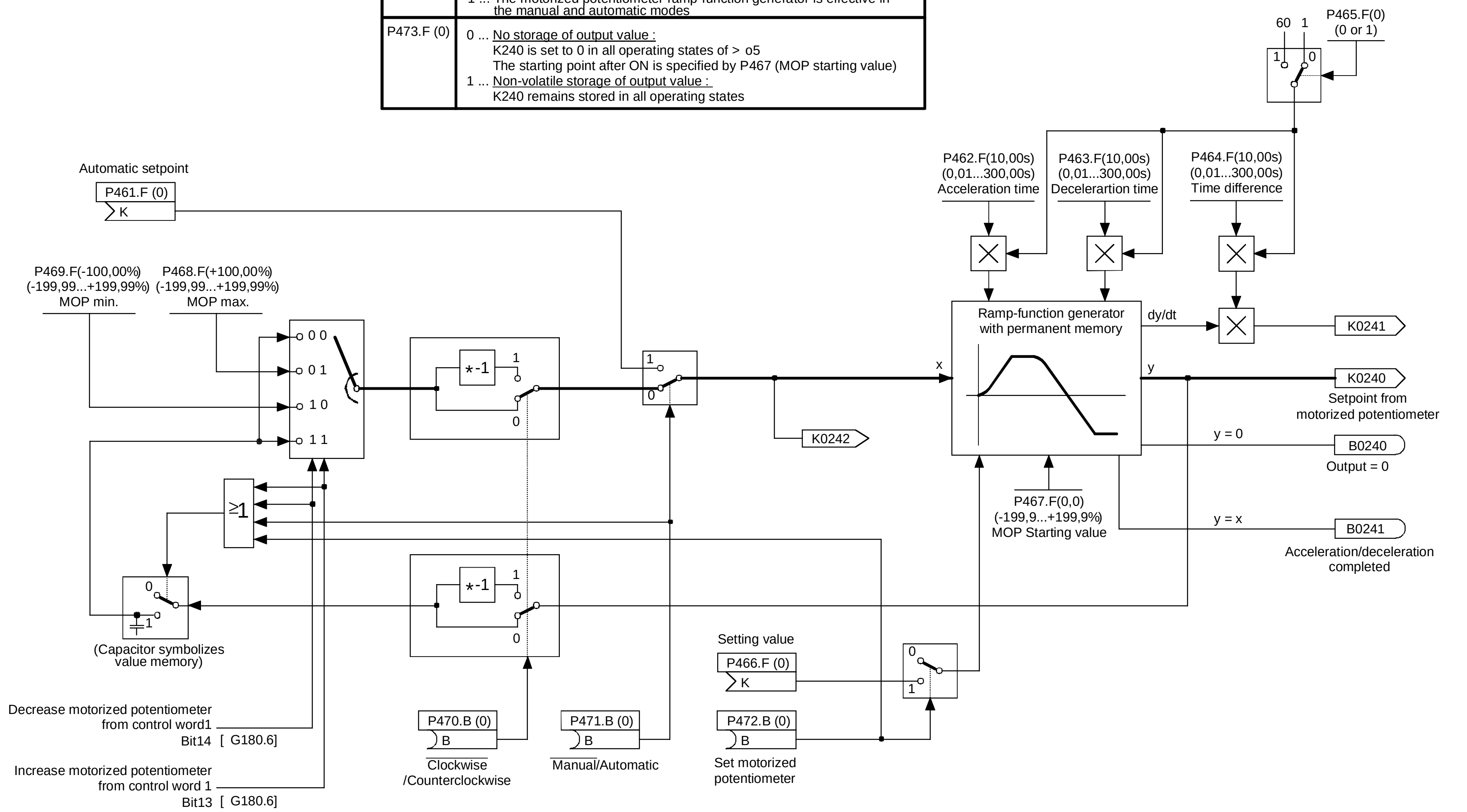


1	2	3	4	5	6	7	8

Motorized potentiometer

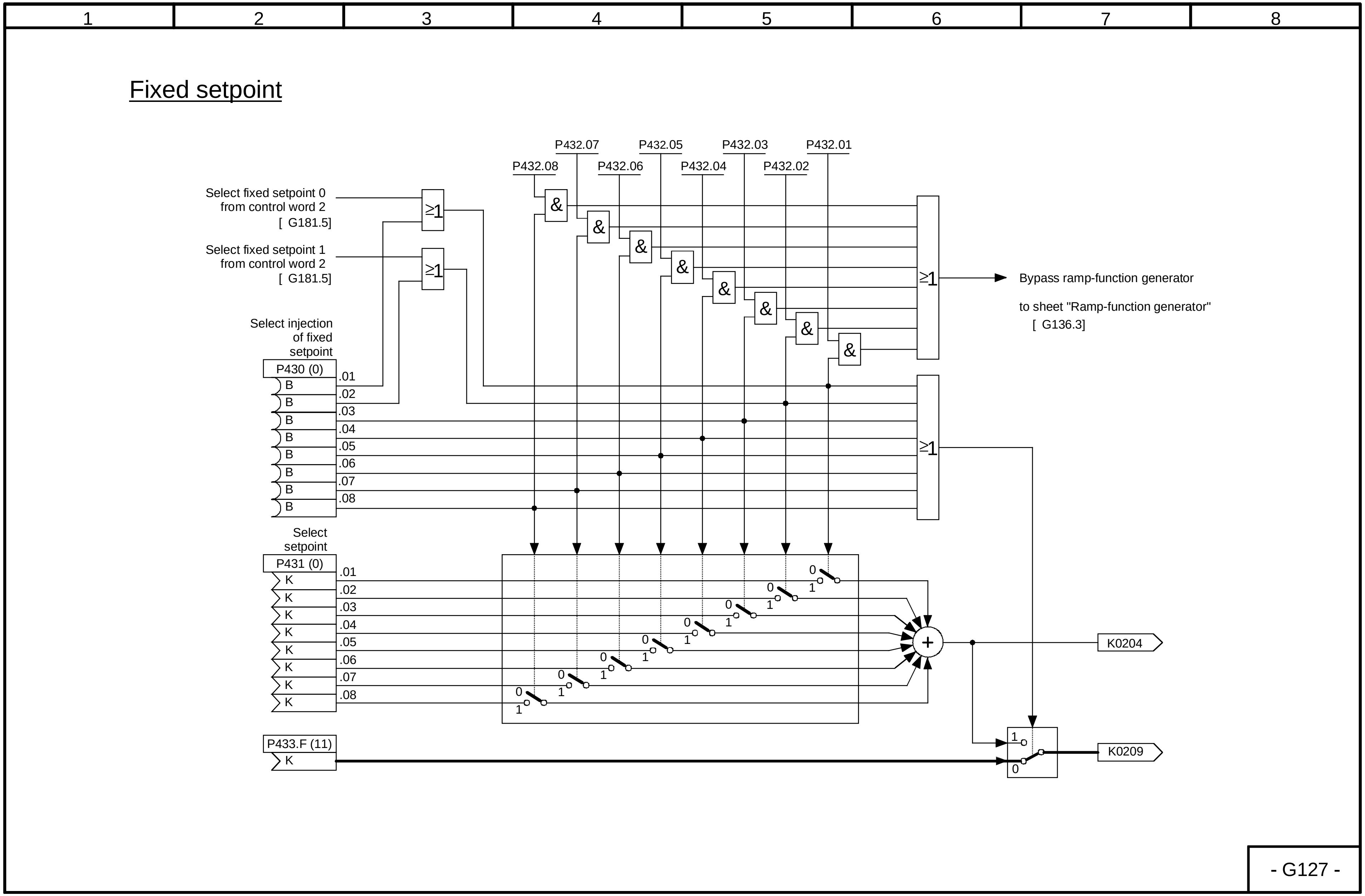
Motorized potentiometer operating mode

P460.F (1)	0 ... The motorized potentiometer ramp-function generator is bypassed in automatic mode (effect as for P462 and P463 = 0) 1 ... The motorized potentiometer ramp-function generator is effective in the manual and automatic modes
P473.F (0)	0 ... No storage of output value : K240 is set to 0 in all operating states of > o5 The starting point after ON is specified by P467 (MOP starting value) 1 ... Non-volatile storage of output value : K240 remains stored in all operating states



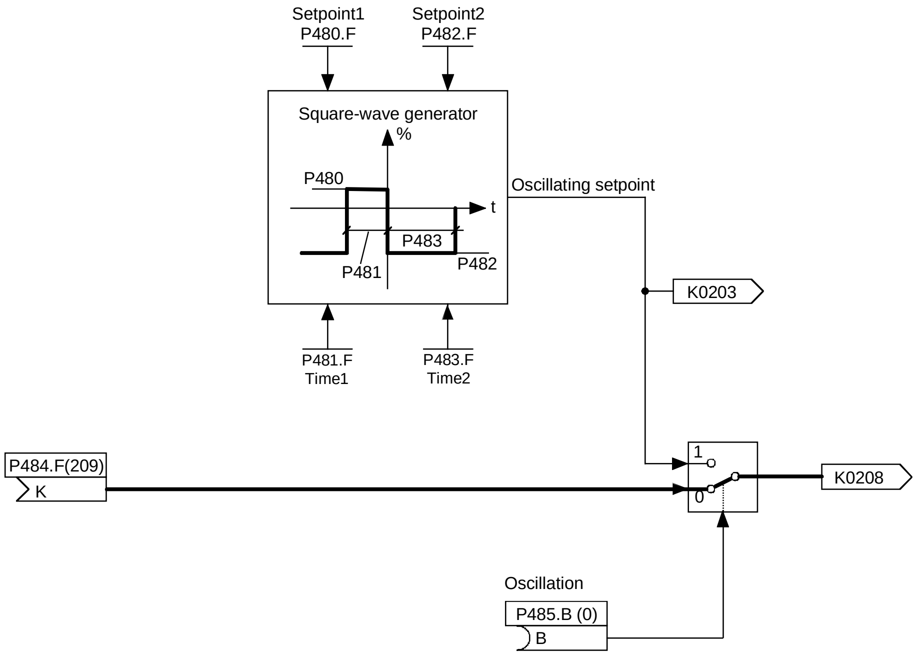
- G126 -

Fixed setpoint



1 2 3 4 5 6 7 8

Oscillating / square-wave generator



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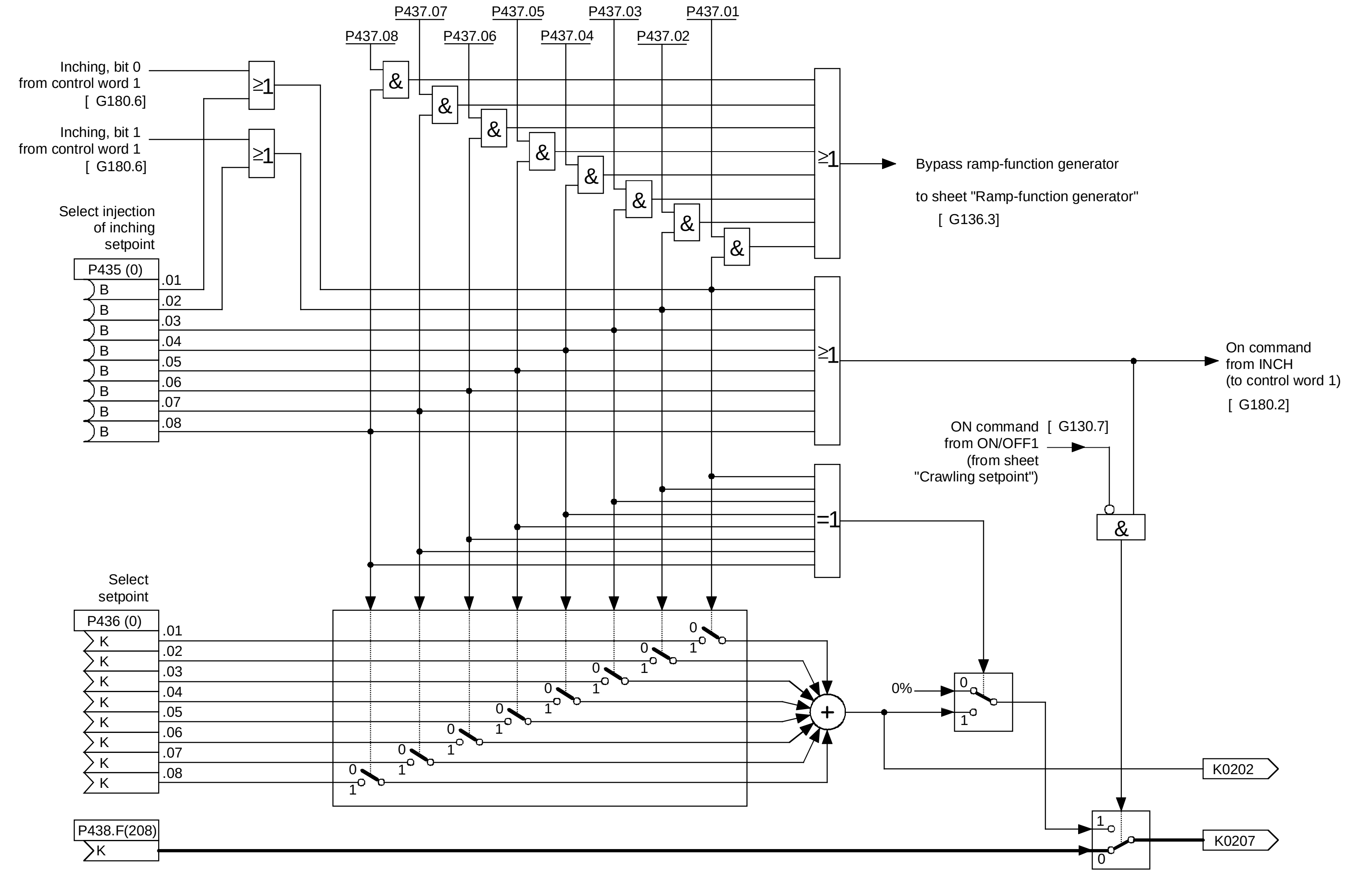
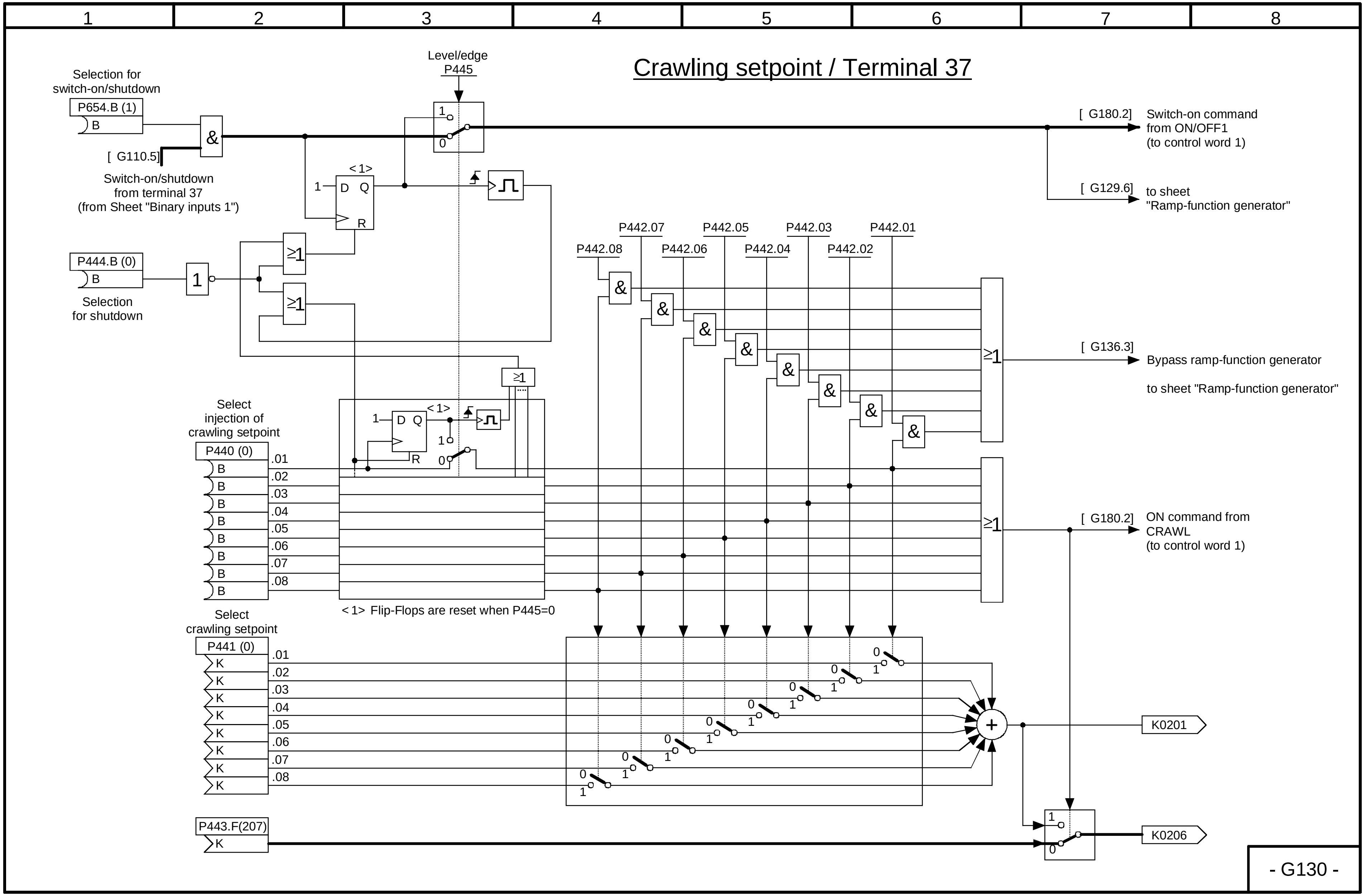
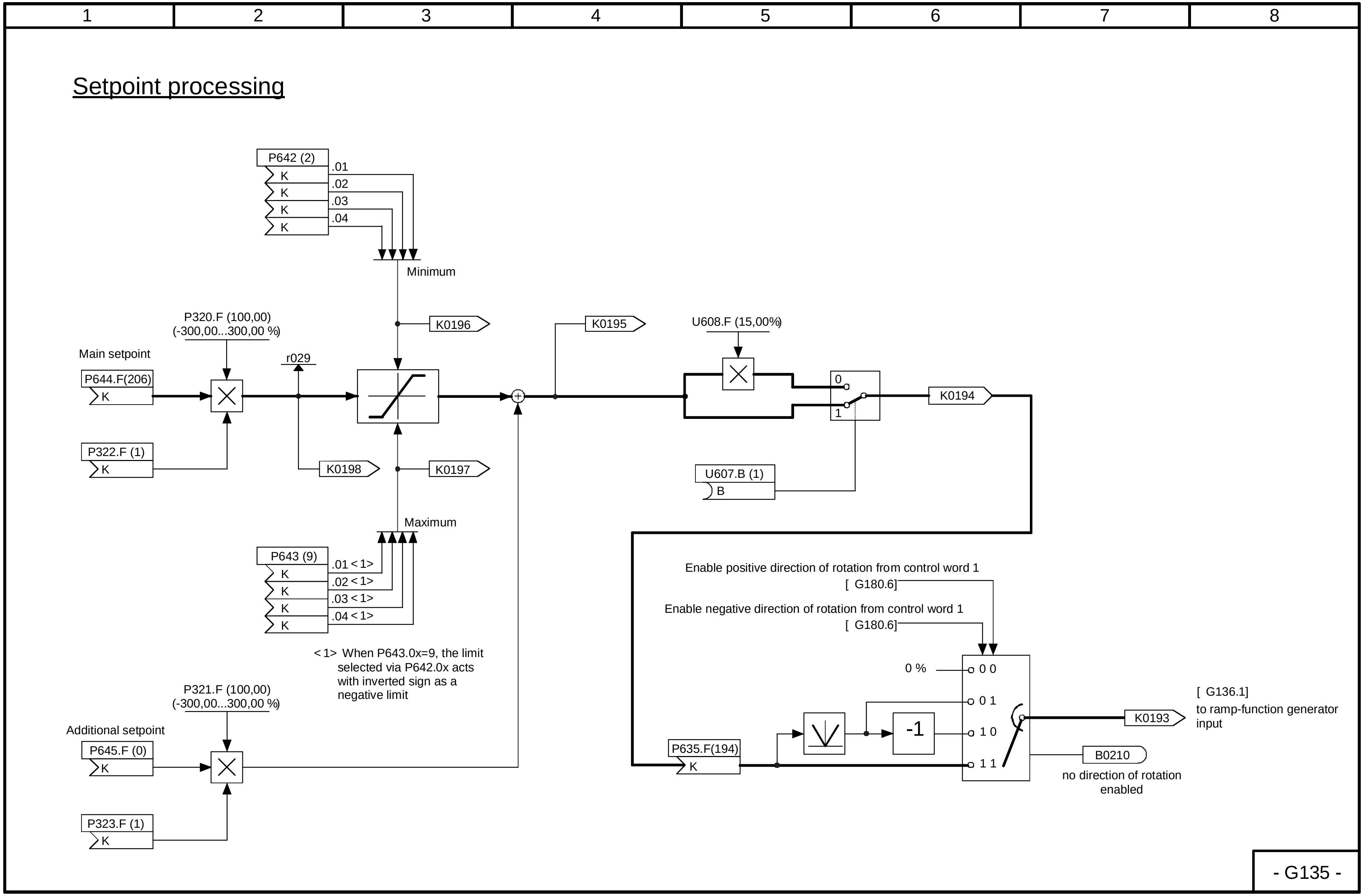
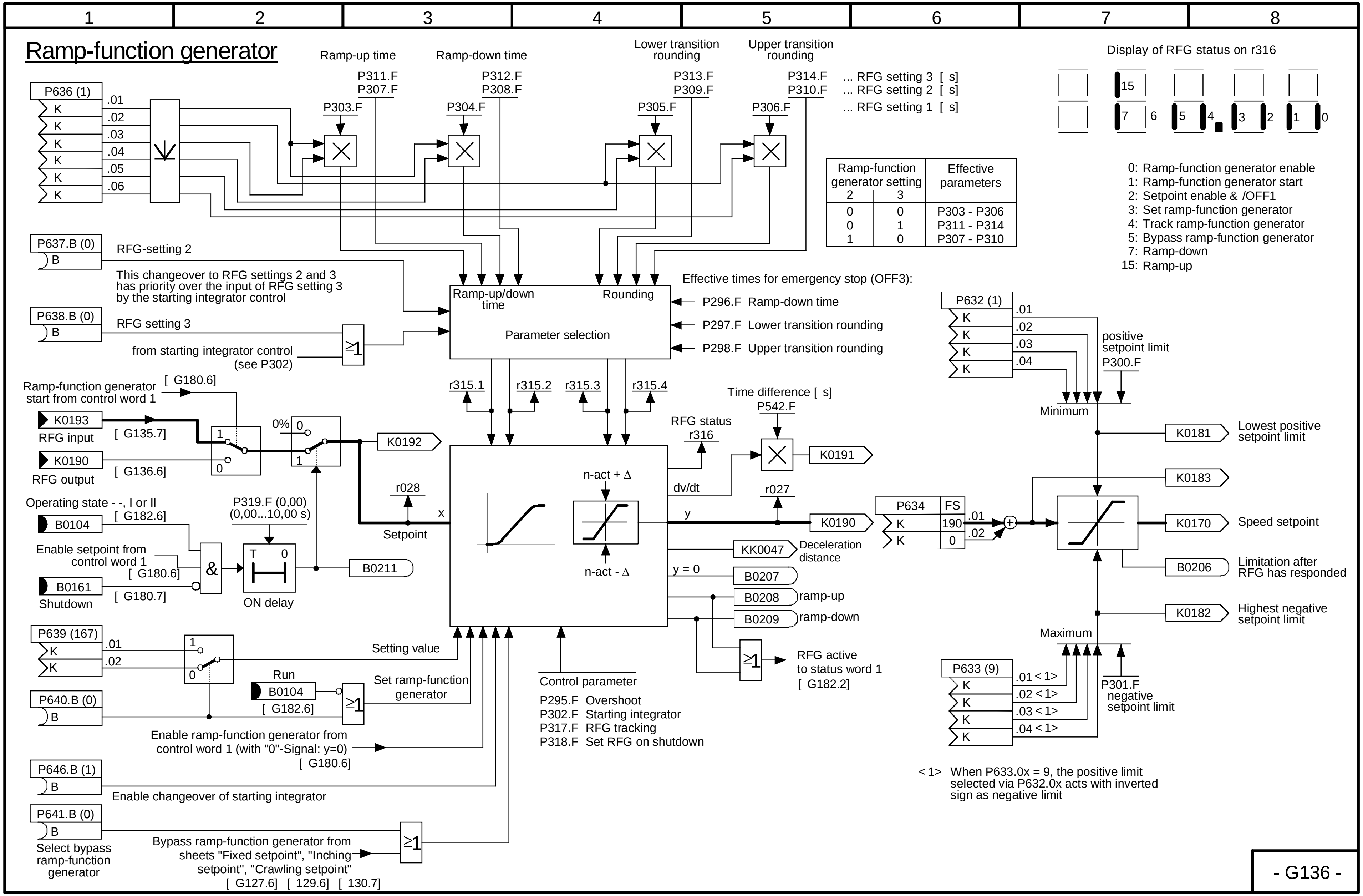
Inching setpoint



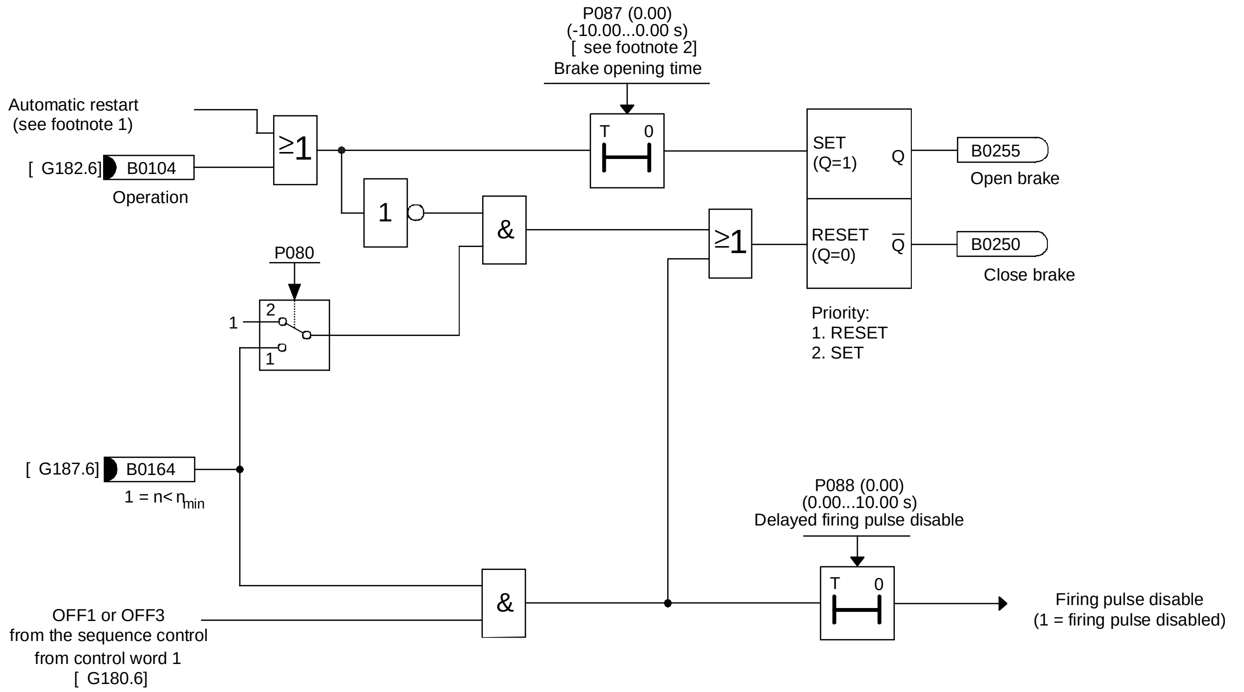

1
2
3
4
5
6
7
8
Crawling setpoint / Terminal 37
Level/edge
P445
Selection for
switch-on/shutdown
P654.B (1)
B
&
[G110.5]
Switch-on/shutdown
from terminal 37
(from Sheet "Binary inputs 1")
< 1>
1
D Q
R
1
0
[G180.2]
Switch-on command
from ON/OFF1
(to control word 1)
[G129.6]
to sheet
"Ramp-function generator"
P444.B (0)
B
Selection
for shutdown
≥1
P442.07
P442.05
P442.03
P442.01
P442.08
P442.06
P442.04
P442.02
[G136.3]
Bypass ramp-function generator
to sheet "Ramp-function generator"
Select
injection of
crawling setpoint
P440 (0)
.01
.02
.03
.04
.05
.06
.07
.08
[G180.2]
ON command from
CRAWL
(to control word 1)
< 1> Flip-Flops are reset when P445=0
Select
crawling setpoint
P441 (0)
K
+
K0201
P443.F(207)
K0206
- G130 -


1
2
3
4
5
6
7
8
Setpoint processing
P642 (2)
.01
.02
.03
.04
K
Minimum
K0196
K0195
U608.F (15,00%)
P320.F (100,00)
(-300,00...300,00 %)
Main setpoint
r029
P644.F(206)
K
0
1
K0194
P322.F (1)
K0198
K0197
U607.B (1)
B
Maximum
P643 (9)
.01 < 1>
.02 < 1>
.03 < 1>
.04 < 1>
Enable positive direction of rotation from control word 1
[G180.6]
Enable negative direction of rotation from control word 1
[G180.6]
< 1> When P643.0x=9, the limit selected via P642.0x acts with inverted sign as a negative limit
0 %
0 0
0 1
1 0
1 1
-1
P321.F (100,00)
(-300,00...300,00 %)
Additional setpoint
P645.F (0)
P635.F(194)
[G136.1]
to ramp-function generator input
K0193
B0210
no direction of rotation enabled
P323.F (1)
- G135 -



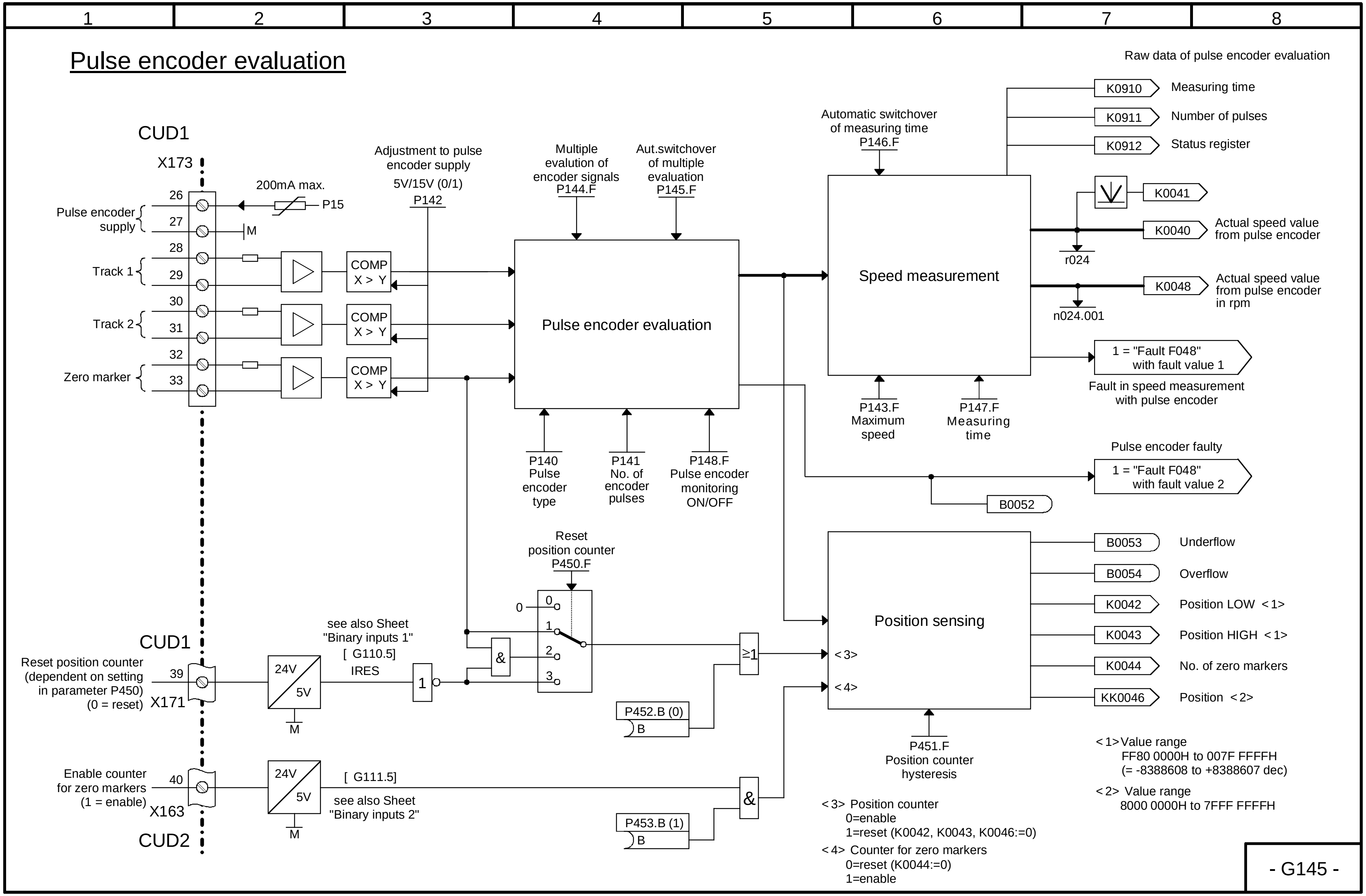
Ramp-function generator setting 2	Ramp-function generator setting 3	Effective parameters
0	0	P303 - P306
0	1	P311 - P314
1	0	P307 - P310

Brake control



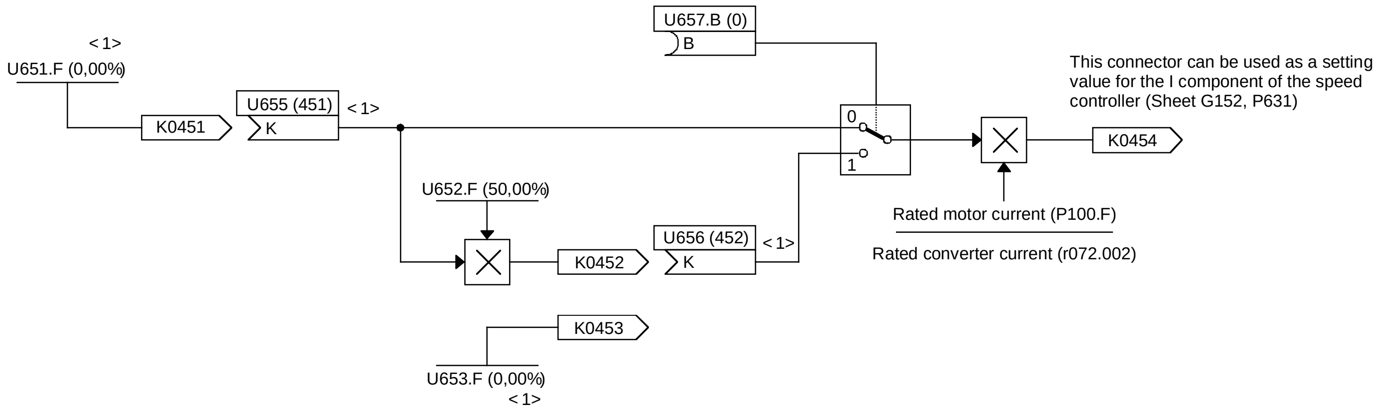
Footnote 1:
The signal "automatic restart" is generated by the sequence control.
If the voltage at the power section fails briefly in the "operating" state (see P086)
(and if automatic restart is selected, i.e. P086 > 0), the "operating" signal goes to log. "0" and
the "automatic restart" signal to log. "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.


1
2
3
4
5
6
7
8
Pulse encoder evaluation
Raw data of pulse encoder evaluation
CUD1
X173
Pulse encoder supply
26
27
28
29
30
31
32
33
Track 1
Track 2
Zero marker
200mA max.
P15
M
Adjustment to pulse encoder supply
5V/15V (0/1)
P142
COMP
X > Y
Multiple evalution of encoder signals
P144.F
Aut.switchover of multiple evaluation
P145.F
Pulse encoder evaluation
P140
Pulse encoder type
P141
No. of encoder pulses
P148.F
Pulse encoder monitoring ON/OFF
Automatic switchover of measuring time
P146.F
Speed measurement
P143.F
Maximum speed
P147.F
Measuring time
K0910
Measuring time
K0911
Number of pulses
K0912
Status register
K0041
K0040
Actual speed value from pulse encoder
r024
K0048
Actual speed value from pulse encoder in rpm
n024.001
1 = "Fault F048" with fault value 1
Fault in speed measurement with pulse encoder
Pulse encoder faulty
1 = "Fault F048" with fault value 2
B0052
Reset position counter
P450.F
0
1
2
3
&
see also Sheet "Binary inputs 1"
[G110.5]
IRES
CUD1
Reset position counter (dependent on setting in parameter P450) (0 = reset)
39
X171
24V
5V
M
1
≥1
P452.B (0)
B
Position sensing
<3>
<4>
B0053
Underflow
B0054
Overflow
K0042
Position LOW <1>
K0043
Position HIGH <1>
K0044
No. of zero markers
KK0046
Position <2>
P451.F
Position counter hysteresis
Enable counter for zero markers (1 = enable)
40
X163
CUD2
[G111.5]
see also Sheet "Binary inputs 2"
P453.B (1)
<1> Value range
FF80 0000H to 007F FFFFH
(= -8388608 to +8388607 dec)
<2> Value range
8000 0000H to 7FFF FFFFH
<3> Position counter
0=enable
1=reset (K0042, K0043, K0046:=0)
<4> Counter for zero markers
0=reset (K0044:=0)
1=enable
- G145 -

1	2	3	4	5	6	7	8

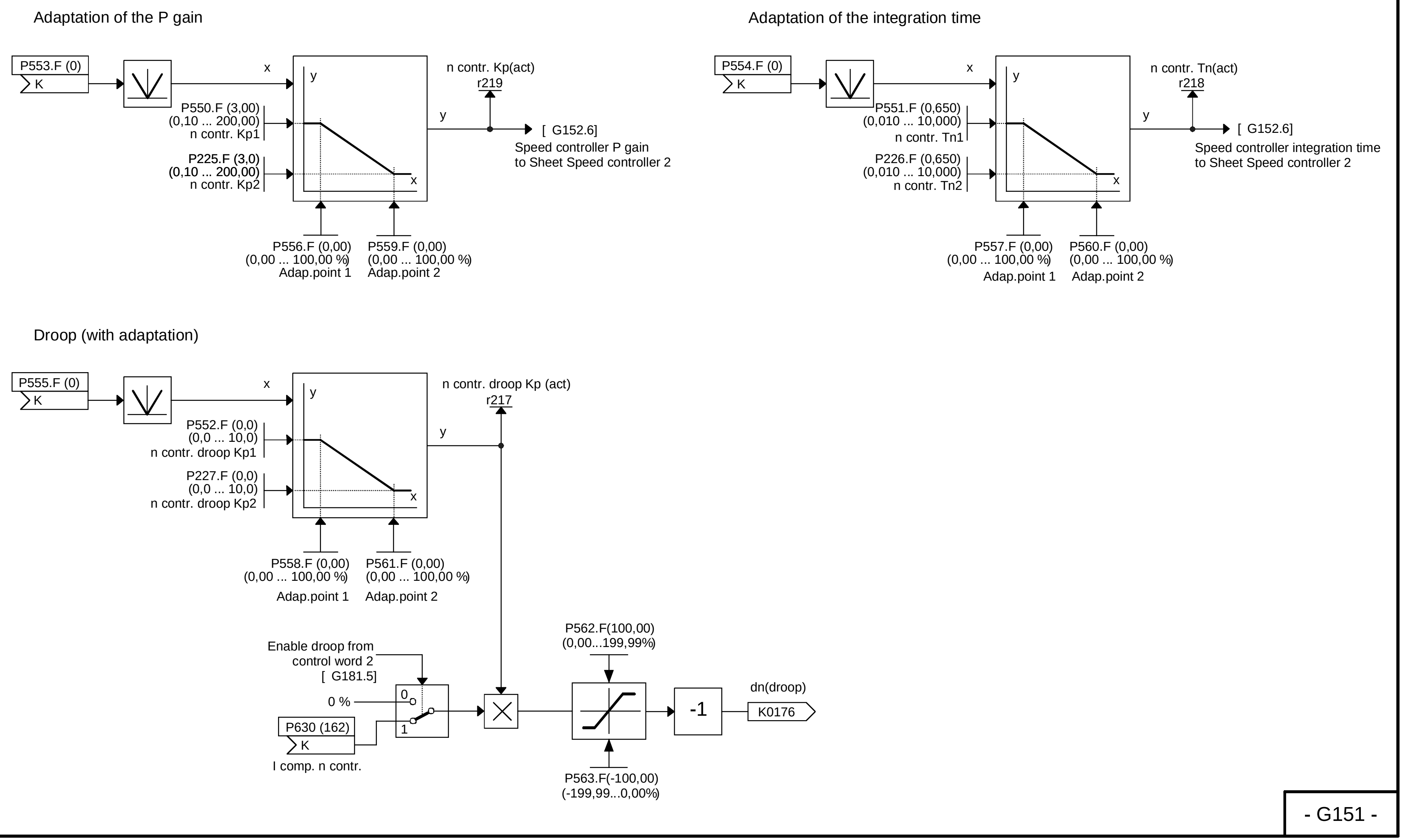
Starting pulse - speed controller



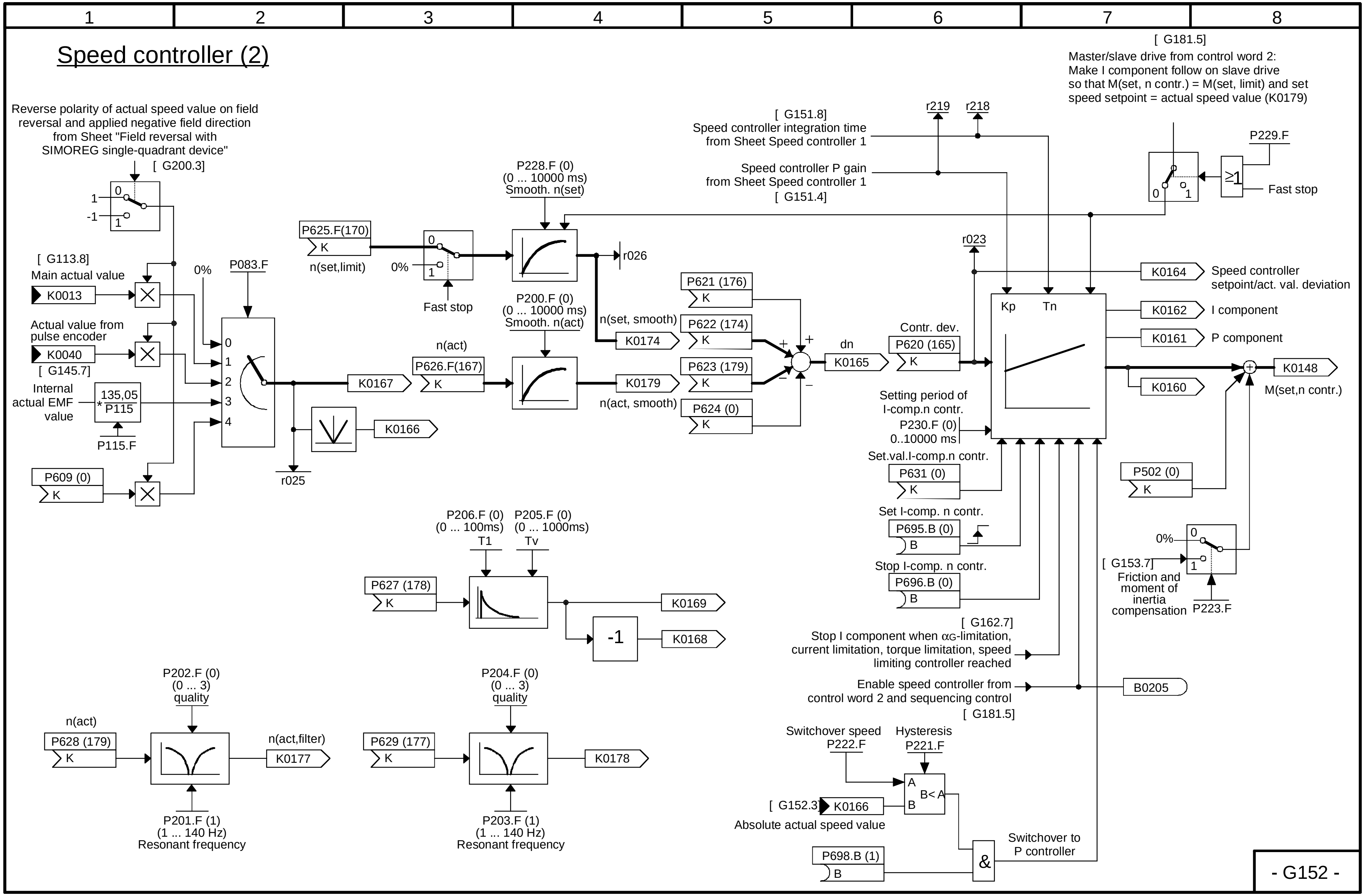
< 1> 100% corresponds to 100% of the rated current of the motor (P100)

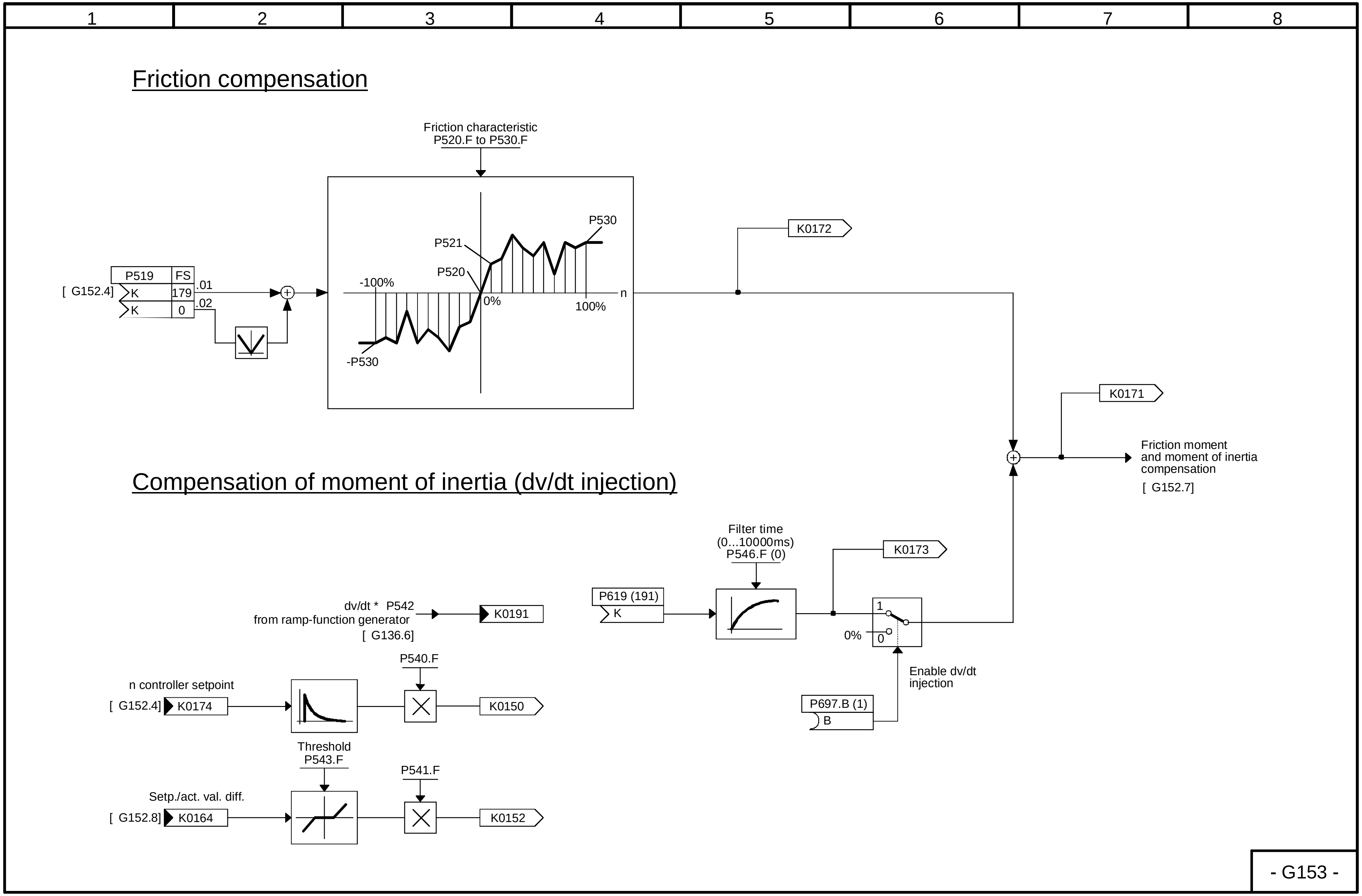
1	2	3	4	5	6	7	8

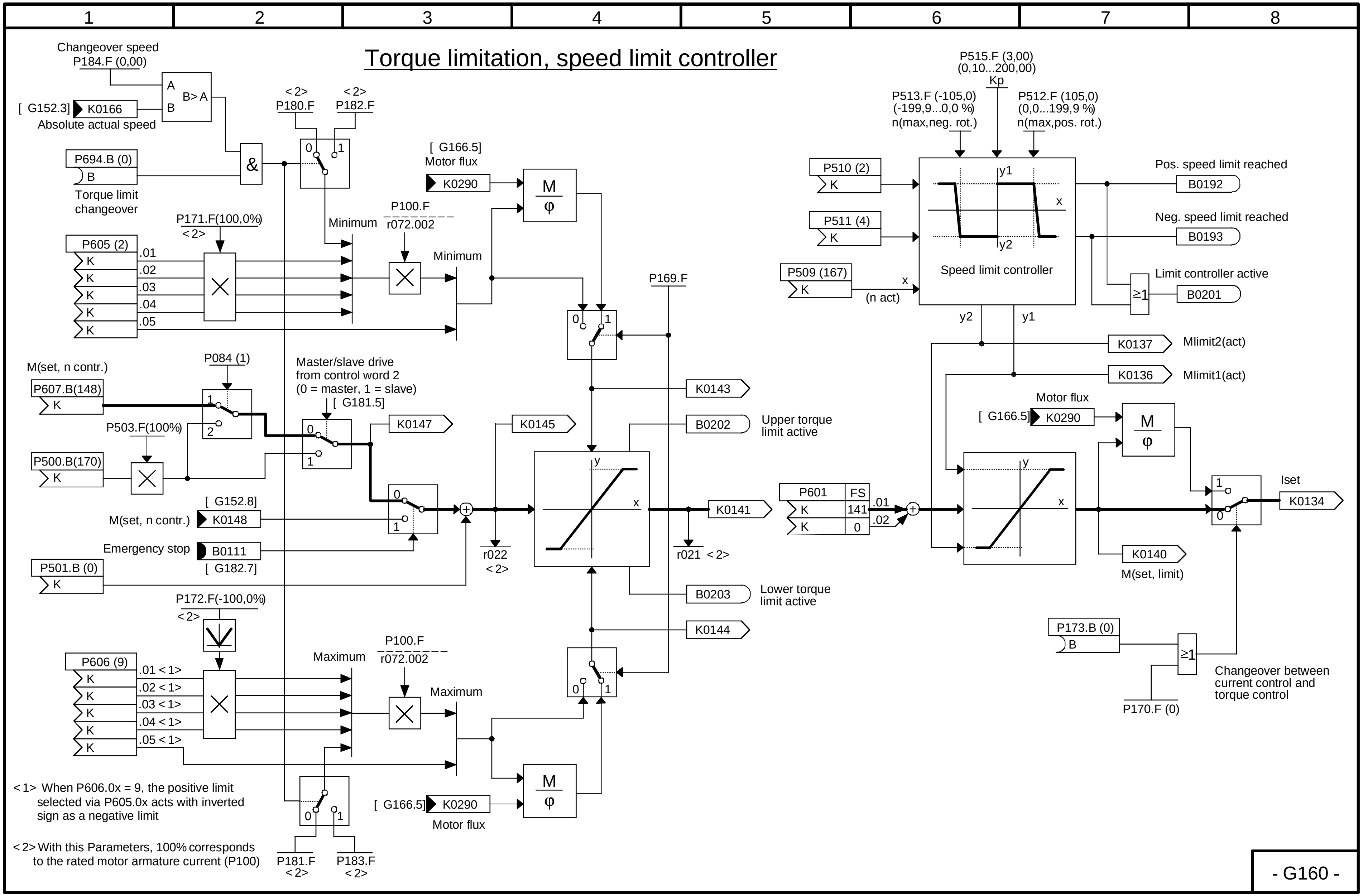
Speed controller (1)



Speed controller (2)



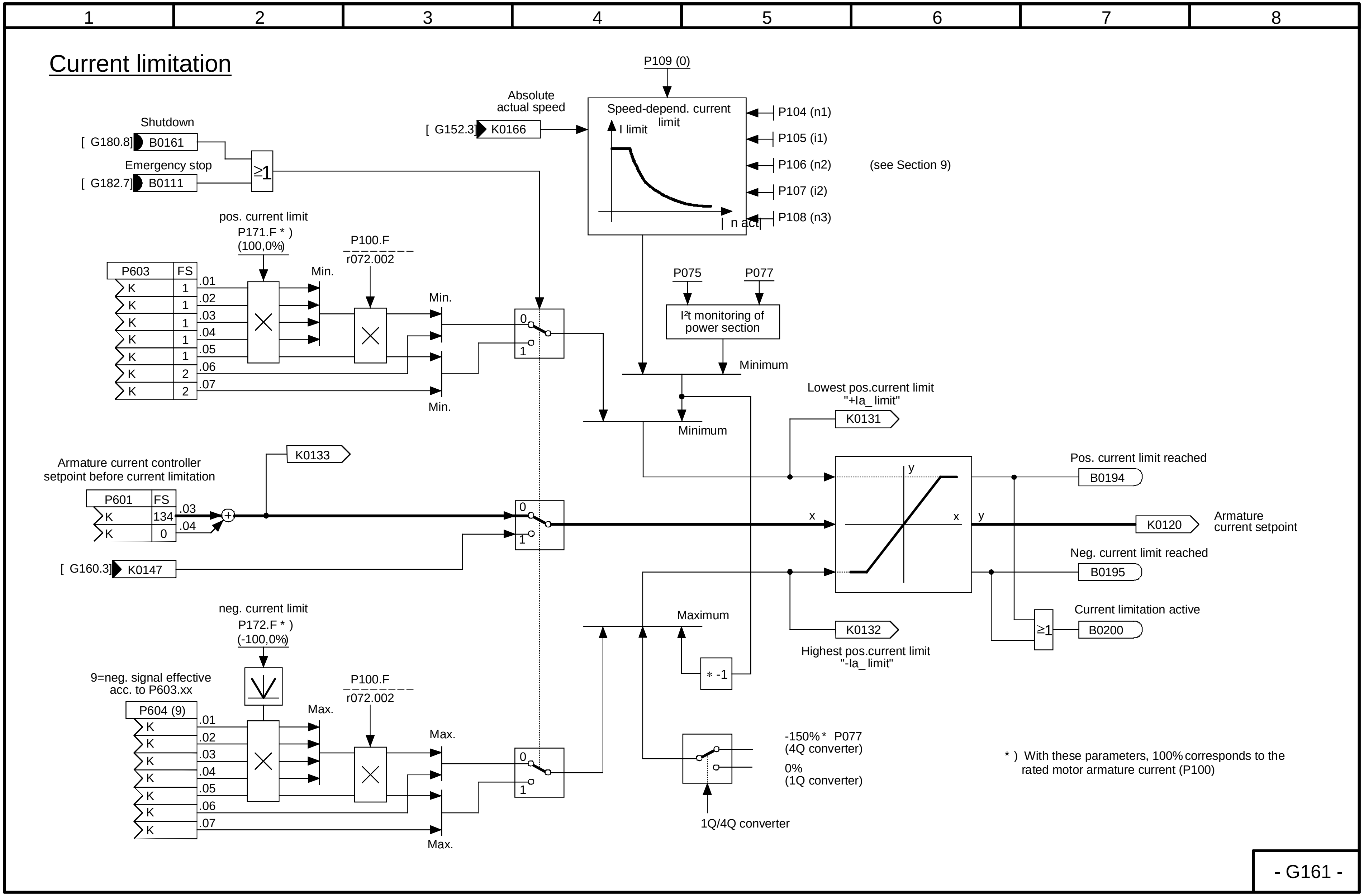

1
2
3
4
5
6
7
8
Friction compensation
Friction characteristic
P520.F to P530.F
P530
P521
P520
-100%
0%
100%
n
-P530
P519
FS
[G152.4]
K
179
.01
K
0
.02
K0172
K0171
Friction moment
and moment of inertia
compensation
[G152.7]
Compensation of moment of inertia (dv/dt injection)
Filter time
(0...10000ms)
P546.F (0)
K0173
P619 (191)
K
dv/dt * P542
from ramp-function generator
[G136.6]
K0191
1
0%
0
Enable dv/dt
injection
P697.B (1)
B
P540.F
n controller setpoint
[G152.4]
K0174
K0150
Threshold
P543.F
P541.F
Setp./act. val. diff.
[G152.8]
K0164
K0152
- G153 -

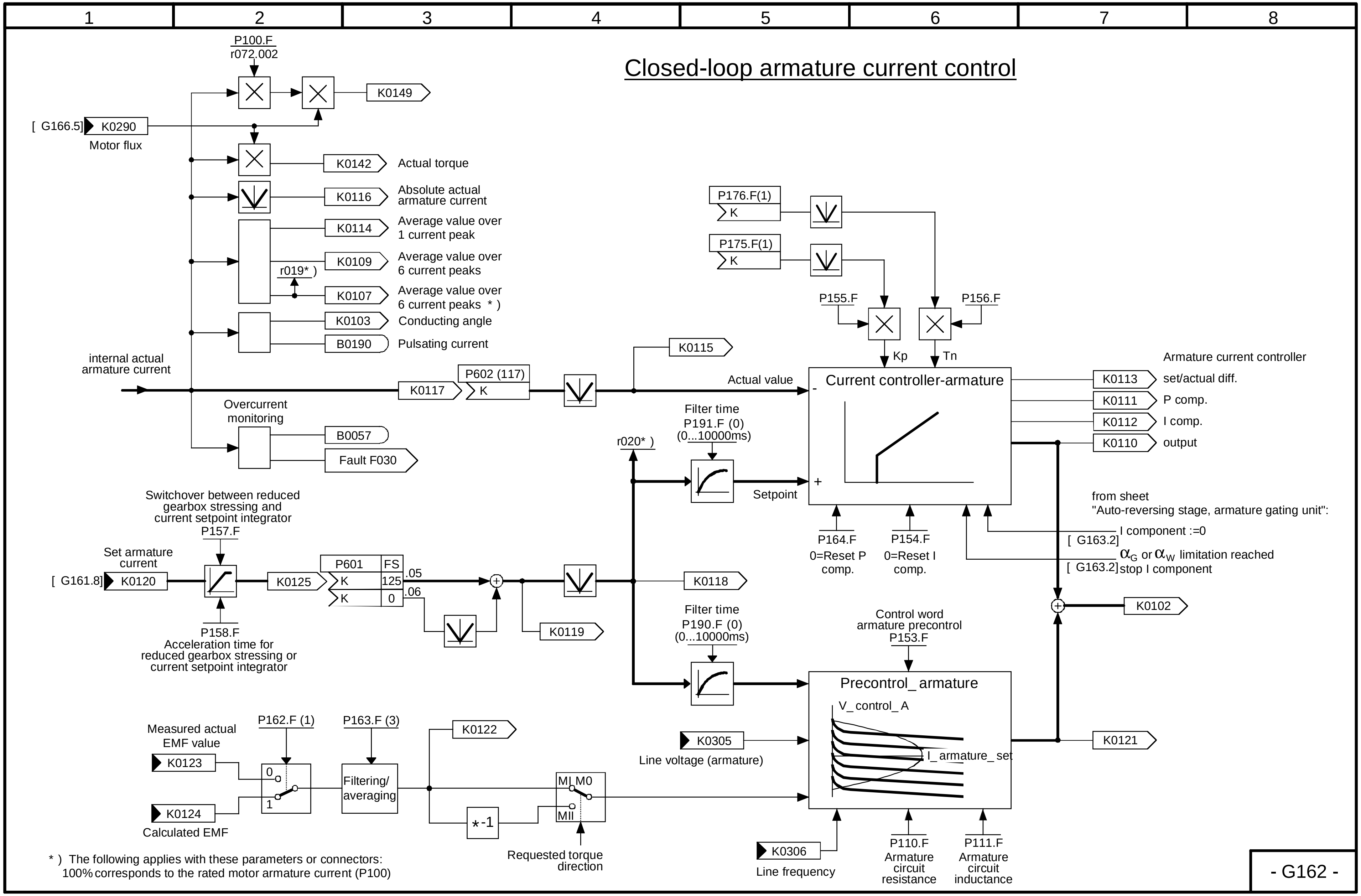


<1> When P606.0x = 9, the positive limit selected via P605.0x acts with inverted sign as a negative limit

<2> With this Parameters, 100% corresponds to the rated motor armature current (P100)

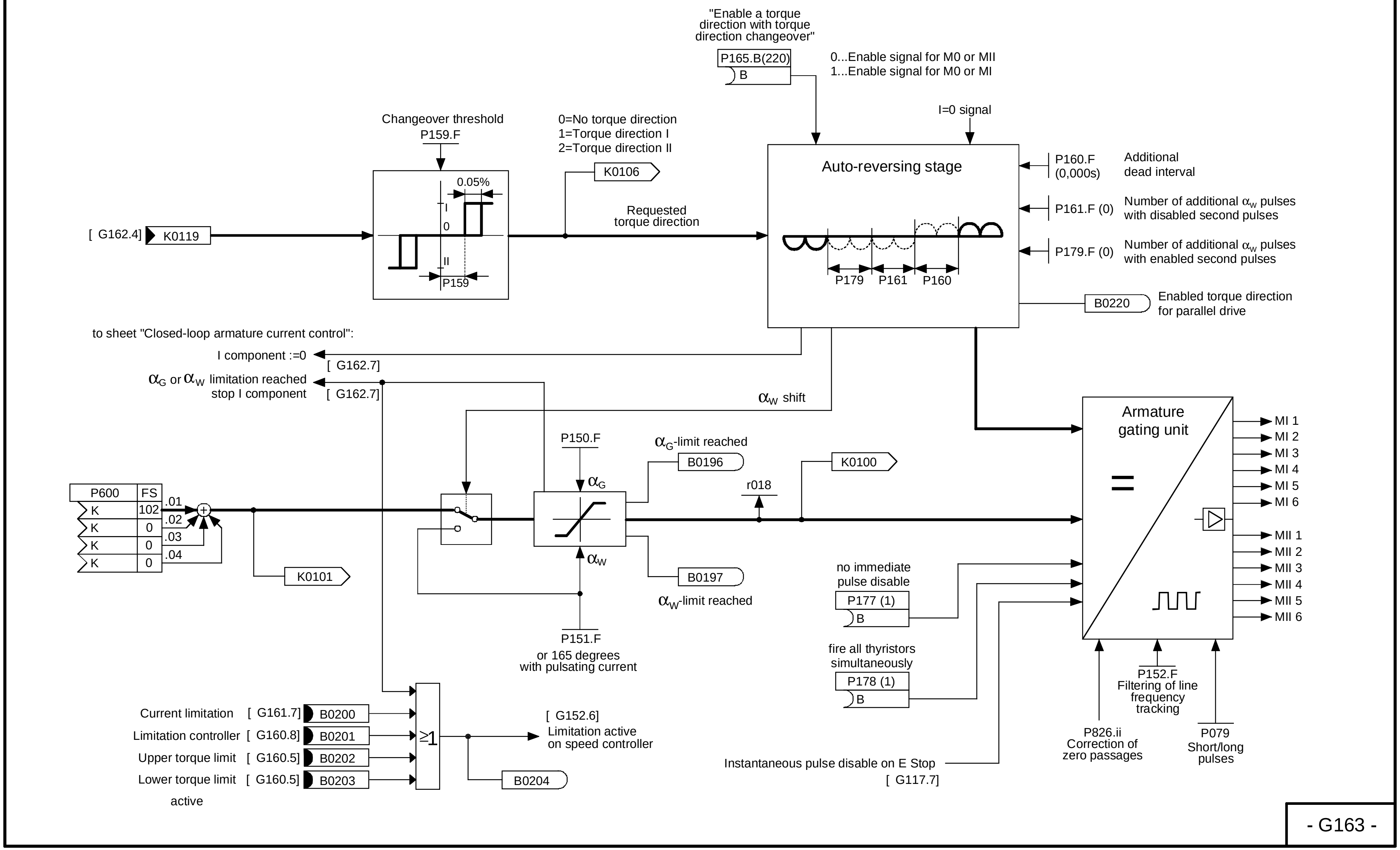
Current limitation




1 2 3 4 5 6 7 8
Closed-loop armature current control
P100.F
r072.002
K0149
[G166.5] K0290
Motor flux
K0142 Actual torque
K0116 Absolute actual armature current
K0114 Average value over 1 current peak
K0109 Average value over 6 current peaks
r019*)
K0107 Average value over 6 current peaks *)
K0103 Conducting angle
B0190 Pulsating current
internal actual armature current
K0117
P602 (117)
K
K0115
Actual value
Overcurrent monitoring
B0057
Fault F030
P176.F(1)
K
P175.F(1)
K
P155.F
P156.F
Kp
Tn
Current controller-armature
Armature current controller
K0113 set/actual diff.
K0111 P comp.
K0112 I comp.
K0110 output
Filter time
P191.F (0)
(0...10000ms)
r020*)
Setpoint
P164.F
0=Reset P comp.
P154.F
0=Reset I comp.
from sheet
"Auto-reversing stage, armature gating unit":
[G163.2] I component :=0
αG or αW limitation reached
[G163.2] stop I component
Switchover between reduced gearbox stressing and current setpoint integrator
P157.F
Set armature current
[G161.8] K0120
K0125
P601 FS
K 125
K 0
.05
.06
K0118
K0119
K0102
P158.F
Acceleration time for reduced gearbox stressing or current setpoint integrator
Filter time
P190.F (0)
(0...10000ms)
Control word armature precontrol
P153.F
Precontrol_ armature
V_ control_ A
I_ armature_ set
K0305
Line voltage (armature)
K0121
Measured actual EMF value
K0123
P162.F (1)
P163.F (3)
Filtering/ averaging
K0122
K0124
Calculated EMF
*-1
MI M0
MII
Requested torque direction
K0306
Line frequency
P110.F Armature circuit resistance
P111.F Armature circuit inductance
*) The following applies with these parameters or connectors:
100% corresponds to the rated motor armature current (P100)
- G162 -

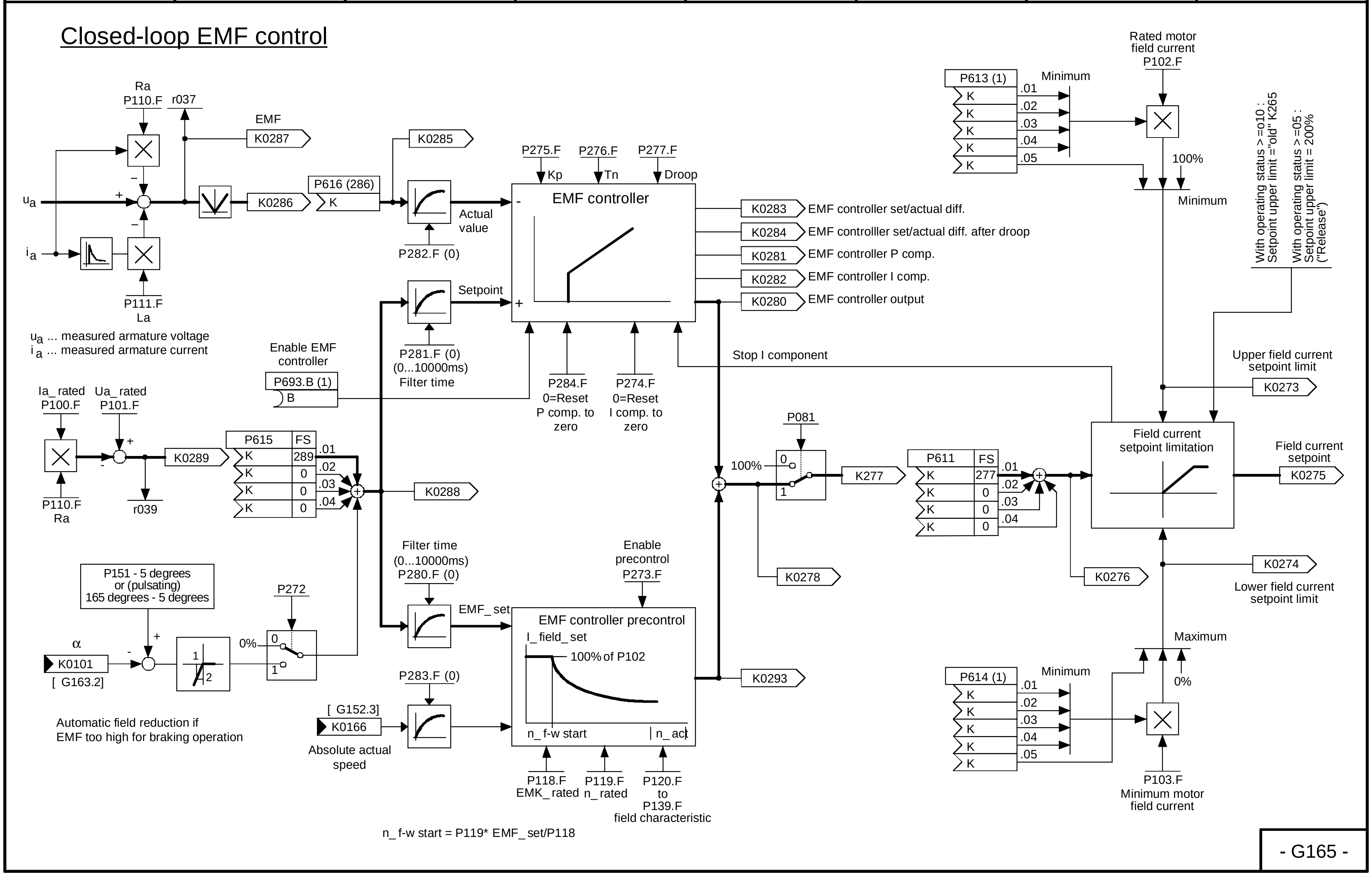
1	2	3	4	5	6	7	8

Auto-reversing stage, armature gating unit



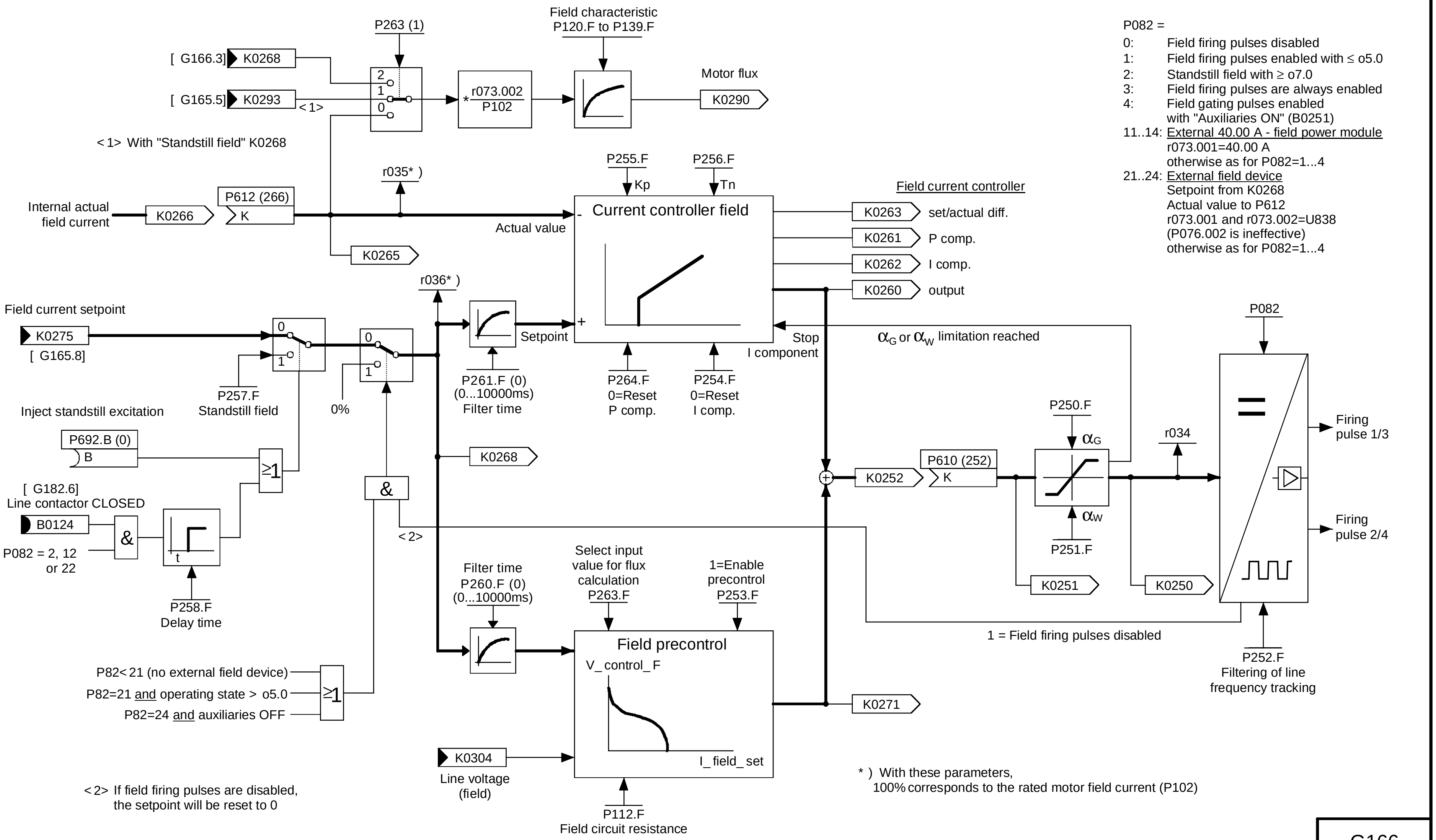
- G163 -

Closed-loop EMF control



1	2	3	4	5	6	7	8

Closed-loop field current control, field gating unit

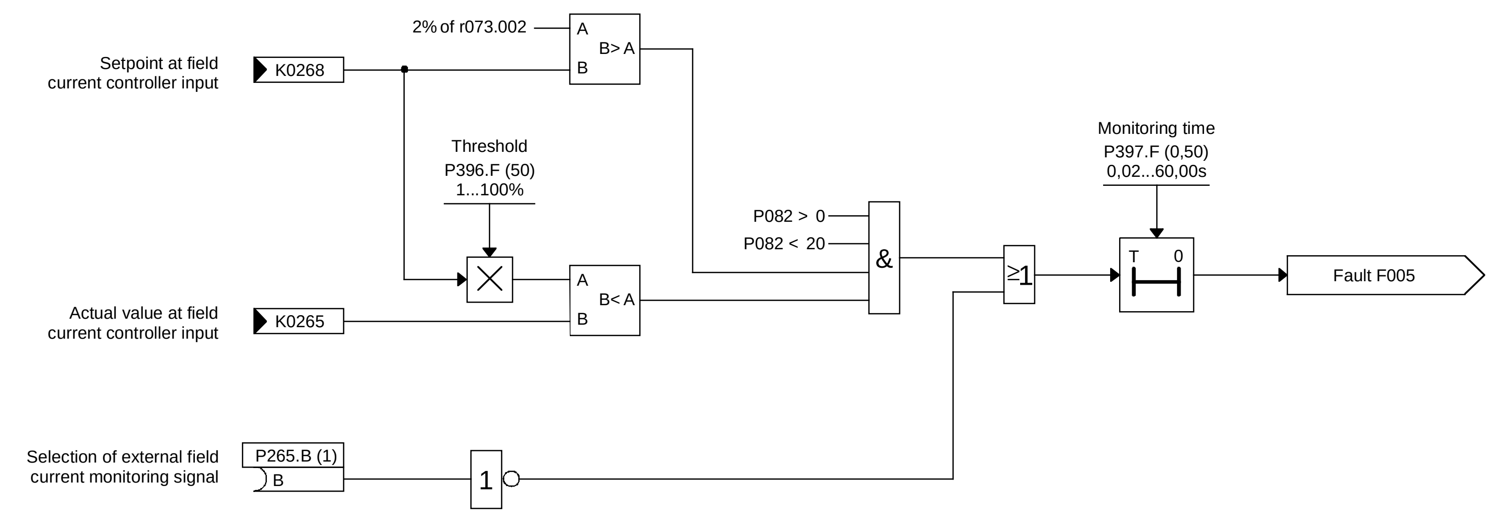


P082 =
0: Field firing pulses disabled
1: Field firing pulses enabled with ≤ o5.0
2: Standstill field with ≥ o7.0
3: Field firing pulses are always enabled
4: Field gating pulses enabled with "Auxiliaries ON" (B0251)
11..14: External 40.00 A - field power module
r073.001=40.00 A
otherwise as for P082=1...4
21..24: External field device
Setpoint from K0268
Actual value to P612
r073.001 and r073.002=U838
(P076.002 is ineffective)
otherwise as for P082=1...4

- G166 -

1	2	3	4	5	6	7	8

Field current monitoring



- G167 -

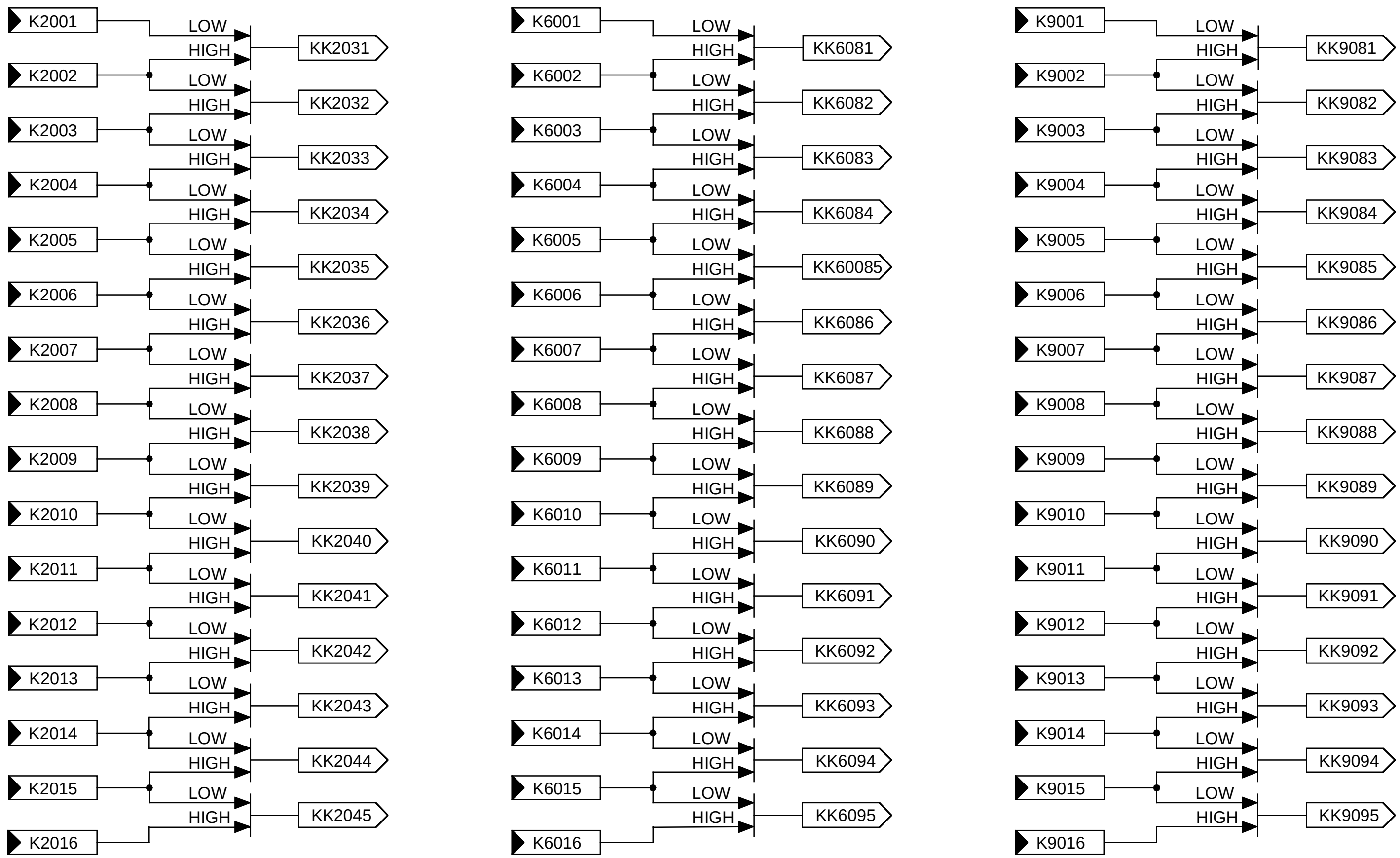
1 2 3 4 5 6 7 8

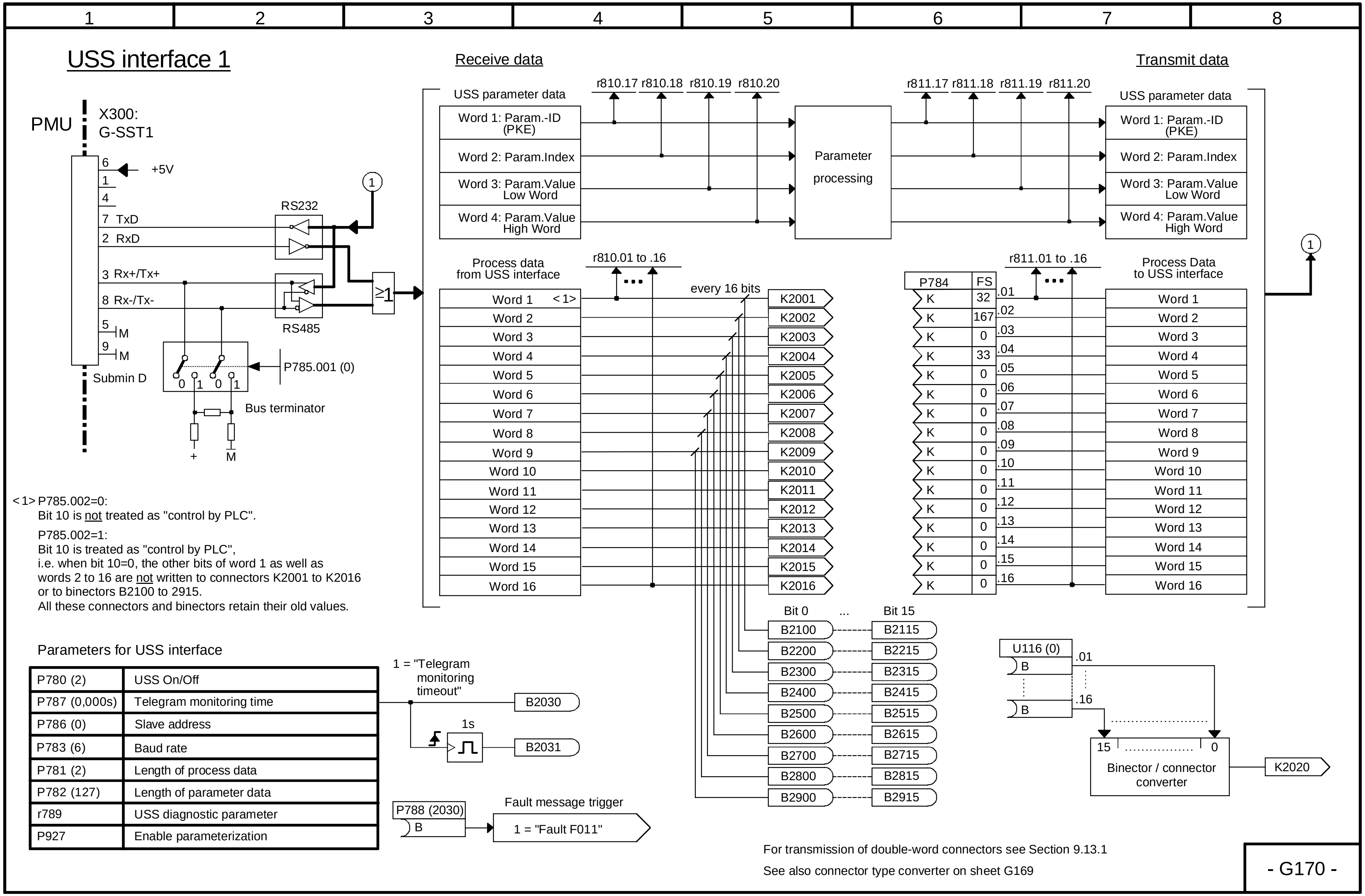
Serial interfaces: connector-type converters

USS interface 1 (G170)

USS interface 2 (G171)
Peer-to-peer interface 2 (G173)

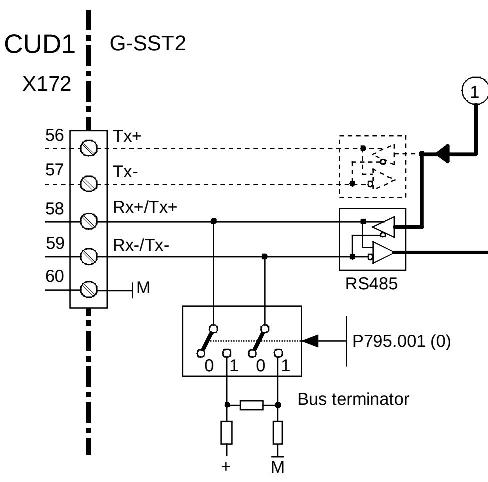
USS interface 3 (G172)
Peer-to-peer interface 3 (G174)

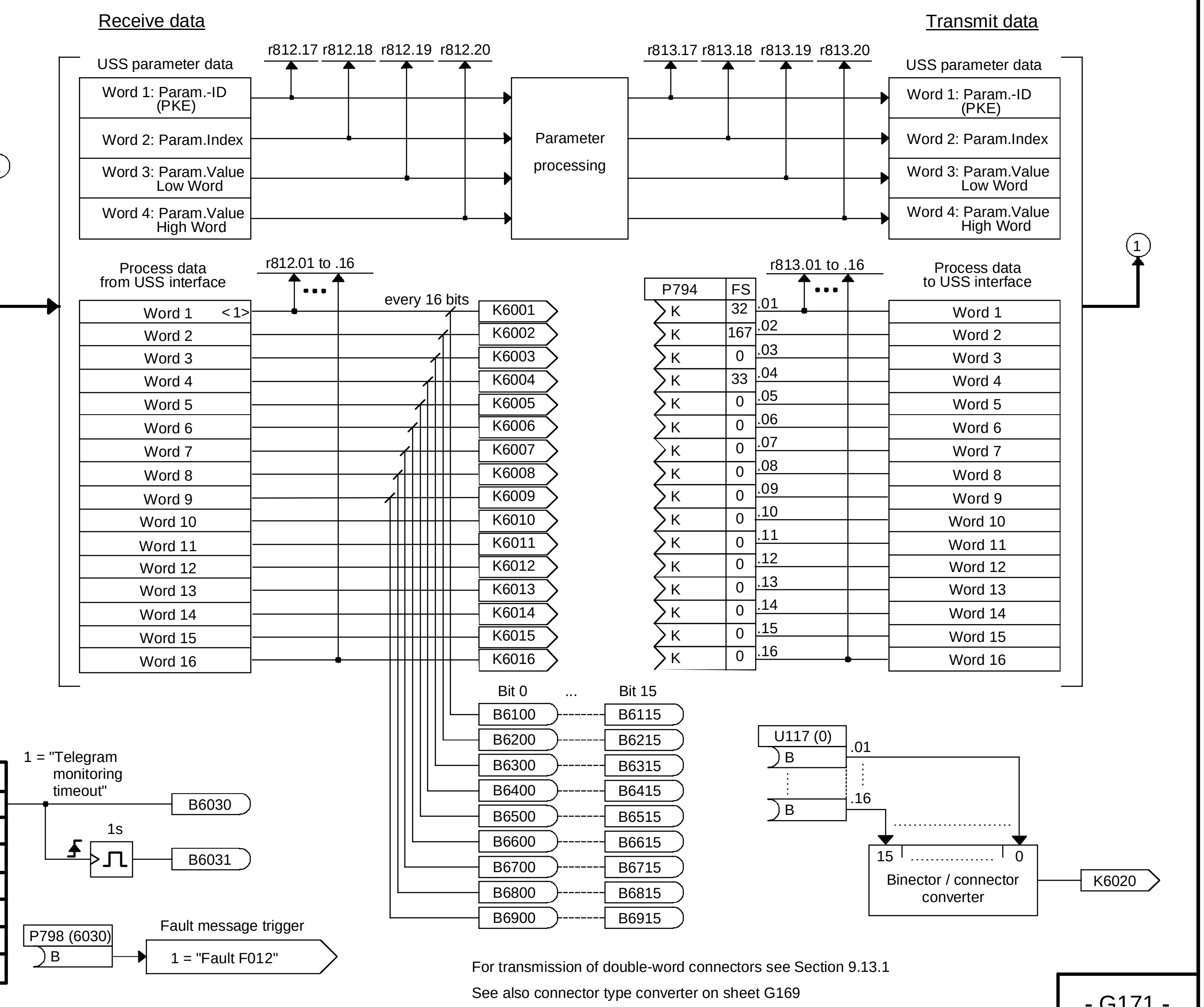



1 2 3 4 5 6 7 8
USS interface 1
PMU
X300:
G-SST1
6 +5V
1
4
7 TxD
2 RxD
3 Rx+/Tx+
8 Rx-/Tx-
5 M
9 M
Submin D
RS232
RS485
≥1
P785.001 (0)
0 1 0 1
Bus terminator
+ M
Receive data
USS parameter data
r810.17 r810.18 r810.19 r810.20
Word 1: Param.-ID (PKE)
Word 2: Param.Index
Word 3: Param.Value Low Word
Word 4: Param.Value High Word
Parameter processing
r811.17 r811.18 r811.19 r811.20
Transmit data
USS parameter data
Word 1: Param.-ID (PKE)
Word 2: Param.Index
Word 3: Param.Value Low Word
Word 4: Param.Value High Word
Process data from USS interface
r810.01 to .16
Word 1 <1>
Word 2
Word 3
Word 4
Word 5
Word 6
Word 7
Word 8
Word 9
Word 10
Word 11
Word 12
Word 13
Word 14
Word 15
Word 16
every 16 bits
K2001
K2002
K2003
K2004
K2005
K2006
K2007
K2008
K2009
K2010
K2011
K2012
K2013
K2014
K2015
K2016
Bit 0 ... Bit 15
B2100 B2115
B2200 B2215
B2300 B2315
B2400 B2415
B2500 B2515
B2600 B2615
B2700 B2715
B2800 B2815
B2900 B2915
P784 FS
K 32 .01
K 167 .02
K 0 .03
K 33 .04
K 0 .05
K 0 .06
K 0 .07
K 0 .08
K 0 .09
K 0 .10
K 0 .11
K 0 .12
K 0 .13
K 0 .14
K 0 .15
K 0 .16
r811.01 to .16
Process Data to USS interface
Word 1
Word 2
Word 3
Word 4
Word 5
Word 6
Word 7
Word 8
Word 9
Word 10
Word 11
Word 12
Word 13
Word 14
Word 15
Word 16
<1> P785.002=0:
Bit 10 is not treated as "control by PLC".
P785.002=1:
Bit 10 is treated as "control by PLC",
i.e. when bit 10=0, the other bits of word 1 as well as
words 2 to 16 are not written to connectors K2001 to K2016
or to binectors B2100 to 2915.
All these connectors and binectors retain their old values.
Parameters for USS interface
P780 (2) USS On/Off
P787 (0,000s) Telegram monitoring time
P786 (0) Slave address
P783 (6) Baud rate
P781 (2) Length of process data
P782 (127) Length of parameter data
r789 USS diagnostic parameter
P927 Enable parameterization
1 = "Telegram monitoring timeout"
B2030
1s
B2031
P788 (2030)
B
Fault message trigger
1 = "Fault F011"
U116 (0)
B .01
B .16
15 0
Binector / connector converter
K2020
For transmission of double-word connectors see Section 9.13.1
See also connector type converter on sheet G169
- G170 -

1	2	3	4	5	6	7	8

USS interface 2





<1> P795.002=0:
Bit 10 is not treated as "control by PLC".

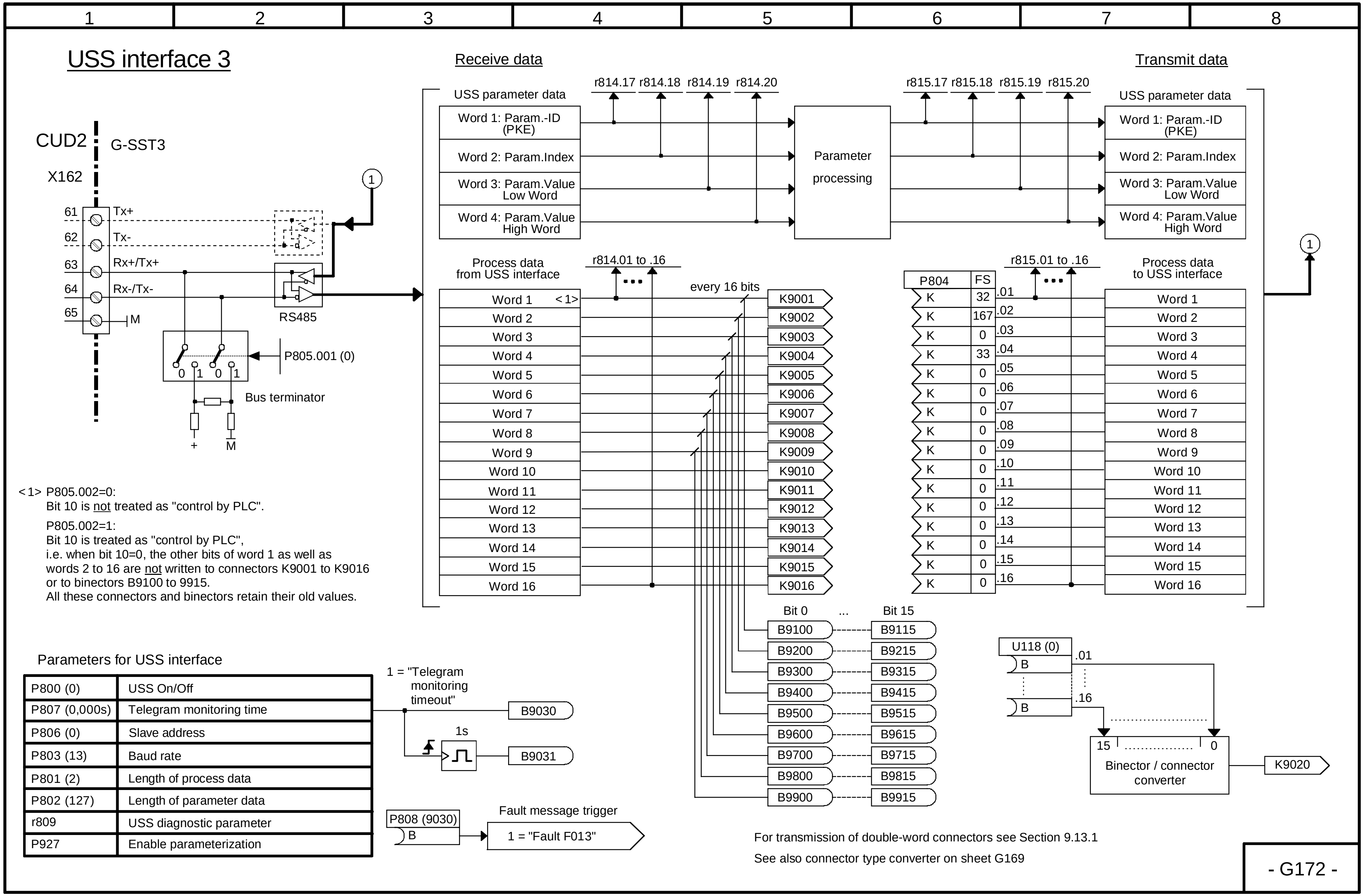
P795.002=1:
Bit 10 is treated as "control by PLC",
i.e. when bit 10=0, the other bits of word 1 as well as words 2 to 16 are not written to connectors K6001 to K6016 or to binectors B6100 to 6915.
All these connectors and binectors retain their old values.

Parameters for USS interface

P790 (0)	USS On/Off
P797 (0,000s)	Telegram monitoring time
P796 (0)	Slave address
P793 (6)	Baud rate
P791 (2)	Length of process data
P792 (127)	Length of parameter data
r799	USS diagnostic parameter
P927	Enable parameterization

For transmission of double-word connectors see Section 9.13.1
See also connector type converter on sheet G169

USS interface 3



<1> P805.002=0:
Bit 10 is not treated as "control by PLC".

P805.002=1:
Bit 10 is treated as "control by PLC",
i.e. when bit 10=0, the other bits of word 1 as well as words 2 to 16 are not written to connectors K9001 to K9016 or to binectors B9100 to 9915.
All these connectors and binectors retain their old values.

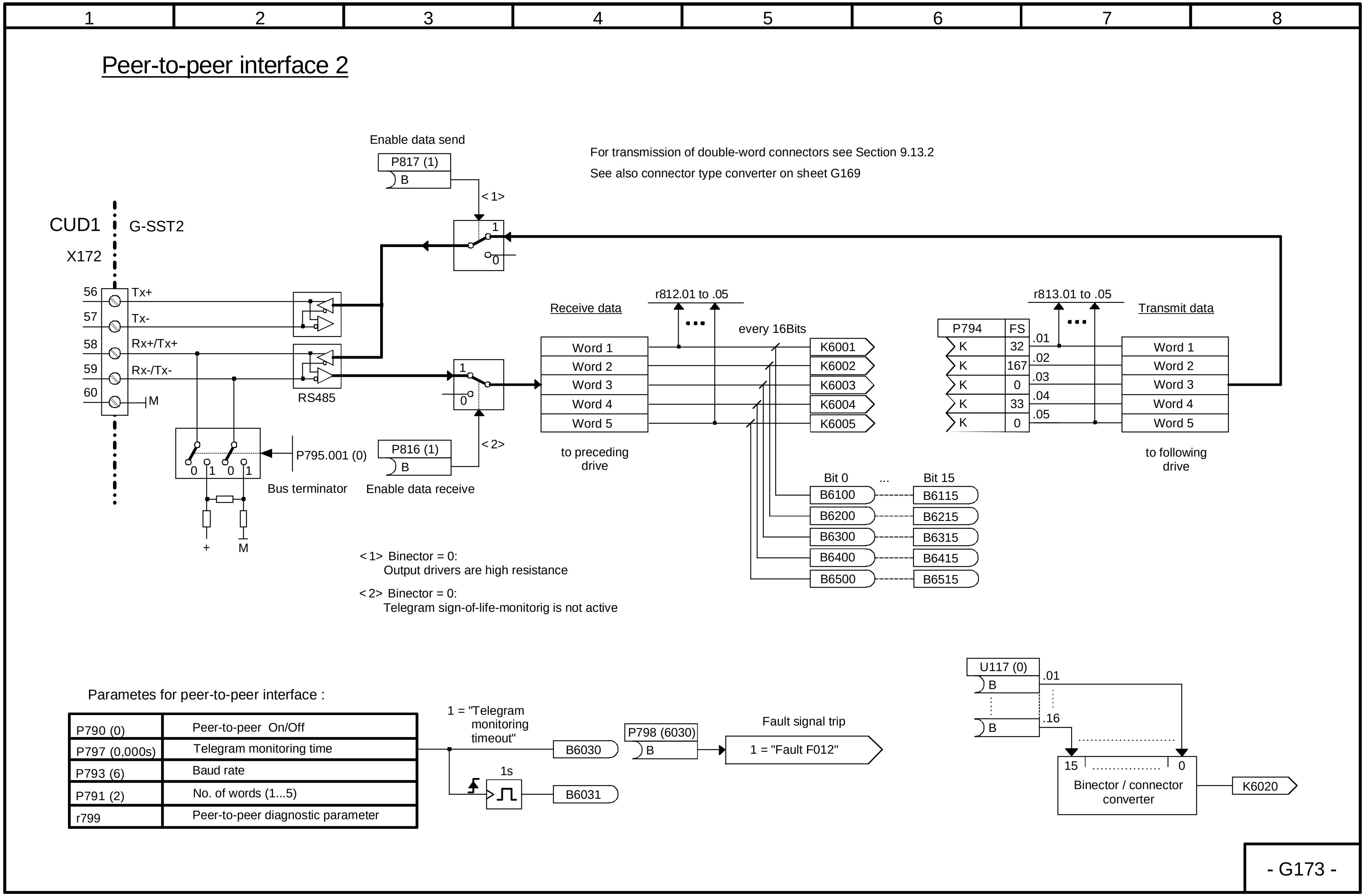
Parameters for USS interface

P800 (0)	USS On/Off
P807 (0,000s)	Telegram monitoring time
P806 (0)	Slave address
P803 (13)	Baud rate
P801 (2)	Length of process data
P802 (127)	Length of parameter data
r809	USS diagnostic parameter
P927	Enable parameterization

For transmission of double-word connectors see Section 9.13.1

See also connector type converter on sheet G169

Peer-to-peer interface 2

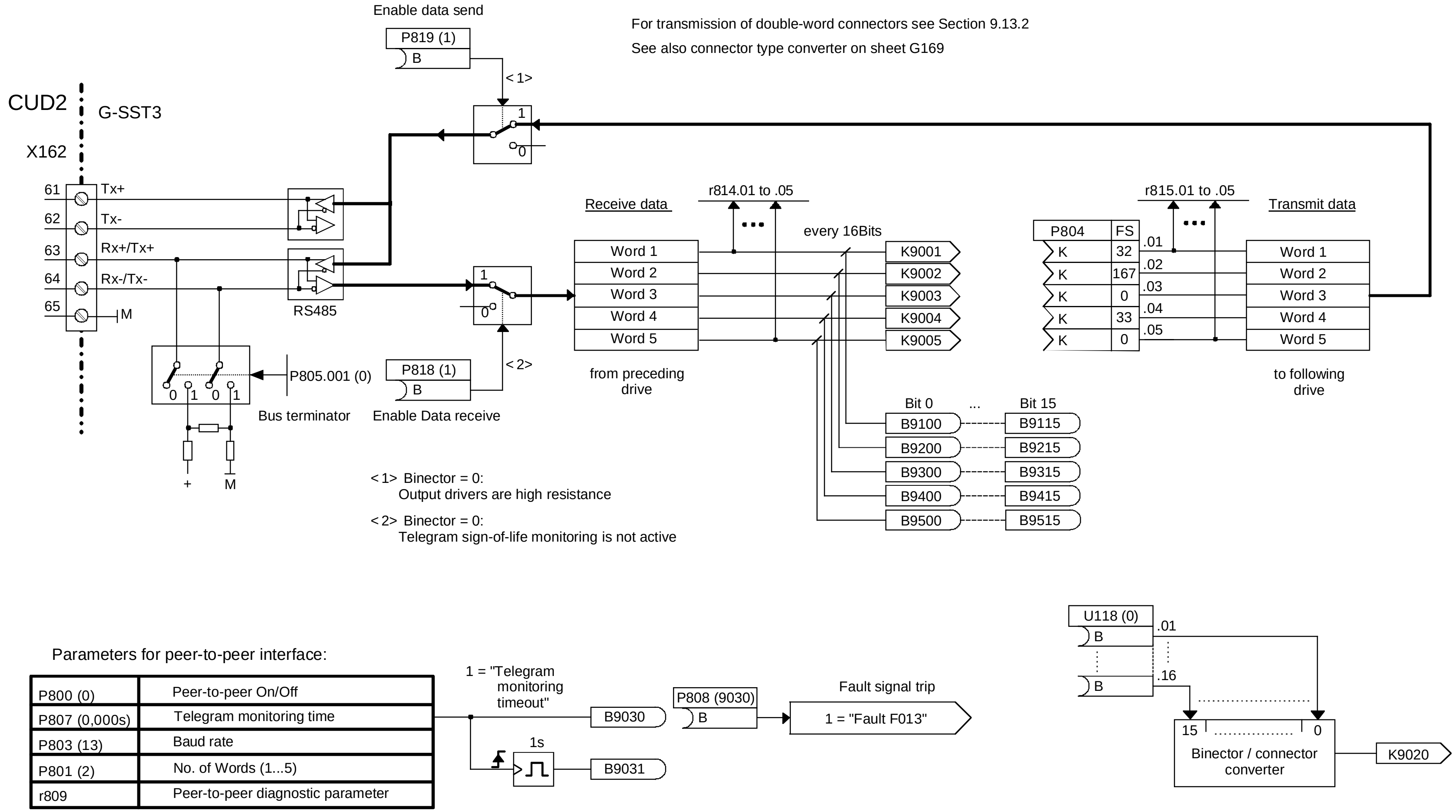


Parametes for peer-to-peer interface :

P790 (0)	Peer-to-peer On/Off
P797 (0,000s)	Telegram monitoring time
P793 (6)	Baud rate
P791 (2)	No. of words (1...5)
r799	Peer-to-peer diagnostic parameter

1	2	3	4	5	6	7	8

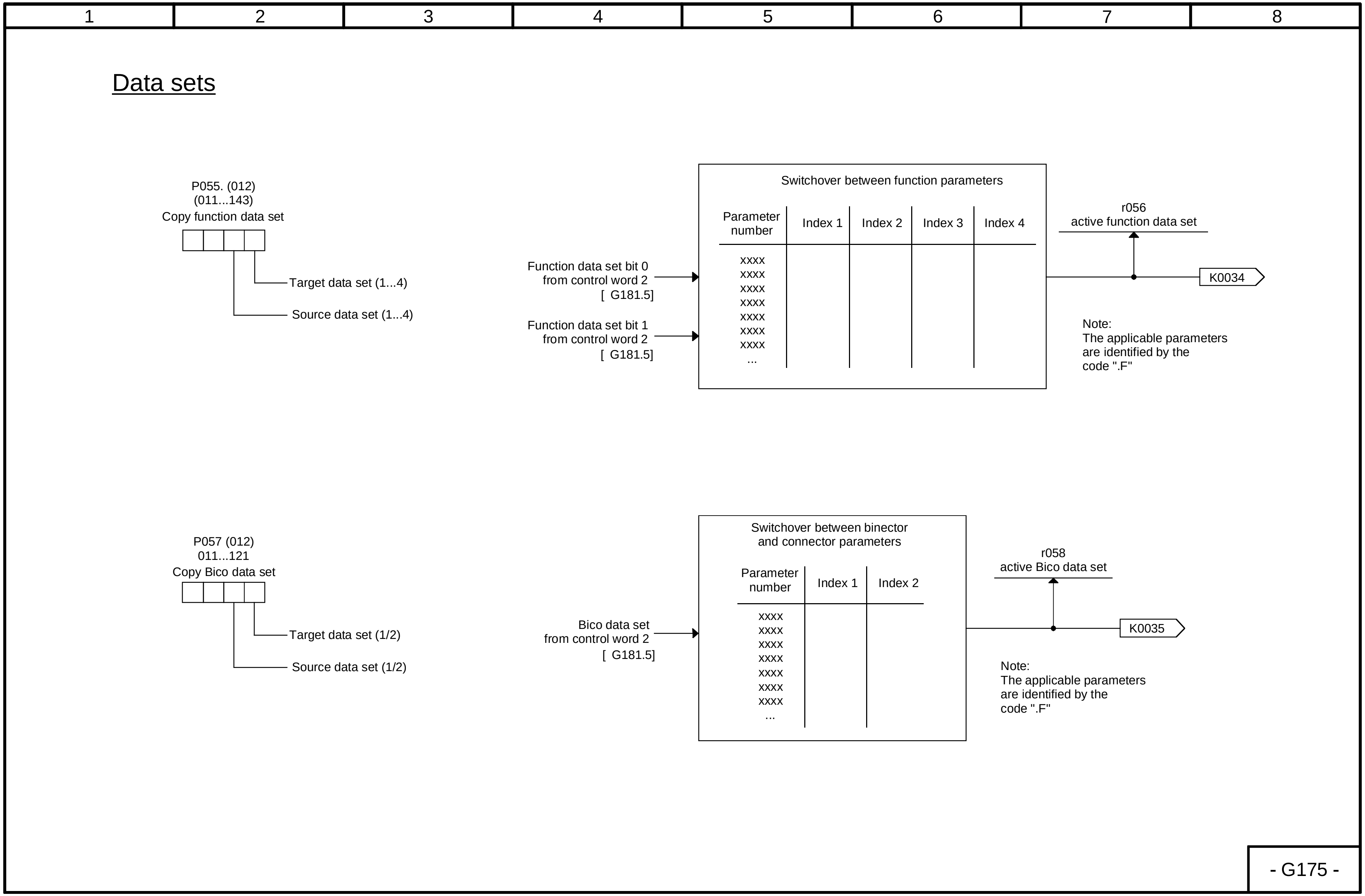
Peer-to-peer interface 3



Parameters for peer-to-peer interface:

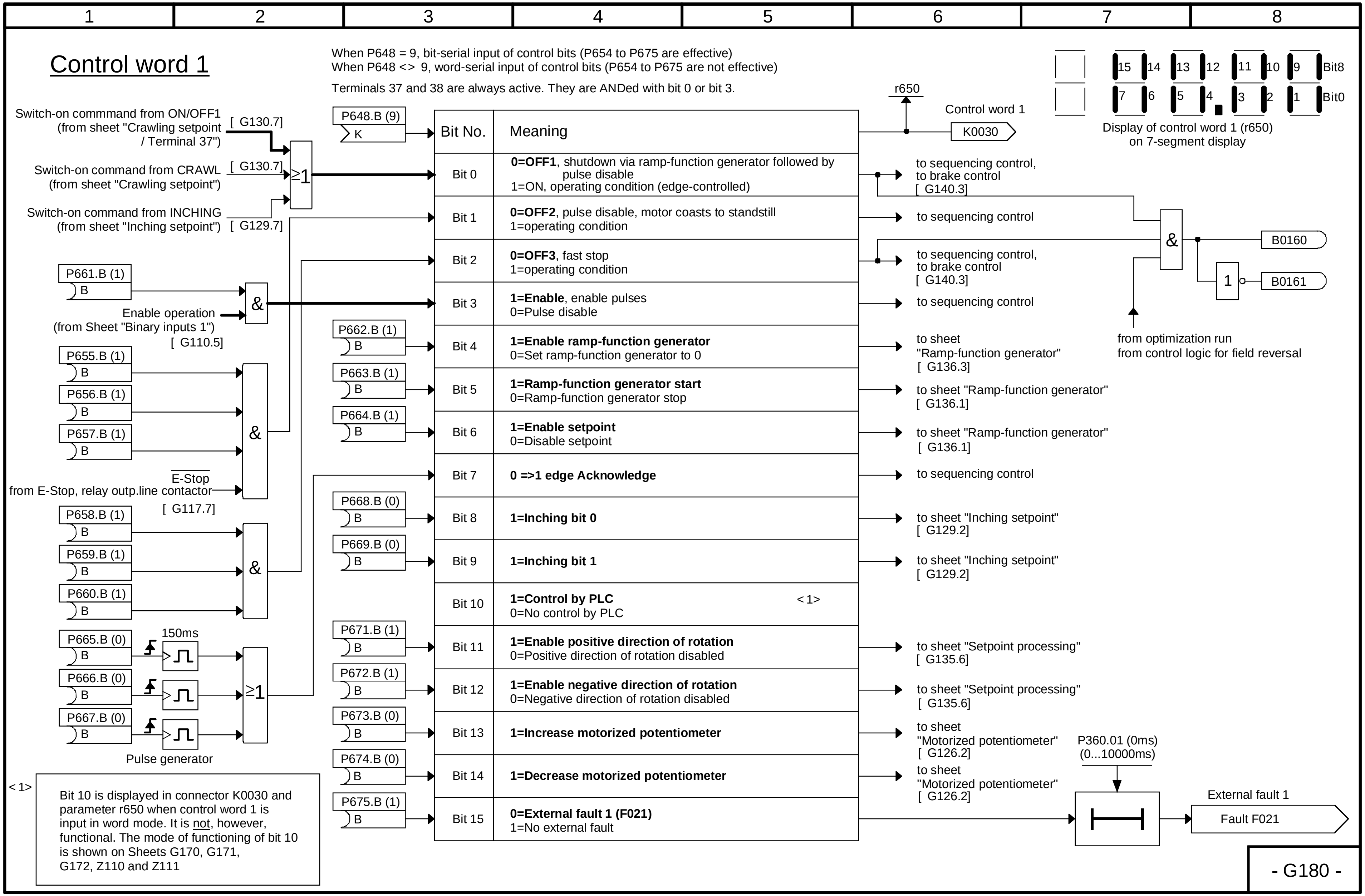
P800 (0)	Peer-to-peer On/Off
P807 (0,000s)	Telegram monitoring time
P803 (13)	Baud rate
P801 (2)	No. of Words (1...5)
r809	Peer-to-peer diagnostic parameter

Data sets


1
2
3
4
5
6
7
8
P055. (012)
(011...143)
Copy function data set
Target data set (1...4)
Source data set (1...4)
Function data set bit 0
from control word 2
[G181.5]
Function data set bit 1
from control word 2
[G181.5]
Switchover between function parameters
Parameter number
Index 1
Index 2
Index 3
Index 4
xxxx
xxxx
xxxx
xxxx
xxxx
xxxx
xxxx
...
r056
active function data set
K0034
Note:
The applicable parameters
are identified by the
code ".F"
P057 (012)
011...121
Copy Bico data set
Target data set (1/2)
Source data set (1/2)
Bico data set
from control word 2
[G181.5]
Switchover between binector
and connector parameters
Parameter number
Index 1
Index 2
xxxx
xxxx
xxxx
xxxx
xxxx
xxxx
xxxx
...
r058
active Bico data set
K0035
Note:
The applicable parameters
are identified by the
code ".F"
- G175 -

Control word 1

When P648 = 9, bit-serial input of control bits (P654 to P675 are effective)
When P648 <> 9, word-serial input of control bits (P654 to P675 are not effective)
Terminals 37 and 38 are always active. They are ANDed with bit 0 or bit 3.



Bit No.	Meaning
Bit 0	**0=OFF1**, shutdown via ramp-function generator followed by pulse disable 1=ON, operating condition (edge-controlled)
Bit 1	**0=OFF2**, pulse disable, motor coasts to standstill 1=operating condition
Bit 2	**0=OFF3**, fast stop 1=operating condition
Bit 3	**1=Enable**, enable pulses 0=Pulse disable
Bit 4	**1=Enable ramp-function generator** 0=Set ramp-function generator to 0
Bit 5	**1=Ramp-function generator start** 0=Ramp-function generator stop
Bit 6	**1=Enable setpoint** 0=Disable setpoint
Bit 7	**0 =>1 edge Acknowledge**
Bit 8	**1=Inching bit 0**
Bit 9	**1=Inching bit 1**
Bit 10	**1=Control by PLC** <1> 0=No control by PLC
Bit 11	**1=Enable positive direction of rotation** 0=Positive direction of rotation disabled
Bit 12	**1=Enable negative direction of rotation** 0=Negative direction of rotation disabled
Bit 13	**1=Increase motorized potentiometer**
Bit 14	**1=Decrease motorized potentiometer**
Bit 15	**0=External fault 1 (F021)** 1=No external fault

<1> Bit 10 is displayed in connector K0030 and parameter r650 when control word 1 is input in word mode. It is not, however, functional. The mode of functioning of bit 10 is shown on Sheets G170, G171, G172, Z110 and Z111

- G180 -

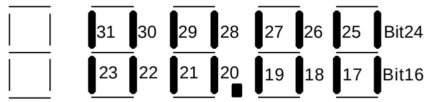
1	2	3	4	5	6	7	8

Control word 2

When P649 = 9, bit-serial input of control bits (P676 to P691 are effective)
When P649 <> 9, word-serial input of control bits (P676 to P691 are not effective)

P649.B (9) K → r651 → Control word 2 K0031

Input	Bit No.	Meaning	Output
P676.B (0) B	Bit 16	**Select function data set bit 0**	to sheet "Data sets" [G175.4]
P677.B (0) B	Bit 17	**Select function data set bit 1**	to sheet "Data sets" [G175.4]
	Bit 18	**Spare**	
	Bit 19	**Spare**	
P680.B (0) B	Bit 20	**Select fixed setpoint 0**	to sheet "Fixed setpoint" [G127.2]
P681.B (0) B	Bit 21	**Select fixed setpoint 1**	to sheet "Fixed setpoint" [G127.2]
	Bit 22	**Spare**	
	Bit 23	**Spare**	
P684.B (1) B	Bit 24	**1=Enable speed controller droop** 0=Speed controller droop disabled	to sheet "Speed controller (1)" [G151.3]
P685.B (1) B	Bit 25	**1=Enable speed controller** 0=Speed controller disabled	to sheet "Speed controller (2)" [G152.6]
P686.B (1) B	Bit 26	**0=External fault 2 (F022)** 1=No external fault 2	P360.02 (0ms) (0...10000ms) → External fault 2: Fault F022
P687.B (0) B	Bit 27	**0=Master drive** (speed control) 1=Slave drive (torque control)	to sheets "Torque limitation" and "Speed controller (2)" [G160.2] [G152.7]
P688.B (1) B	Bit 28	**0=External alarm 1 (A021)** 1=No external alarm 1	P360.03 (0ms) (0...10000ms) → External alarm 1: Alarm A021
P689.B (1) B	Bit 29	**0=External alarm 2 (A022)** 1=No external alarm 2	P360.04 (0ms) (0...10000ms) → External alarm 2: Alarm A022
P690 (0) B	Bit 30	**0=Select Bico data set 1** 1=Select Bico data set 2	to sheet "Data sets" [G175.4]
P691.B (0) B	Bit 31	**Main contactor check-back signal**	to sequencing control

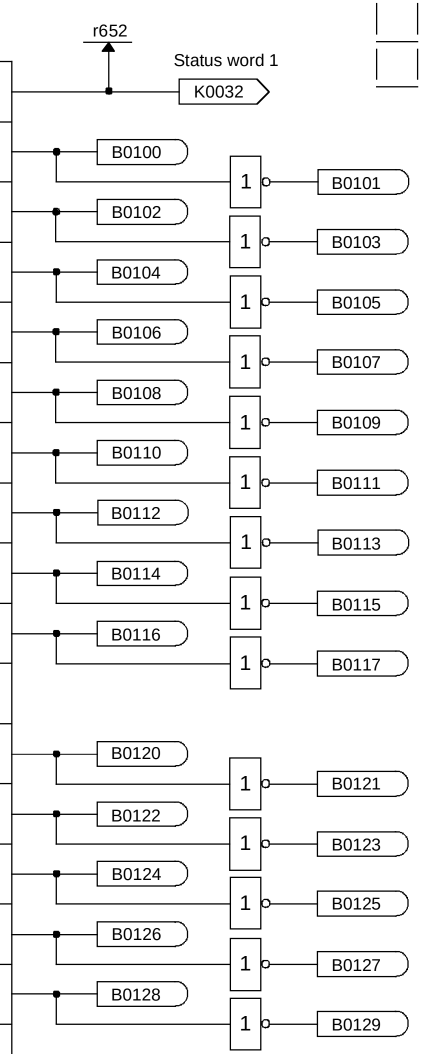


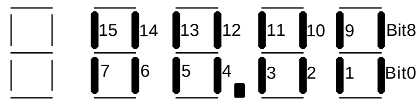
Display of control word 2 (r651)
on 7-segment display

1 2 3 4 5 6 7 8

Status word 1

Source	Bit No.	Meaning
from sequencing control	Bit 0	1 = Ready to switch on 0 = Not ready to switch on
from sequencing control	Bit 1	1 = Ready to operate (pulses disabled) 0 = Not ready to operate
from sequencing control	Bit 2	1 = Run (output terminals energized) 0 = Pulses disabled
from fault processing	Bit 3	1 = Fault is active (pulses disabled) 0 = No fault is active
rom sequencing control	Bit 4	0 = OFF2 applied 1 = No OFF2 applied
from sequencing control	Bit 5	0 = OFF3 applied 1 = No OFF3 applied
from sequencing control	Bit 6	1 = Switch-on inhibit 0 = No switch-on inhibit (converter can be switched on)
from alarm processing	Bit 7	1 = Alarm is active 0 = No alarm is active
from sheet "Signals (1)" [G187.6]	Bit 8	0 = Setpoint/actual value deviation detected 1 = No setpoint/actual value deviation detected
from sequencing control	Bit 9	1 = PZD control requests (always 1)
from sheet "Signals (1)" [G187.6]	Bit 10	**1=Actual value ≥ comparison setpoint (P373)** 0=Actual value < comparison setpoint (P373)
from fault processing	Bit 11	1 = Undervoltage fault (F006) 0 = No undervoltage fault is active
from relay output line contactor [G117.5]	Bit 12	1 = Request to energize main contactor 0 = Request not to energize main contactor
from ramp-function generator [G136.5]	Bit 13	1 = Ramp-function generator active 0 = Ramp-function generator not active
from sheet "Signals (2)" [G188.3]	Bit 14	1 = Positive speed setpoint 0 = Negative speed setpoint
	Bit 15	Spare



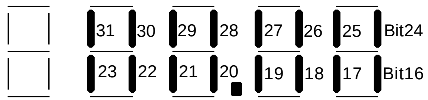


Display of status word 1 (r652) on 7-segment display

1	2	3	4	5	6	7	8

Status word 2

r653 — Status word 2 → K0033



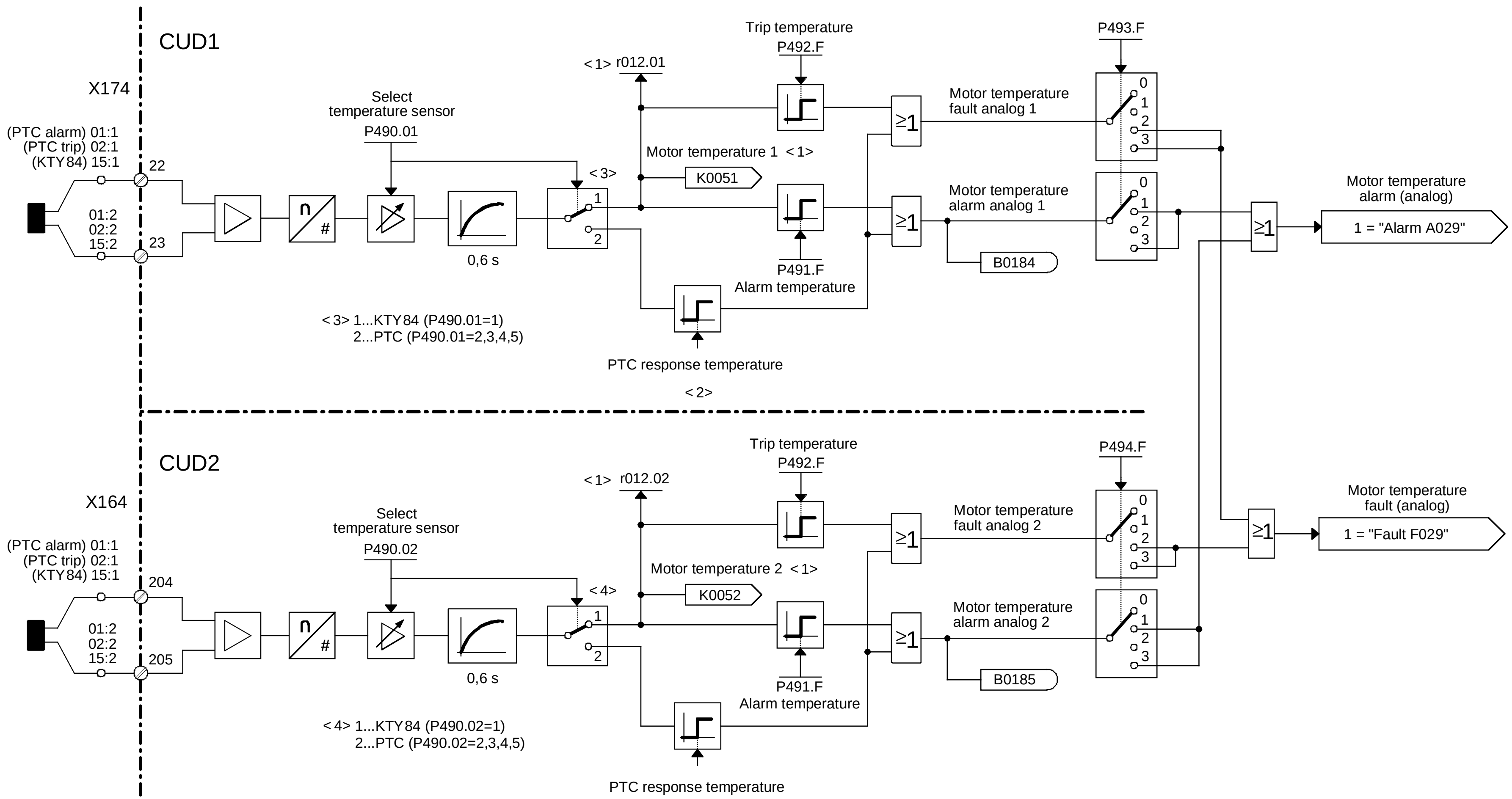
Display of status word 2 (r653) on 7-segment display

Source	Bit Nr.	Meaning	Binector	Inverted binector
	Bit 16	Spare		
	Bit 17	Spare		
from sheet "Signals" [G188.7]	Bit 18	0 = Overspeed (A038 and F038) 1 = No overspeed	B0136	B0137
from sequencing control	Bit 19	1 = External fault 1 active (F021) 0 = No external fault 1 active	B0138	B0139
from sequencing control	Bit 20	1 = External fault 2 acrive (F022) 0 = No external fault 2 active	B0140	B0141
from sequencing control	Bit 21	1 = External alarm active (A021 or A022) 0 = No external alarm active	B0142	B0143
from alarm processing	Bit 22	1 = Power section overload alarm active (A039) 0 = No overload alarm active	B0144	B0145
from fault processing	Bit 23	1 = Power section overtemperature fault active (F067) 0 = No overtemperature faultactive	B0146	B0147
from alarm processing	Bit 24	1 = Power section overtemperature alarm active (A067) 0 = No overtemperature alarm active	B0148	B0149
from alarm processing	Bit 25	1 = Motor overtemperature alarm active (A029) 0 = No motor overtemperature alarm active	B0150	B0151
from alarm processing	Bit 26	1 = Motor overtemperature fault active (F029) 0 = No motor overtemperature fault active	B0152	B0153
	Bit 27	spare		
from fault processing	Bit 28	1 = Motor locked fault active (F035) 0 = No motor locked fault active	B0156	B0157
	Bit 29	spare		
	Bit 30	spare		
	Bit 31	spare		

- G183 -

1	2	3	4	5	6	7	8

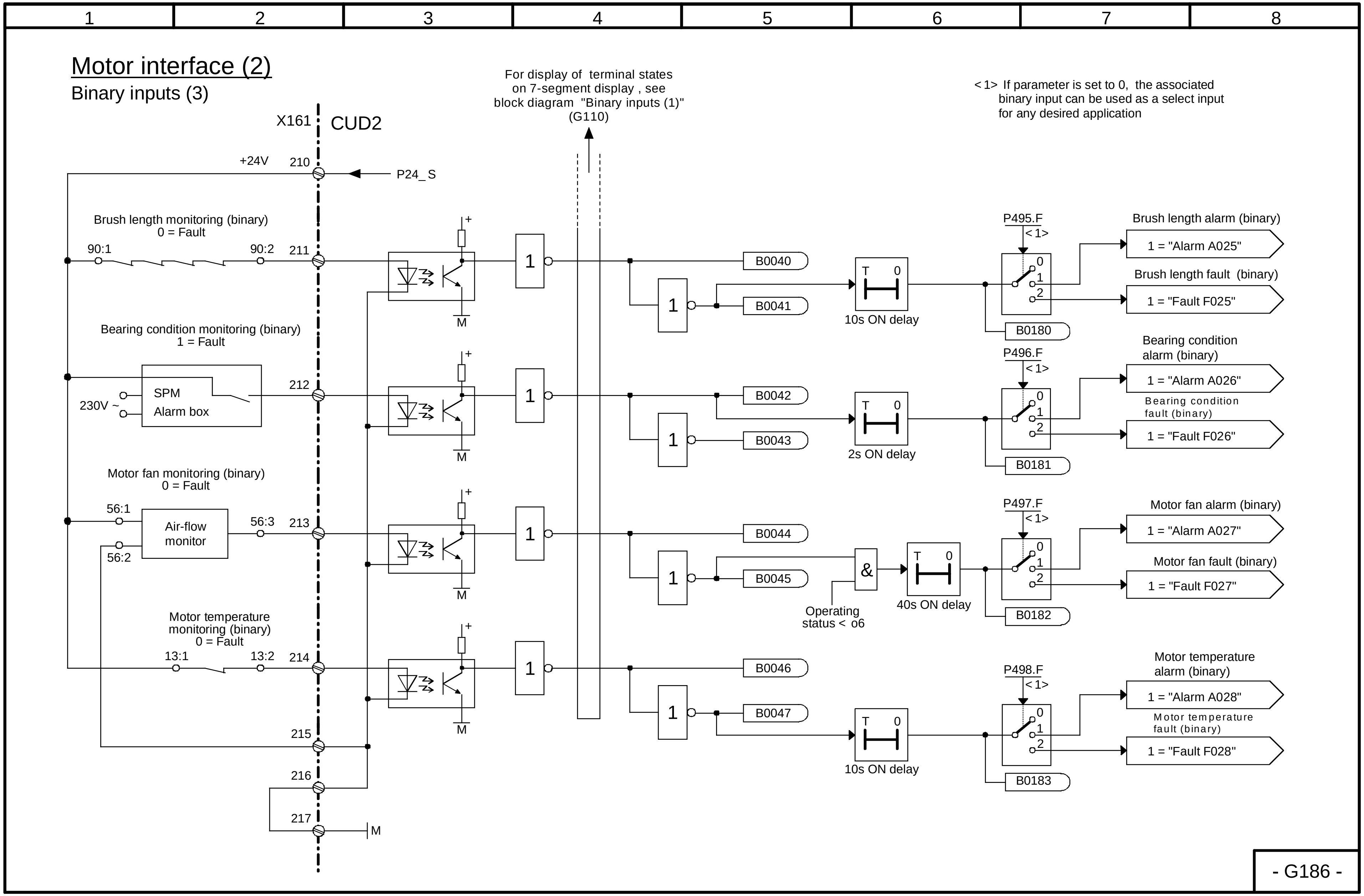
Motor interface (1)

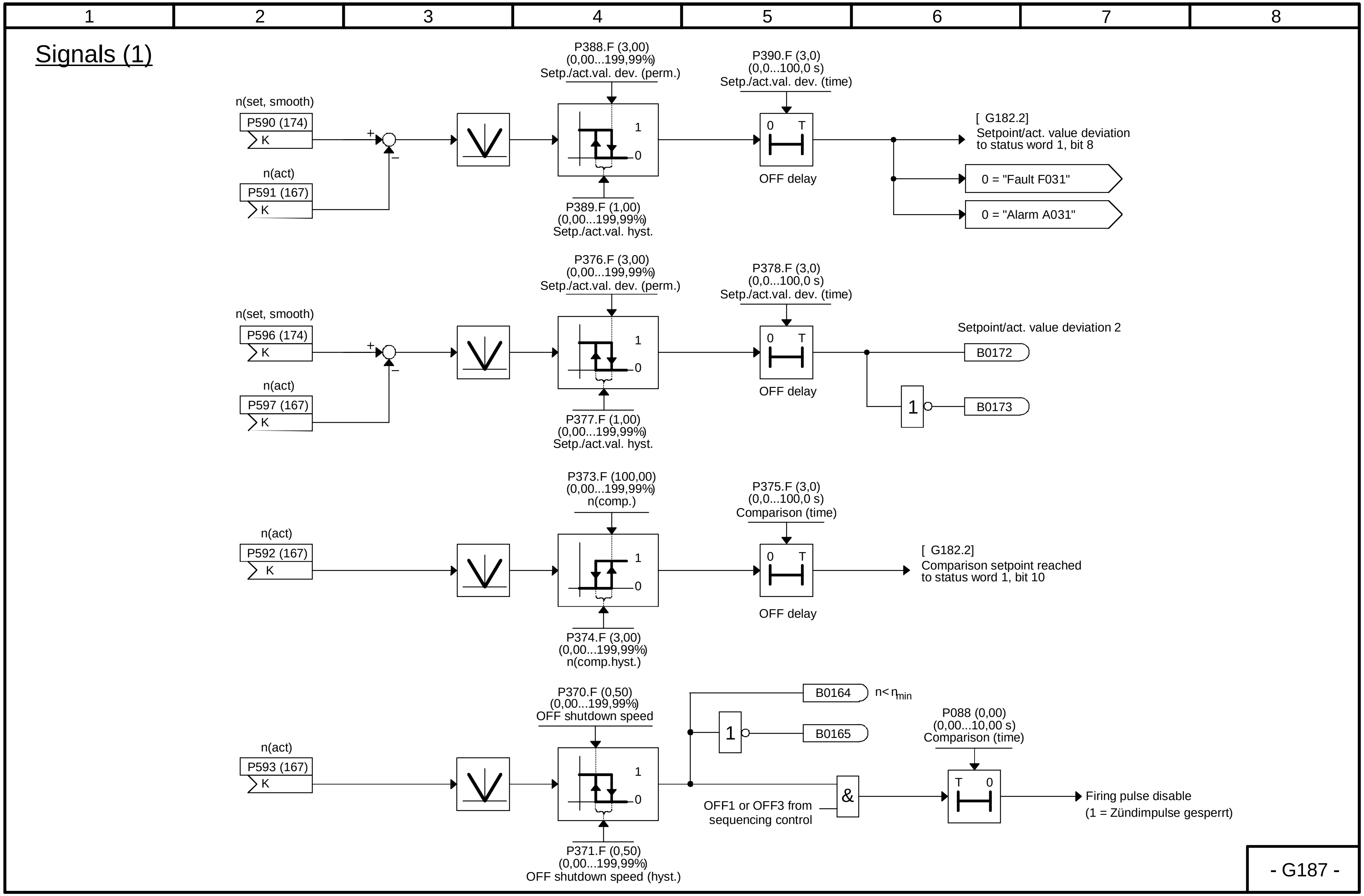


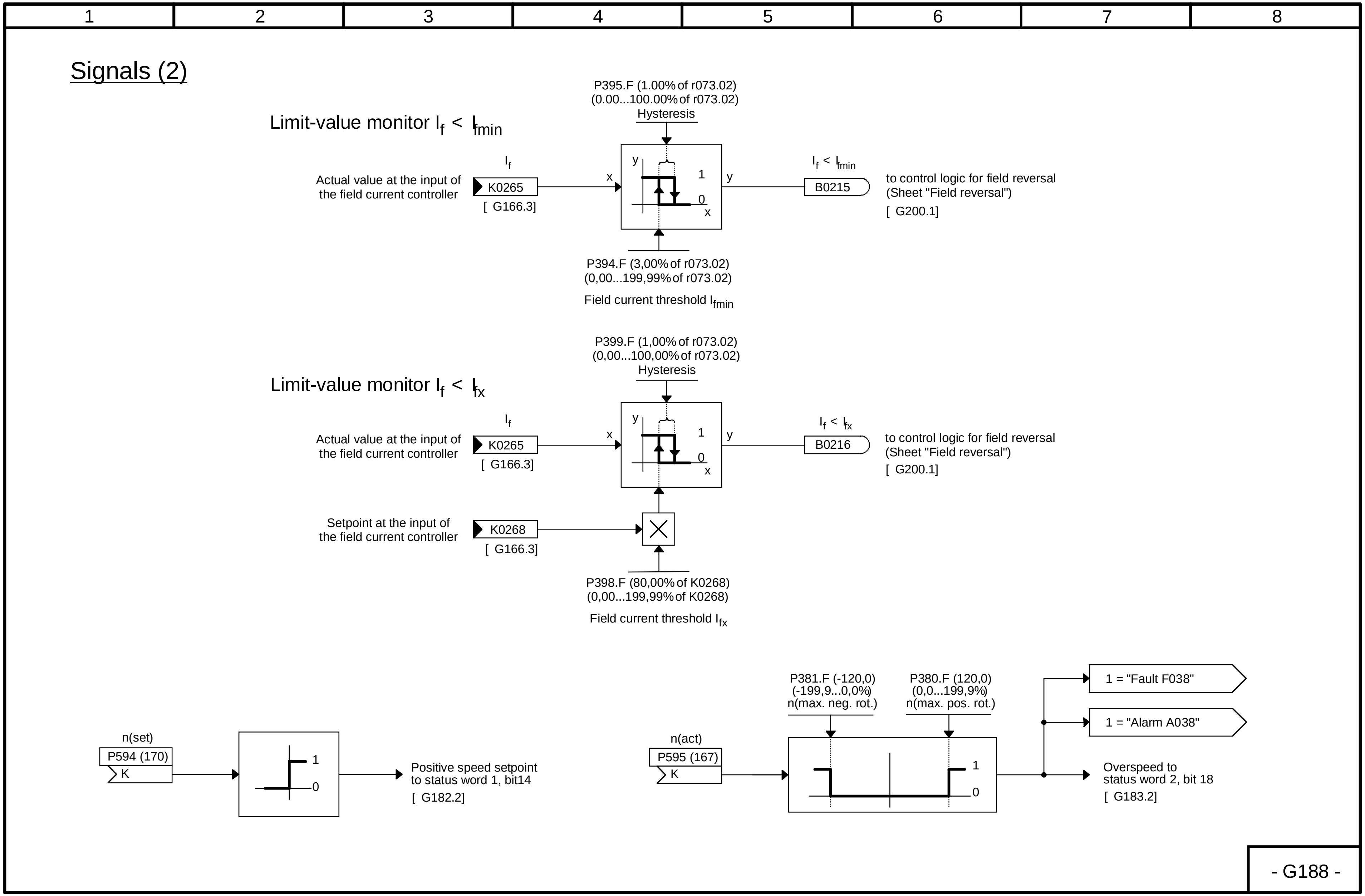
< 1> Parameter r012 and connectors K0051 / K0052 output valid values only if a KTY84 is selected.
When a PTC is selected, r012 and K0051 / K0052 always output "0".

< 2> Response temperature used depends on the type of PTC

- G185 -

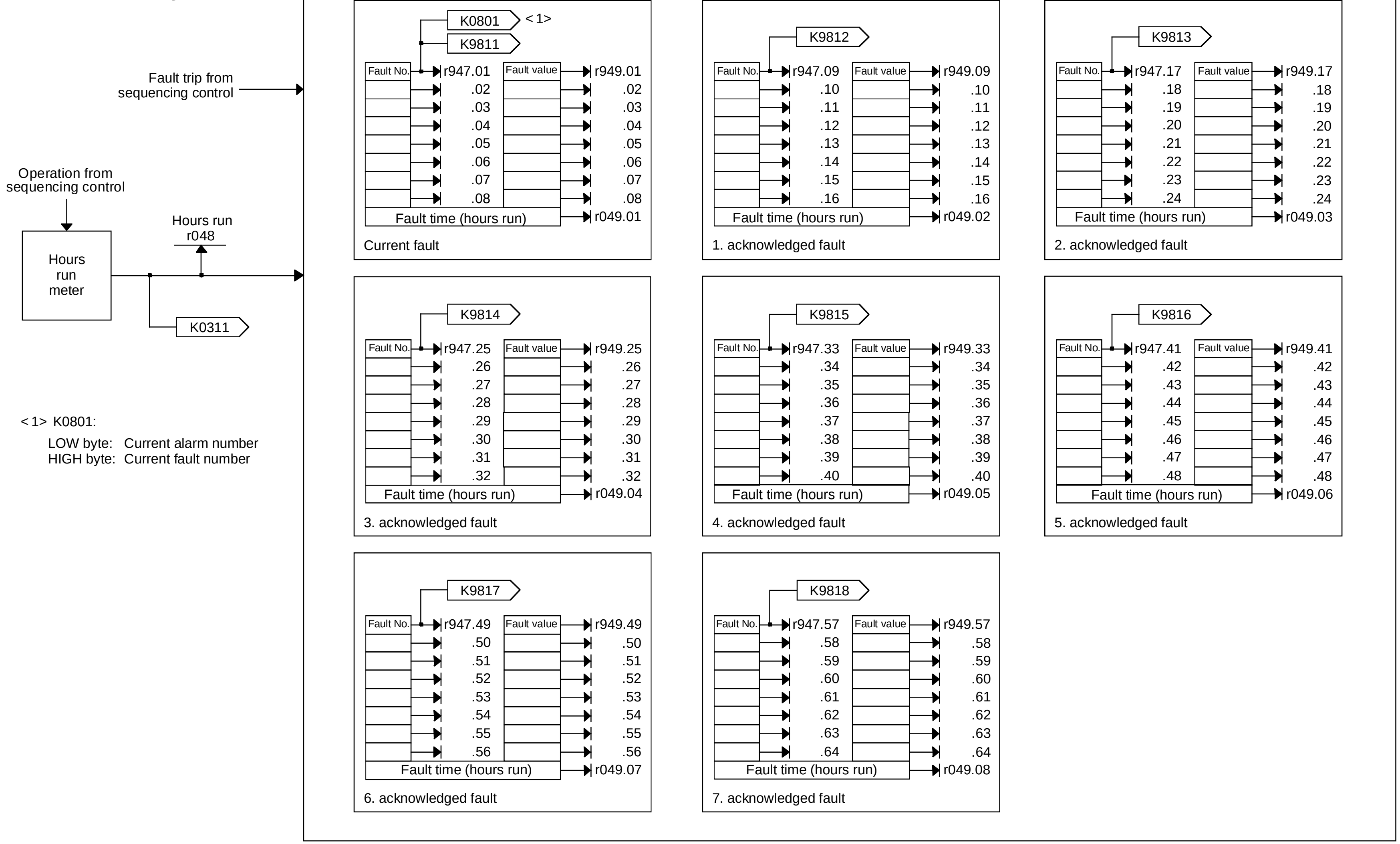

1
2
3
4
5
6
7
8
Motor interface (2)
Binary inputs (3)
X161
CUD2
For display of terminal states on 7-segment display , see block diagram "Binary inputs (1)" (G110)
< 1> If parameter is set to 0, the associated binary input can be used as a select input for any desired application
+24V
210
P24_S
Brush length monitoring (binary)
0 = Fault
90:1
90:2
211
Bearing condition monitoring (binary)
1 = Fault
SPM
Alarm box
230V ~
212
Motor fan monitoring (binary)
0 = Fault
56:1
56:2
Air-flow monitor
56:3
213
Motor temperature monitoring (binary)
0 = Fault
13:1
13:2
214
215
216
217
M
B0040
B0041
B0042
B0043
B0044
B0045
B0046
B0047
10s ON delay
2s ON delay
40s ON delay
10s ON delay
Operating status < o6
P495.F
P496.F
P497.F
P498.F
B0180
B0181
B0182
B0183
Brush length alarm (binary)
1 = "Alarm A025"
Brush length fault (binary)
1 = "Fault F025"
Bearing condition alarm (binary)
1 = "Alarm A026"
Bearing condition fault (binary)
1 = "Fault F026"
Motor fan alarm (binary)
1 = "Alarm A027"
Motor fan fault (binary)
1 = "Fault F027"
Motor temperature alarm (binary)
1 = "Alarm A028"
Motor temperature fault (binary)
1 = "Fault F028"
- G186 -


1
2
3
4
5
6
7
8
Signals (1)
n(set, smooth)
P590 (174)
K
n(act)
P591 (167)
K
P388.F (3,00)
(0,00...199,99%)
Setp./act.val. dev. (perm.)
P389.F (1,00)
(0,00...199,99%)
Setp./act.val. hyst.
P390.F (3,0)
(0,0...100,0 s)
Setp./act.val. dev. (time)
OFF delay
[G182.2]
Setpoint/act. value deviation
to status word 1, bit 8
0 = "Fault F031"
0 = "Alarm A031"
n(set, smooth)
P596 (174)
K
n(act)
P597 (167)
K
P376.F (3,00)
(0,00...199,99%)
Setp./act.val. dev. (perm.)
P377.F (1,00)
(0,00...199,99%)
Setp./act.val. hyst.
P378.F (3,0)
(0,0...100,0 s)
Setp./act.val. dev. (time)
OFF delay
Setpoint/act. value deviation 2
B0172
B0173
n(act)
P592 (167)
K
P373.F (100,00)
(0,00...199,99%)
n(comp.)
P374.F (3,00)
(0,00...199,99%)
n(comp.hyst.)
P375.F (3,0)
(0,0...100,0 s)
Comparison (time)
OFF delay
[G182.2]
Comparison setpoint reached
to status word 1, bit 10
n(act)
P593 (167)
K
P370.F (0,50)
(0,00...199,99%)
OFF shutdown speed
P371.F (0,50)
(0,00...199,99%)
OFF shutdown speed (hyst.)
B0164
n<nmin
B0165
OFF1 or OFF3 from
sequencing control
P088 (0,00)
(0,00...10,00 s)
Comparison (time)
Firing pulse disable
(1 = Zündimpulse gesperrt)
- G187 -


1 2 3 4 5 6 7 8
Signals (2)
Limit-value monitor If < Ifmin
P395.F (1.00% of r073.02)
(0.00...100.00% of r073.02)
Hysteresis
If
Actual value at the input of the field current controller
K0265
[G166.3]
x
y
1
0
If < Ifmin
B0215
to control logic for field reversal
(Sheet "Field reversal")
[G200.1]
P394.F (3,00% of r073.02)
(0,00...199,99% of r073.02)
Field current threshold Ifmin
Limit-value monitor If < Ifx
P399.F (1,00% of r073.02)
(0,00...100,00% of r073.02)
Hysteresis
If
Actual value at the input of the field current controller
K0265
[G166.3]
If < Ifx
B0216
to control logic for field reversal
(Sheet "Field reversal")
[G200.1]
Setpoint at the input of the field current controller
K0268
[G166.3]
P398.F (80,00% of K0268)
(0,00...199,99% of K0268)
Field current threshold Ifx
n(set)
P594 (170)
K
Positive speed setpoint to status word 1, bit14
[G182.2]
P381.F (-120,0)
(-199,9...0,0%)
n(max. neg. rot.)
P380.F (120,0)
(0,0...199,9%)
n(max. pos. rot.)
n(act)
P595 (167)
K
1 = "Fault F038"
1 = "Alarm A038"
Overspeed to status word 2, bit 18
[G183.2]
- G188 -

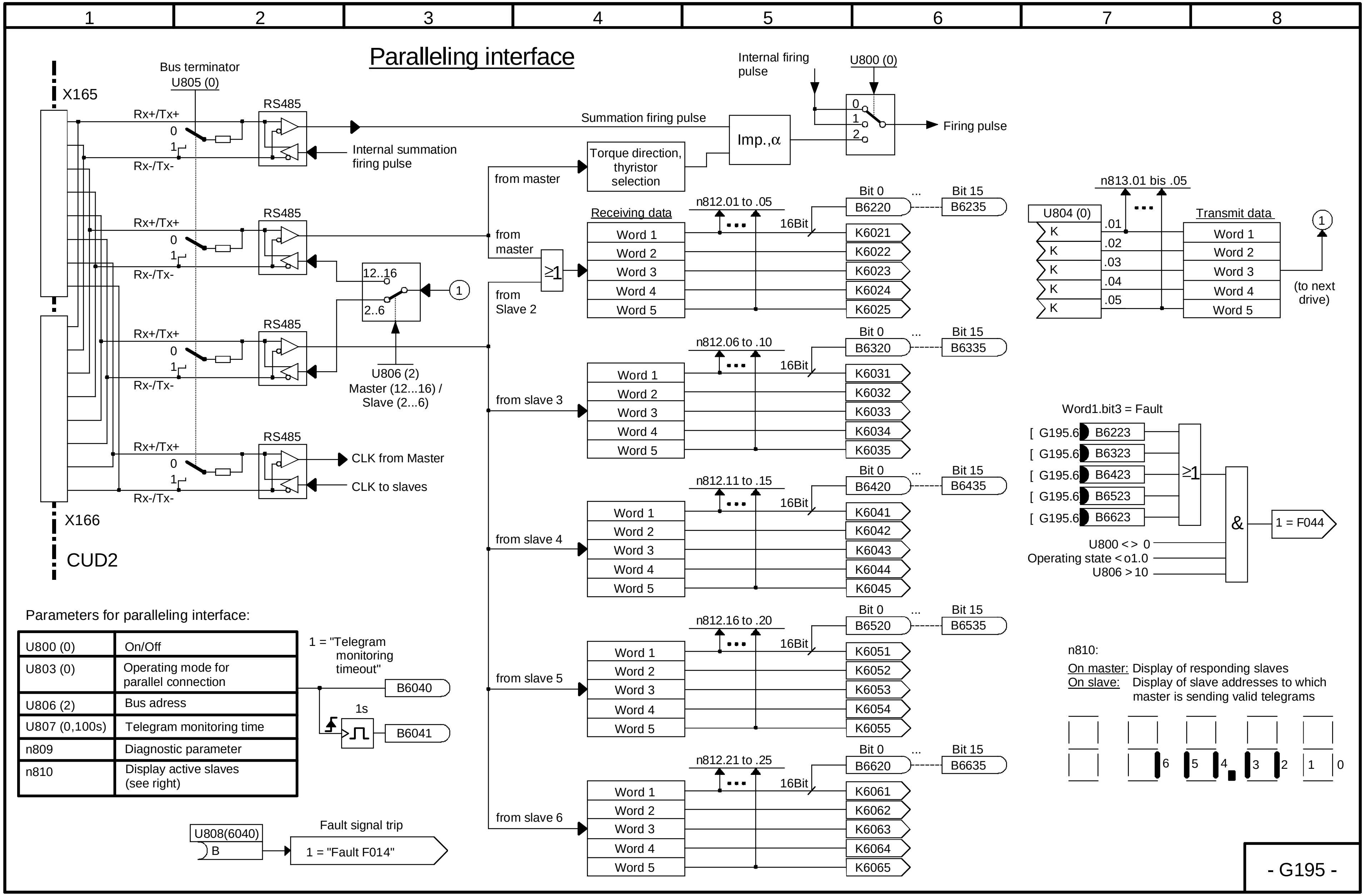
1	2	3	4	5	6	7	8

Fault memory



- G189 -

Paralleling interface

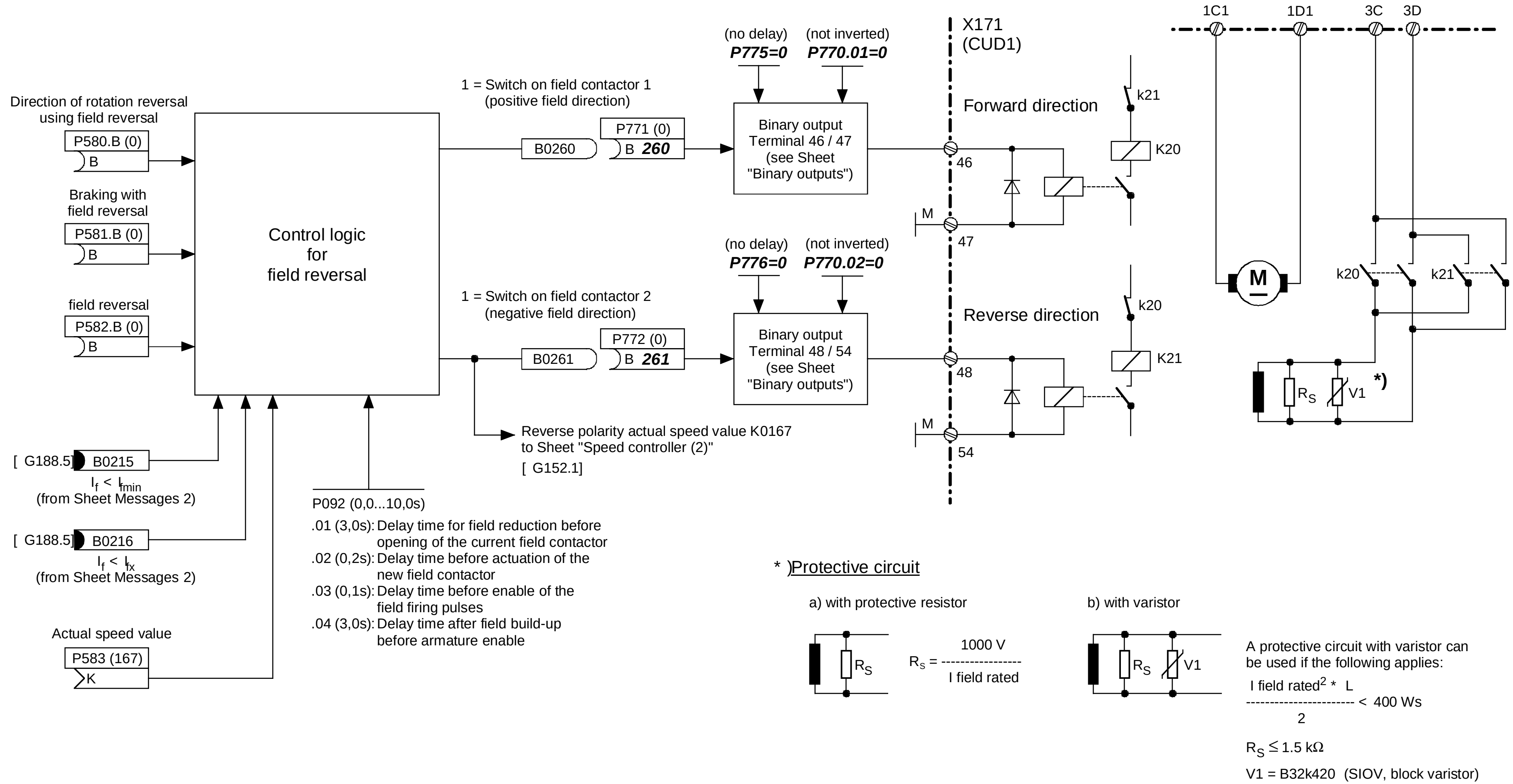


Parameters for paralleling interface:

U800 (0)	On/Off
U803 (0)	Operating mode for parallel connection
U806 (2)	Bus adress
U807 (0,100s)	Telegram monitoring time
n809	Diagnostic parameter
n810	Display active slaves (see right)

1	2	3	4	5	6	7	8

Field reversal with SIMOREG single-quadrant converter



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.

1	2	3	4	5	6	7	8

Function diagram SIMOREG 6RA70 - Contents of the technology software in the basic converter, 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
U977 = PIN number
n978 = 2000

Temporary enabling
U977 = 1500
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.
(Note: In the factory setting of the parameters, all existing function blocks are activated)

5 time slices are available:

Time slice	Sampling time	
1	1 * T0 (firing-pulse-synchronous time slice)	<1>
2	2 * T0 (firing-pulse-synchronous time slice)	<1>
4	4 * T0 (firing-pulse-synchronous time slice)	<1>
10	20 ms (**not** firing-pulse-synchronous)	
20	Block is **not** calculated	<2>

<1> T0 = Mean distance between 2 firing pulses
T0 = 3.33 ms at 50 Hz line frequency
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

Function block No.	Setting with parameter
1	U950.01
2	U950.02
:	:
99	U950.99
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

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.

4. Automatic setting

The execution sequence of the function blocks and their activation can also be made automatic:

U969 = 1: Restore standard sequence
U960, U961, and U962 are set to the factory setting

= 2: Set optimum sequence
U960, U961, and U962 are set in such a way that as few deadtimes as possible occur

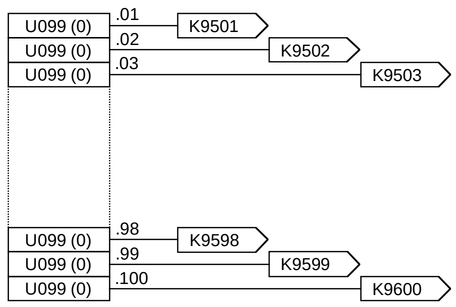
= 3: Set standard setting of the sampling times. U950, U951, and U952 are set to the factory setting!

= 4: Automatic activation/deactivation
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.
The time slice 10 (sampling time 20 ms) is set for all function blocks not previously activated, unchanged for all previously activated function blocks.

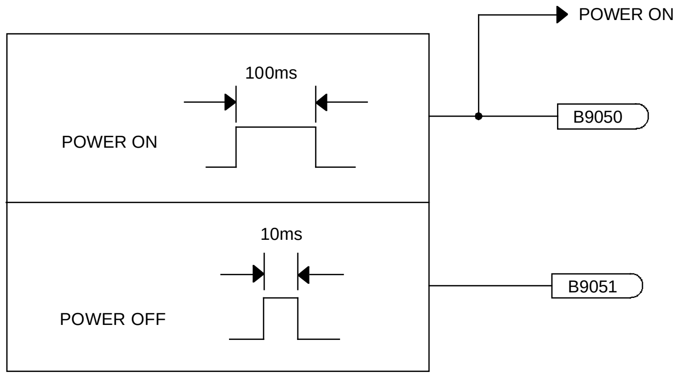
- B101 -

1	2	3	4	5	6	7	8

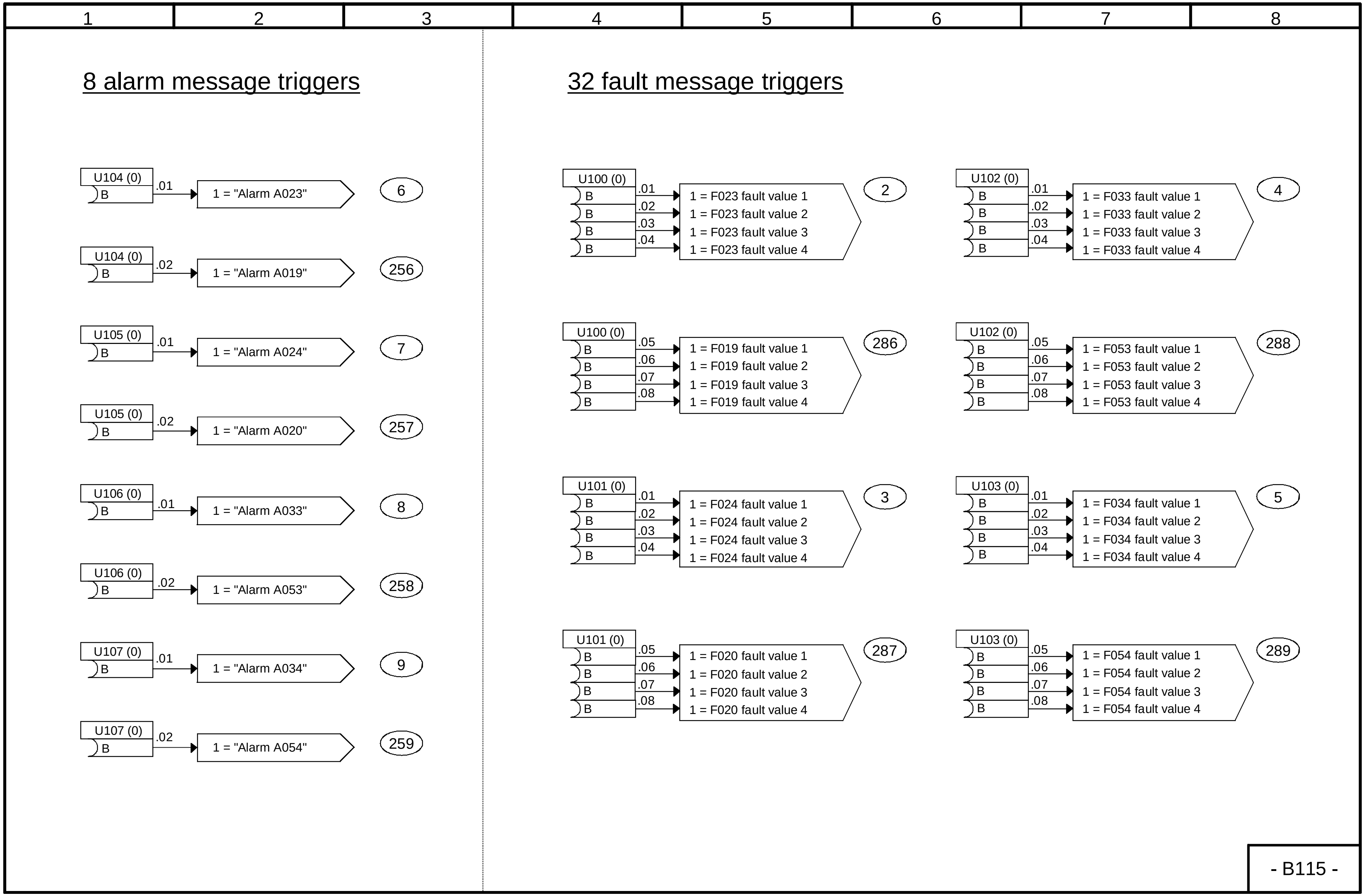
100 fixed values



Voltage monitor for electronics power supply

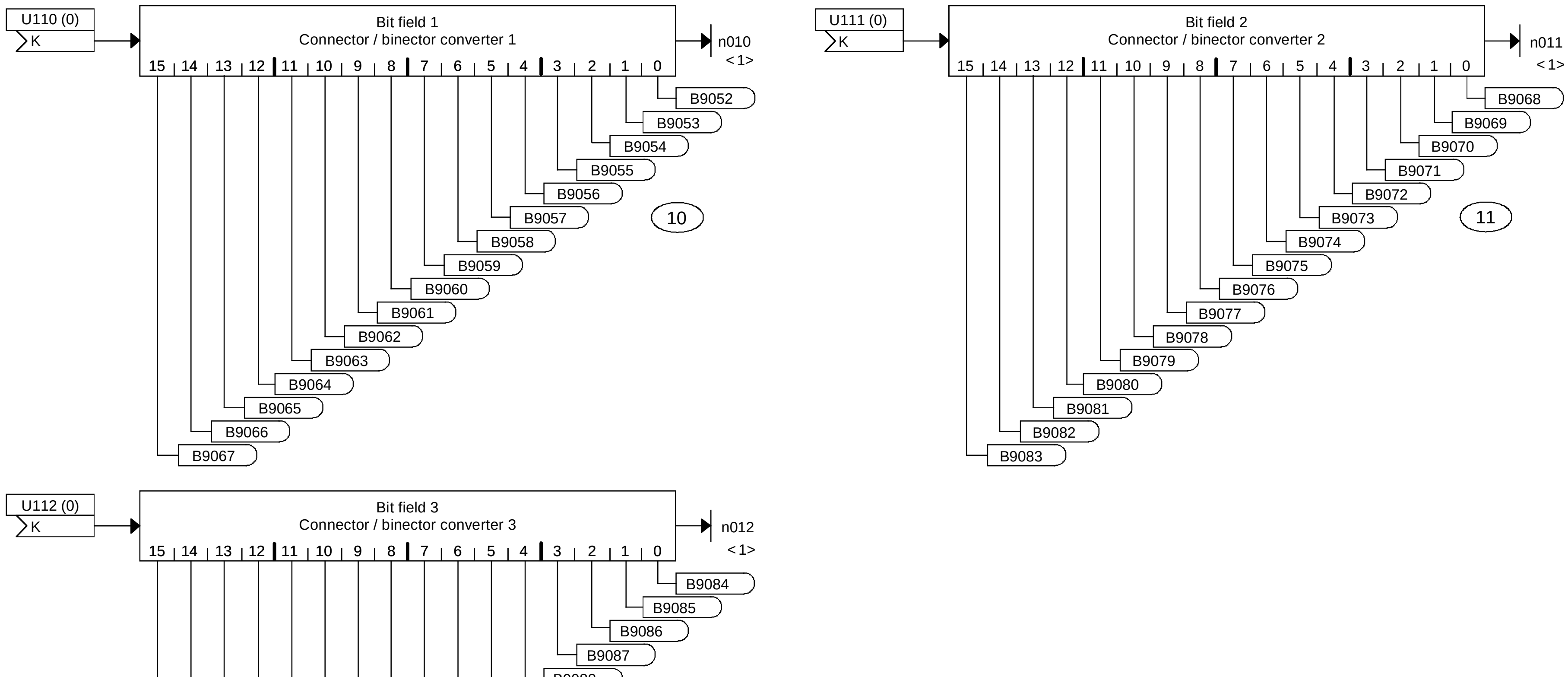


- B110 -

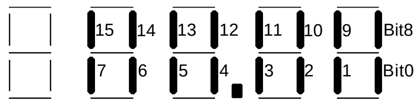

1
2
3
4
5
6
7
8
8 alarm message triggers
U104 (0) B .01 → 1 = "Alarm A023" 6
U104 (0) B .02 → 1 = "Alarm A019" 256
U105 (0) B .01 → 1 = "Alarm A024" 7
U105 (0) B .02 → 1 = "Alarm A020" 257
U106 (0) B .01 → 1 = "Alarm A033" 8
U106 (0) B .02 → 1 = "Alarm A053" 258
U107 (0) B .01 → 1 = "Alarm A034" 9
U107 (0) B .02 → 1 = "Alarm A054" 259
32 fault message triggers
U100 (0) B .01 → 1 = F023 fault value 1; B .02 → 1 = F023 fault value 2; B .03 → 1 = F023 fault value 3; B .04 → 1 = F023 fault value 4; 2
U100 (0) B .05 → 1 = F019 fault value 1; B .06 → 1 = F019 fault value 2; B .07 → 1 = F019 fault value 3; B .08 → 1 = F019 fault value 4; 286
U101 (0) B .01 → 1 = F024 fault value 1; B .02 → 1 = F024 fault value 2; B .03 → 1 = F024 fault value 3; B .04 → 1 = F024 fault value 4; 3
U101 (0) B .05 → 1 = F020 fault value 1; B .06 → 1 = F020 fault value 2; B .07 → 1 = F020 fault value 3; B .08 → 1 = F020 fault value 4; 287
U102 (0) B .01 → 1 = F033 fault value 1; B .02 → 1 = F033 fault value 2; B .03 → 1 = F033 fault value 3; B .04 → 1 = F033 fault value 4; 4
U102 (0) B .05 → 1 = F053 fault value 1; B .06 → 1 = F053 fault value 2; B .07 → 1 = F053 fault value 3; B .08 → 1 = F053 fault value 4; 288
U103 (0) B .01 → 1 = F034 fault value 1; B .02 → 1 = F034 fault value 2; B .03 → 1 = F034 fault value 3; B .04 → 1 = F034 fault value 4; 5
U103 (0) B .05 → 1 = F054 fault value 1; B .06 → 1 = F054 fault value 2; B .07 → 1 = F054 fault value 3; B .08 → 1 = F054 fault value 4; 289
- B115 -

1	2	3	4	5	6	7	8

3 connector/binector converters

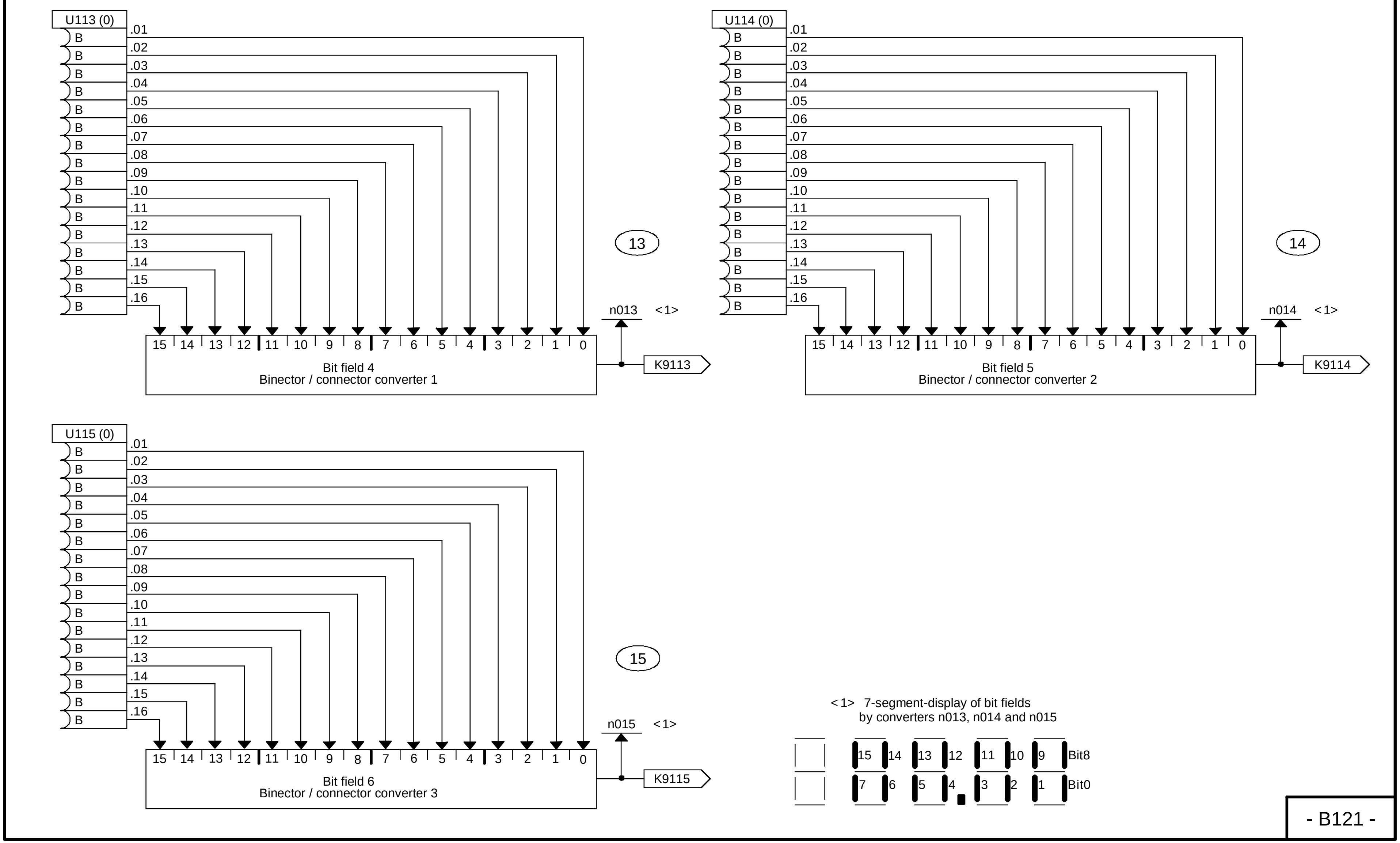


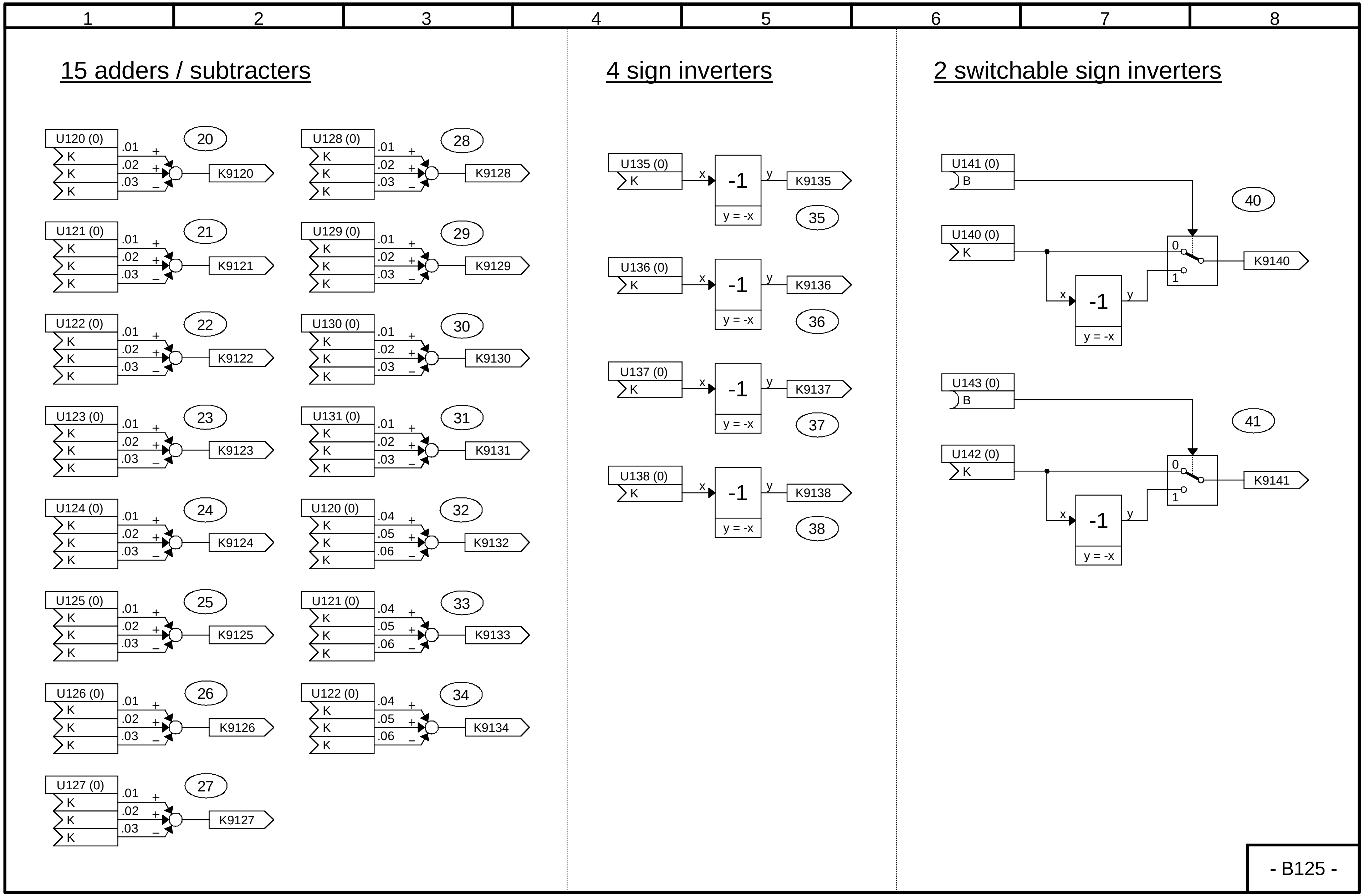
<1> 7-segment display of bit fields
by converters n010, n011 and n012



- B120 -

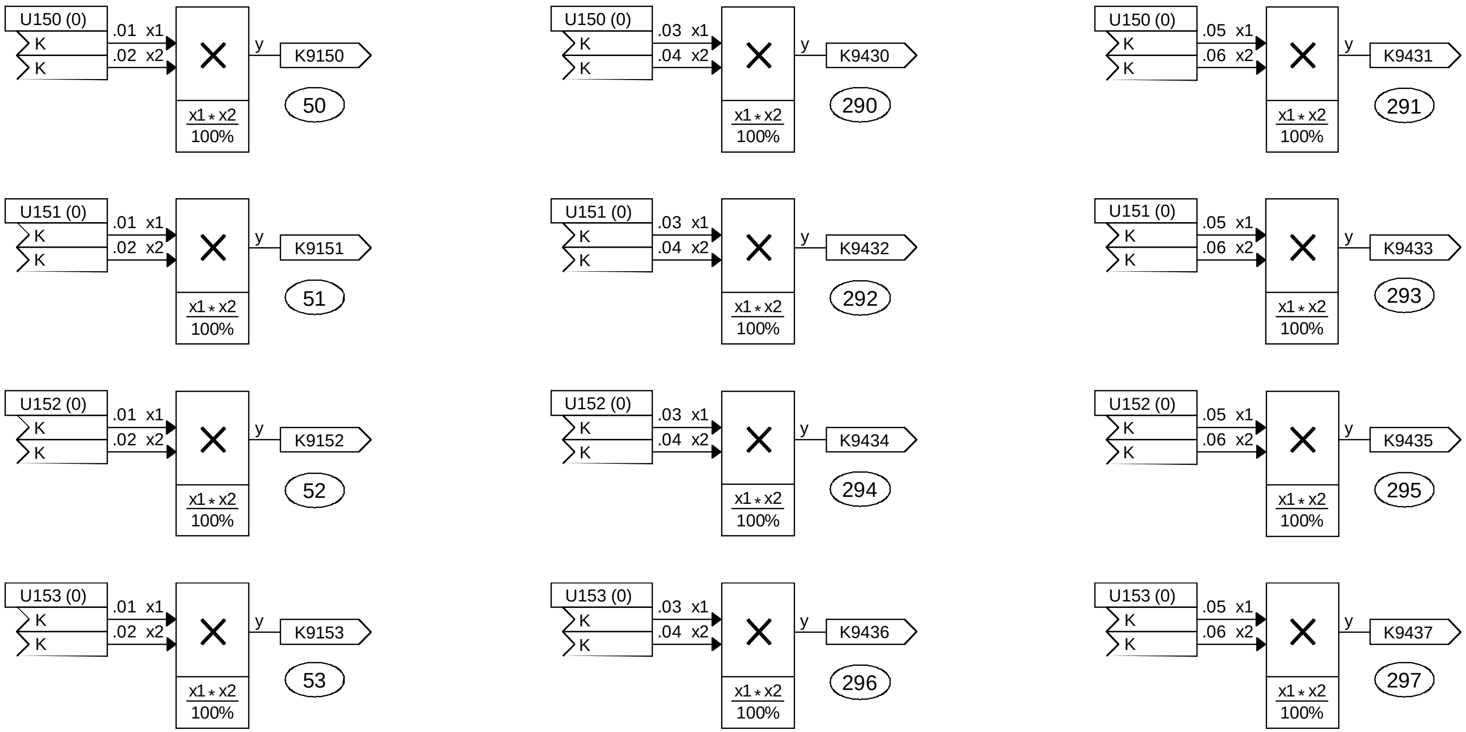
3 binector / connector converter




1
2
3
4
5
6
7
8
15 adders / subtracters
4 sign inverters
2 switchable sign inverters
U120 (0) K K K .01 .02 .03 + + – 20 K9120
U121 (0) K K K .01 .02 .03 + + – 21 K9121
U122 (0) K K K .01 .02 .03 + + – 22 K9122
U123 (0) K K K .01 .02 .03 + + – 23 K9123
U124 (0) K K K .01 .02 .03 + + – 24 K9124
U125 (0) K K K .01 .02 .03 + + – 25 K9125
U126 (0) K K K .01 .02 .03 + + – 26 K9126
U127 (0) K K K .01 .02 .03 + + – 27 K9127
U128 (0) K K K .01 .02 .03 + + – 28 K9128
U129 (0) K K K .01 .02 .03 + + – 29 K9129
U130 (0) K K K .01 .02 .03 + + – 30 K9130
U131 (0) K K K .01 .02 .03 + + – 31 K9131
U120 (0) K K K .04 .05 .06 + + – 32 K9132
U121 (0) K K K .04 .05 .06 + + – 33 K9133
U122 (0) K K K .04 .05 .06 + + – 34 K9134
U135 (0) K x -1 y y = -x 35 K9135
U136 (0) K x -1 y y = -x 36 K9136
U137 (0) K x -1 y y = -x 37 K9137
U138 (0) K x -1 y y = -x 38 K9138
U141 (0) B
U140 (0) K 0 1 x -1 y y = -x 40 K9140
U143 (0) B
U142 (0) K 0 1 x -1 y y = -x 41 K9141
- B125 -

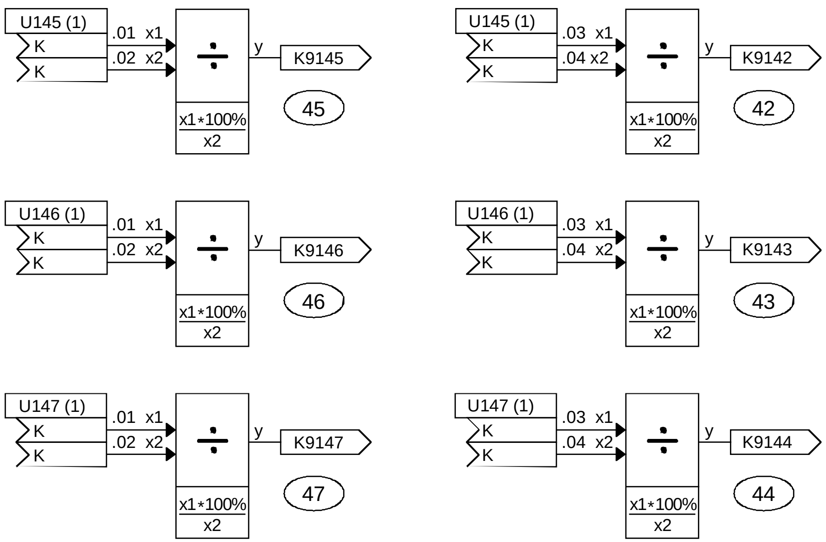
1 2 3 4 5 6 7 8

12 multipliers



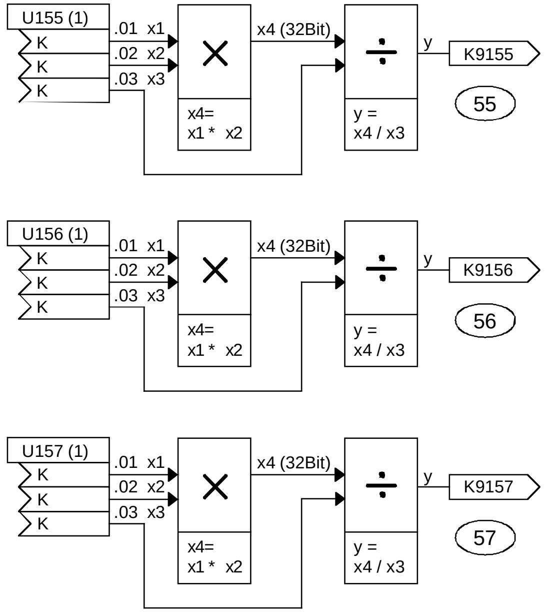
- B130 -

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%

3 high-resolution multipliers / dividers



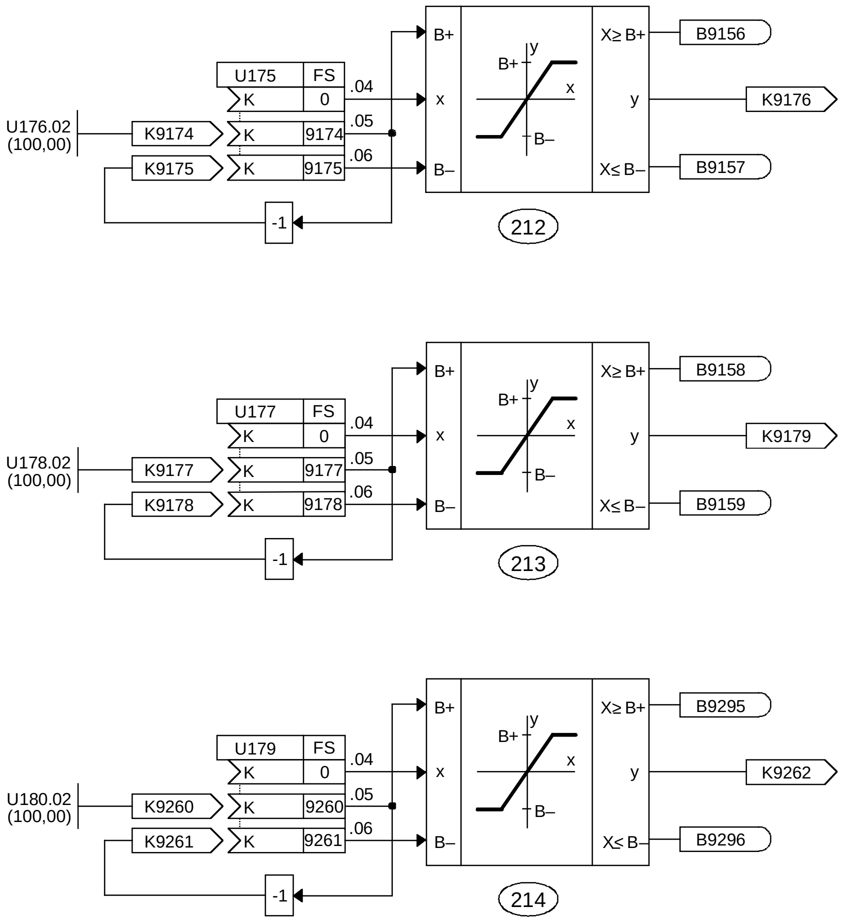
With division by 0 (x3 = 0):
when x4 > 0: y = +199.99%
when x4 = 0: y = 0.00%
when x4 < 0: y = -199.99%

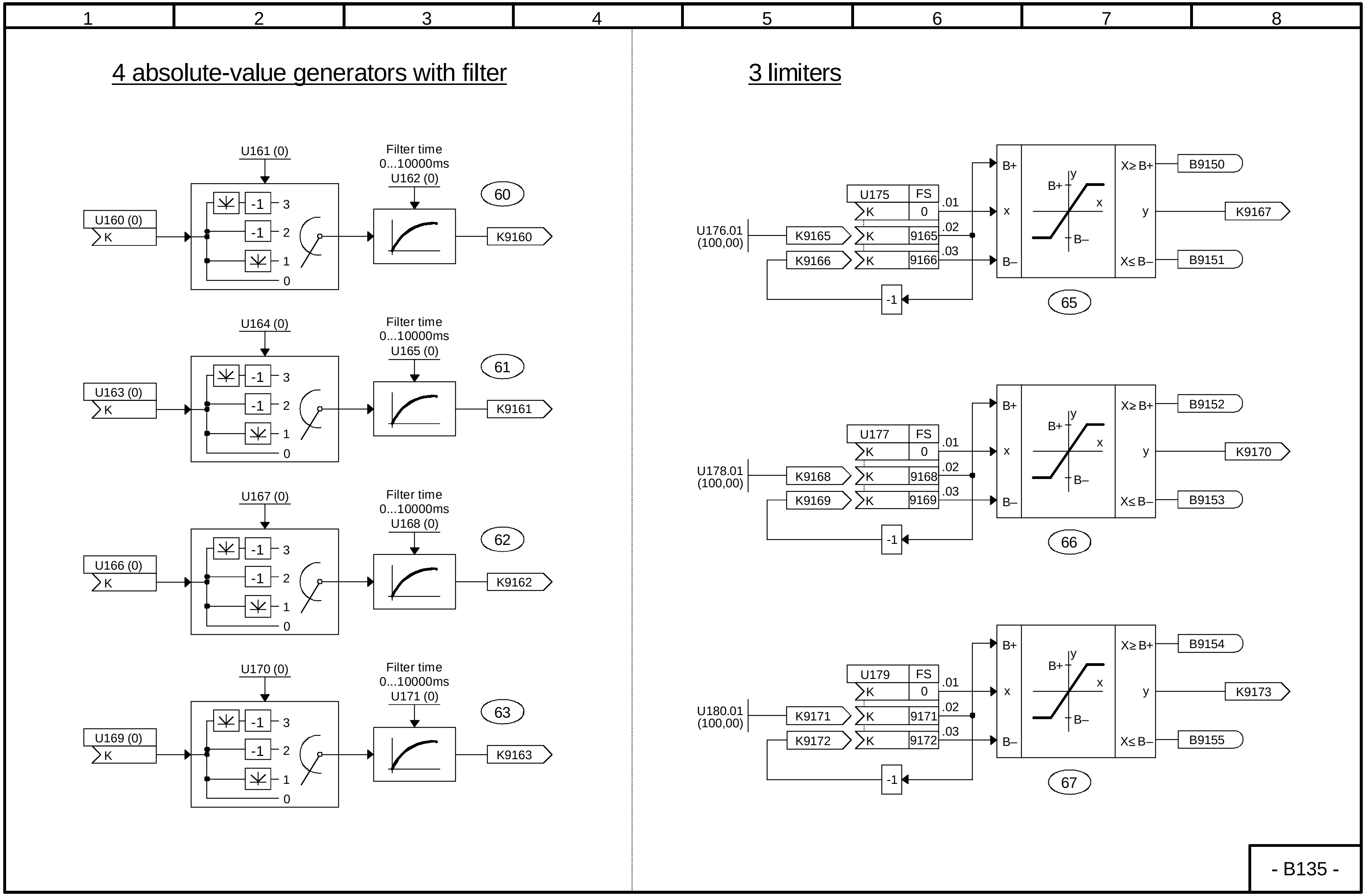
Examples:

x1	x2	x3	y
100%	100%	100%	100%
100%	40%	50%	80%
-200%	-200%	-200%	-200%

1 2 3 4 5 6 7 8

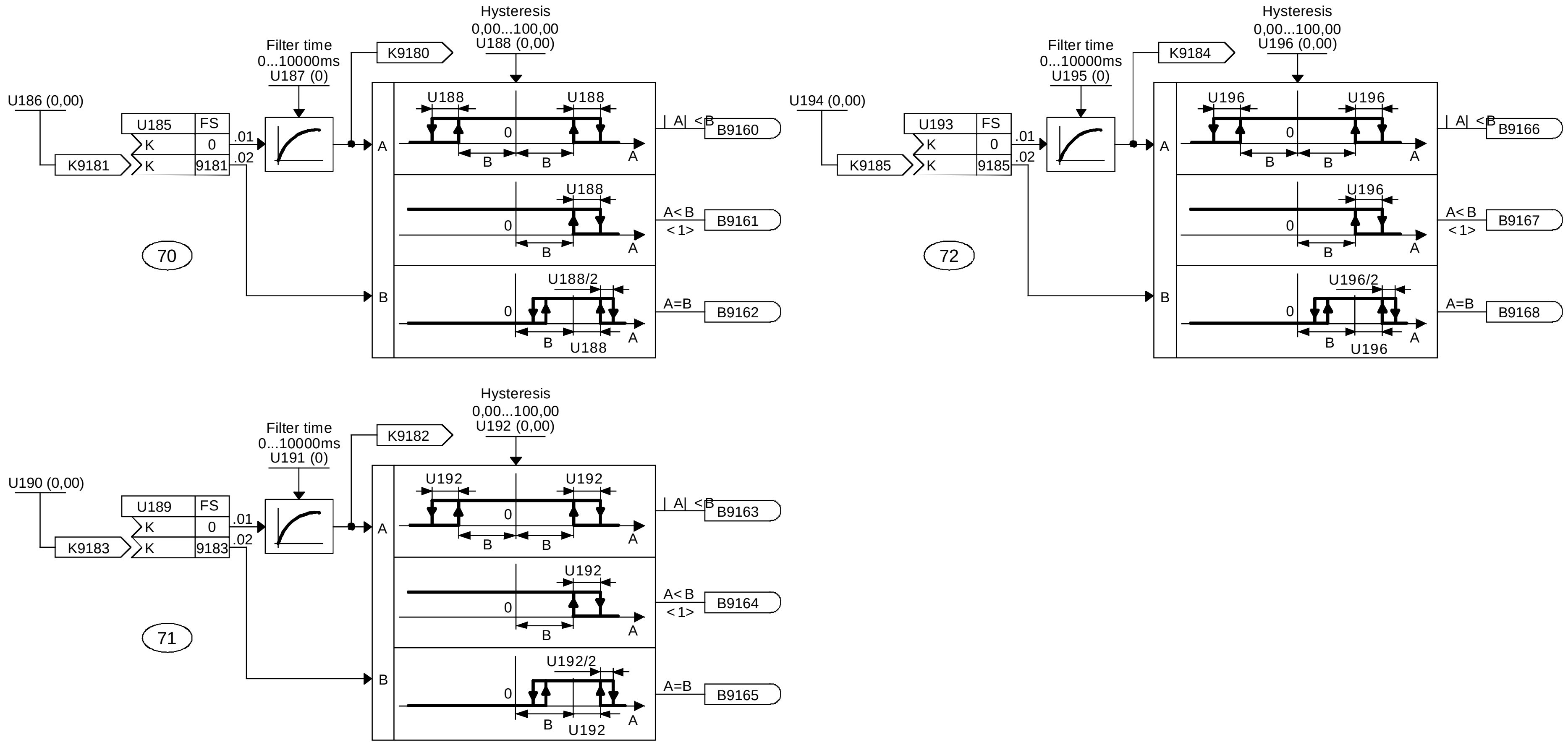
3 limiters




1
2
3
4
5
6
7
8
4 absolute-value generators with filter
3 limiters
U161 (0)
Filter time
0...10000ms
U162 (0)
60
U160 (0)
K
-1
3
-1
2
1
0
K9160
U164 (0)
Filter time
0...10000ms
U165 (0)
61
U163 (0)
K9161
U167 (0)
Filter time
0...10000ms
U168 (0)
62
U166 (0)
K9162
U170 (0)
Filter time
0...10000ms
U171 (0)
63
U169 (0)
K9163
U175
FS
0
9165
9166
.01
.02
.03
U176.01
(100,00)
K9165
K9166
-1
B+
x
B–
y
X≥ B+
X≤ B–
B9150
K9167
B9151
65
U177
U178.01
(100,00)
K9168
K9169
9168
9169
B9152
K9170
B9153
66
U179
U180.01
(100,00)
K9171
K9172
9171
9172
B9154
K9173
B9155
67
- B135 -

1	2	3	4	5	6	7	8

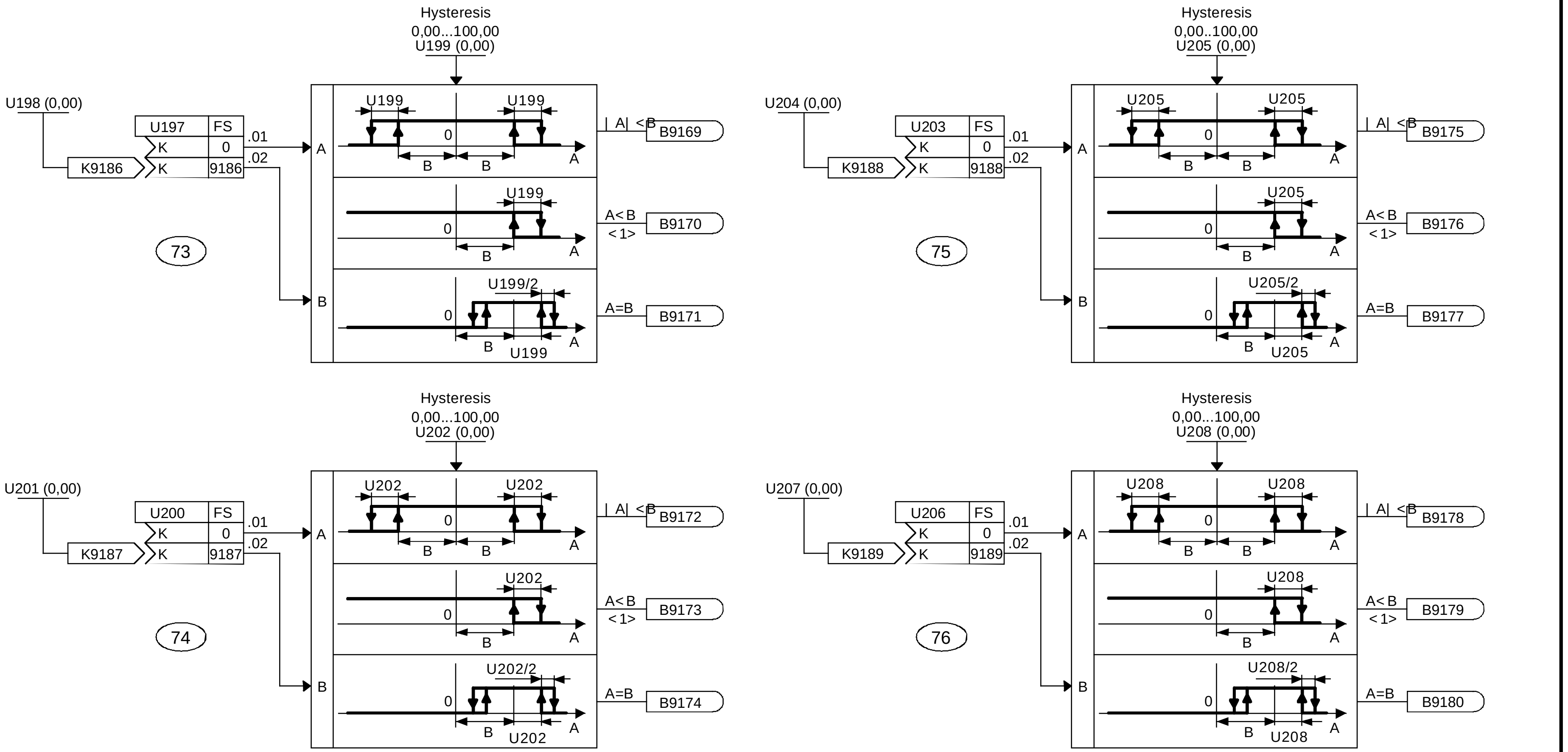
3 limit-value monitors with filter



<1> Example: -50% < -40%

1	2	3	4	5	6	7	8

4 limit-value monitors without filter



<1> Example: -50% < -40%

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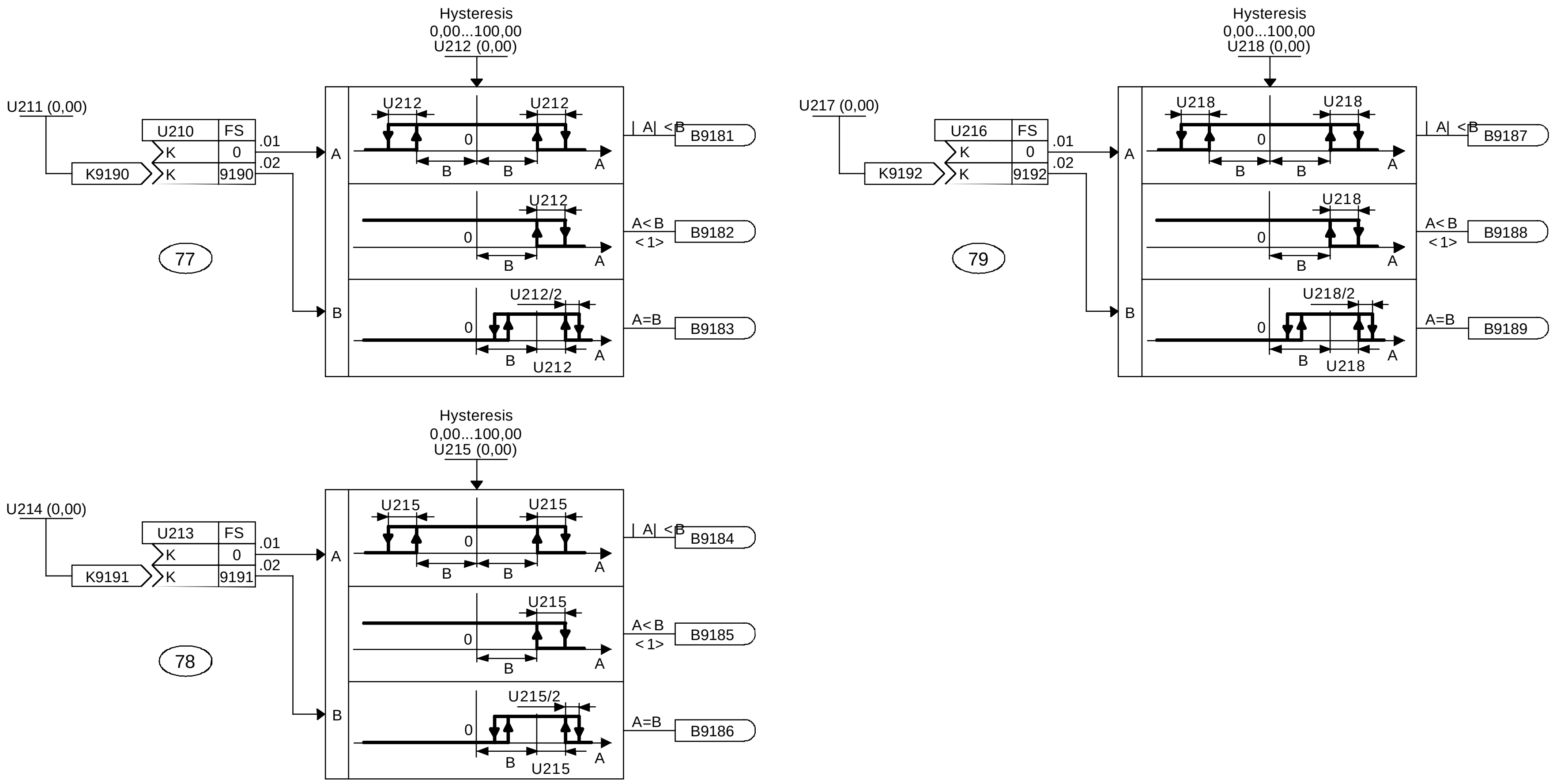
1	2	3	4	5	6	7	8

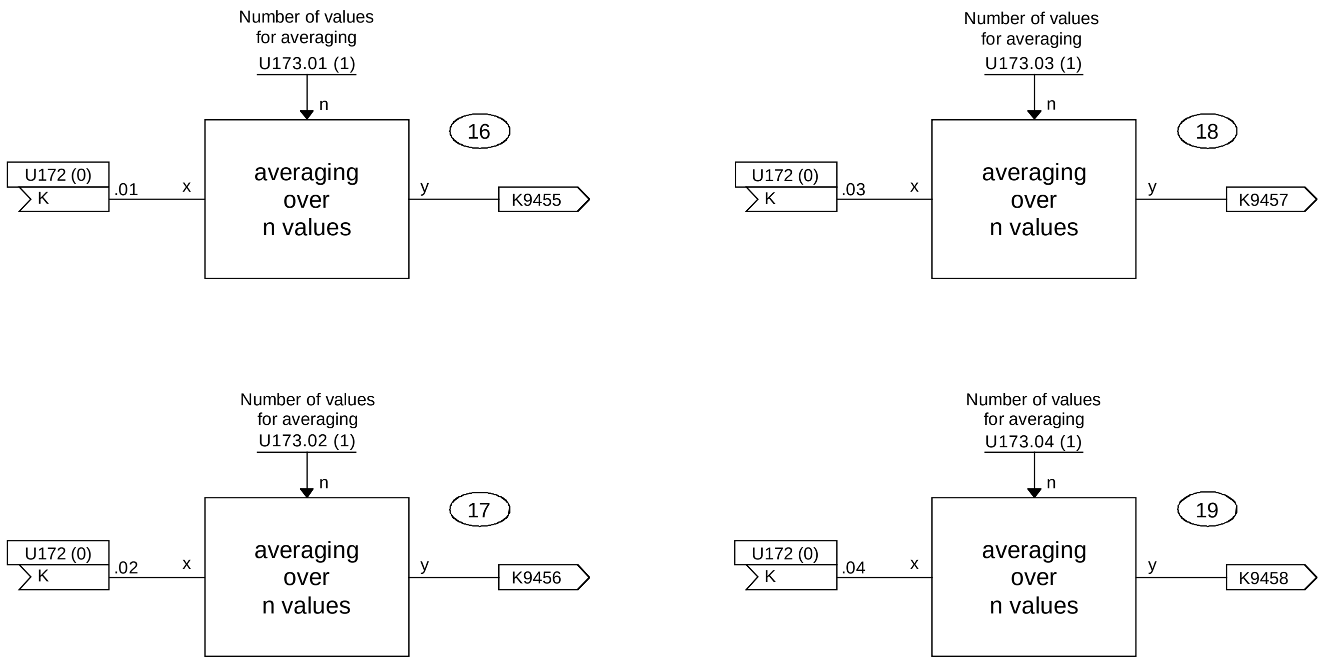
3 limit-value monitors without filter



< 1> Example: -50% < -40%

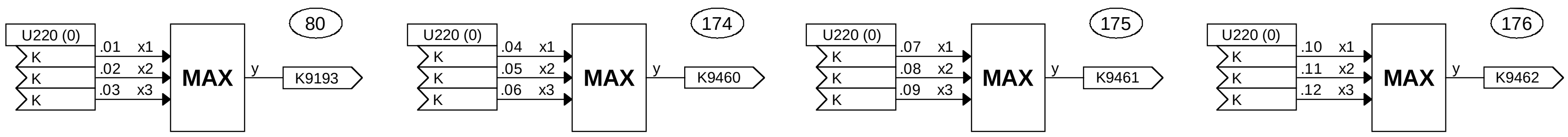
1	2	3	4	5	6	7	8

4 averagers



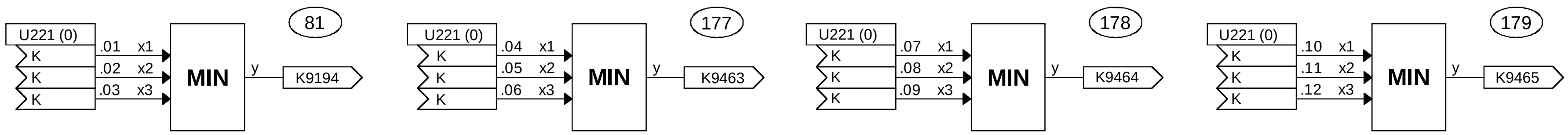
1	2	3	4	5	6	7	8

Maximum selection



y = maximum of x1, x2, x3
(e.g. -40% greater than -50%)

Minimum selection

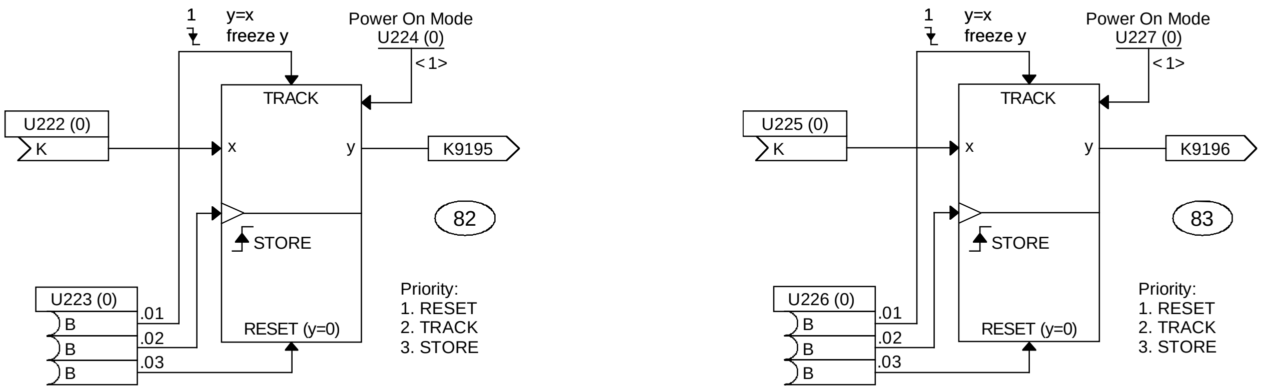


y = minimum of x1, x2, x3
(e.g. -50% lower than -40%)

- B140 -

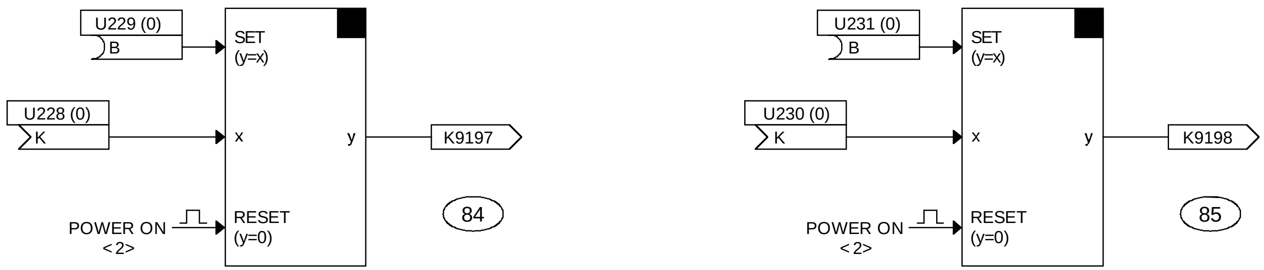
1	2	3	4	5	6	7	8

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 fails, the current output value is stored and output again when voltage is reconnected/recovers.

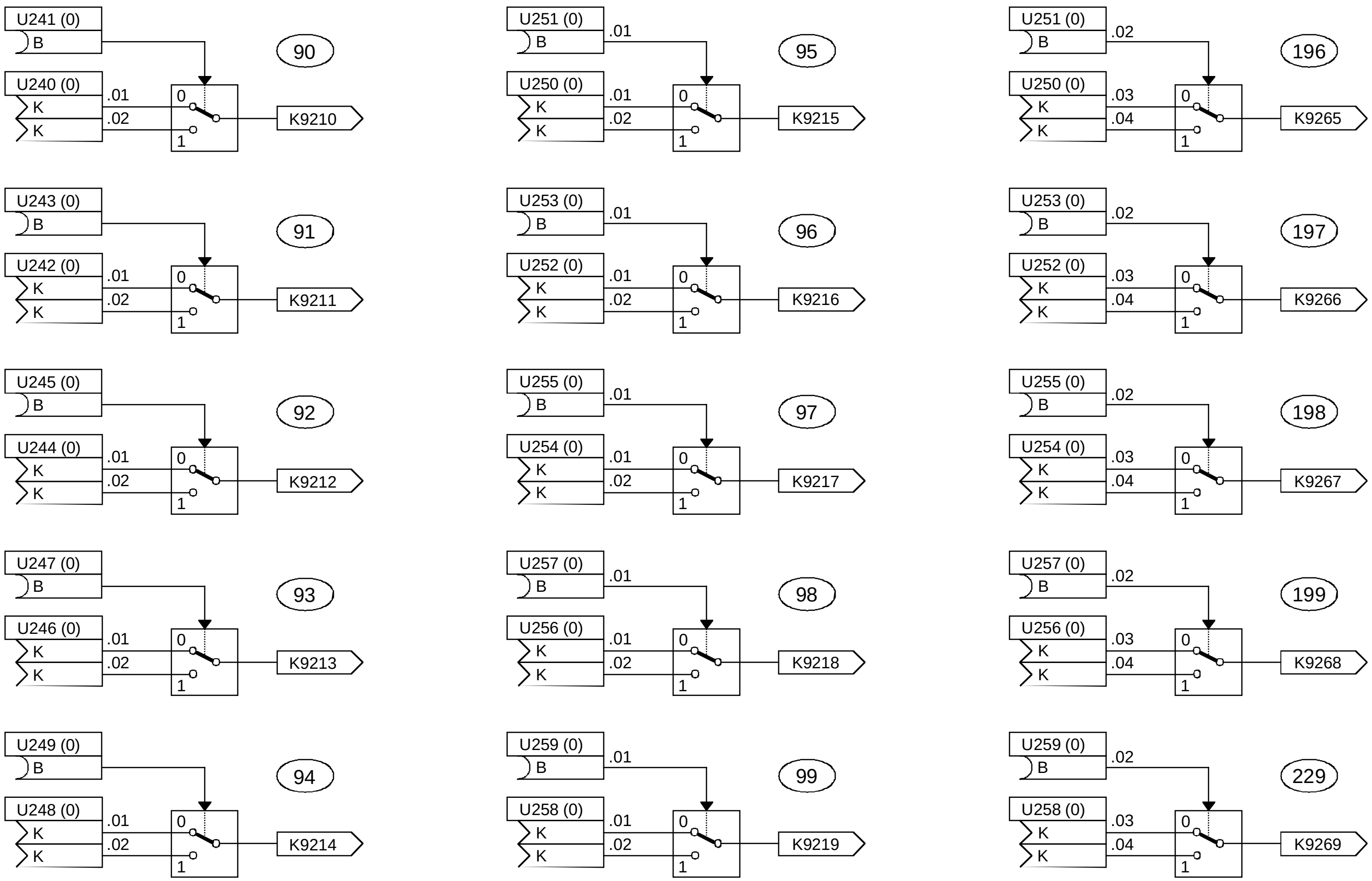
2 connector-memories



< 2> from voltage monitor for electronics power supply

1	2	3	4	5	6	7	8

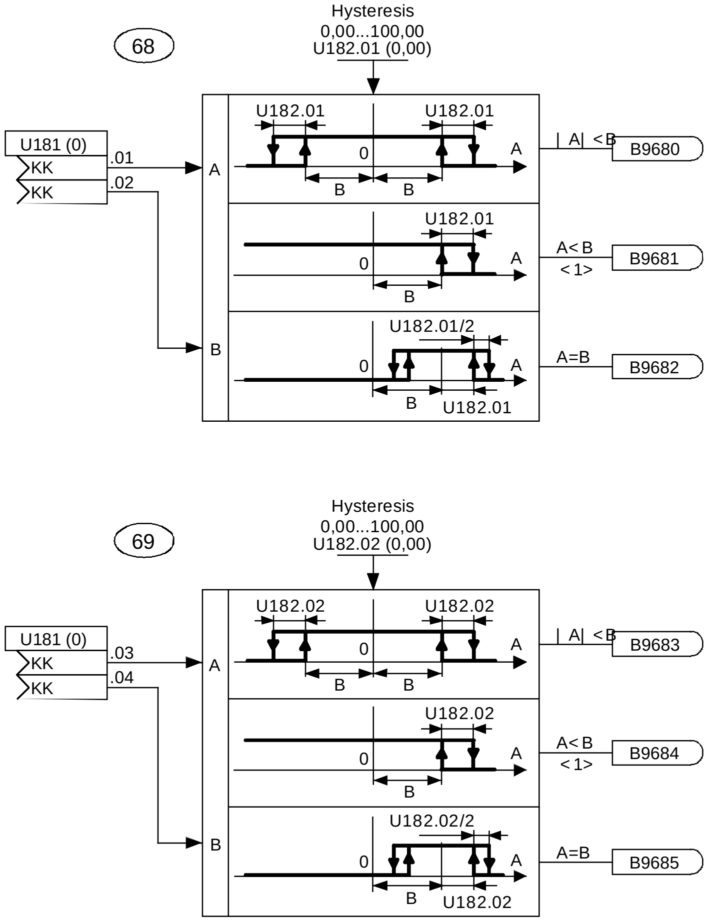
15 connector changeover switches



1	2	3	4	5	6	7	8

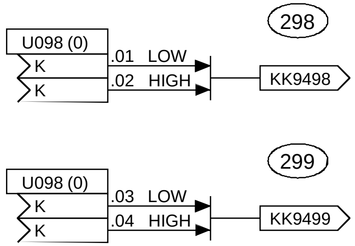
High-resolution blocks

Limit-value monitors (for double connectors)

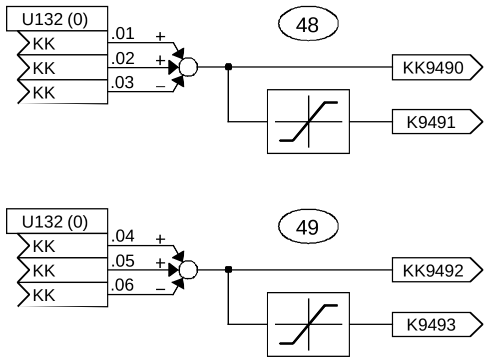


<1> Example: -50% < -40%

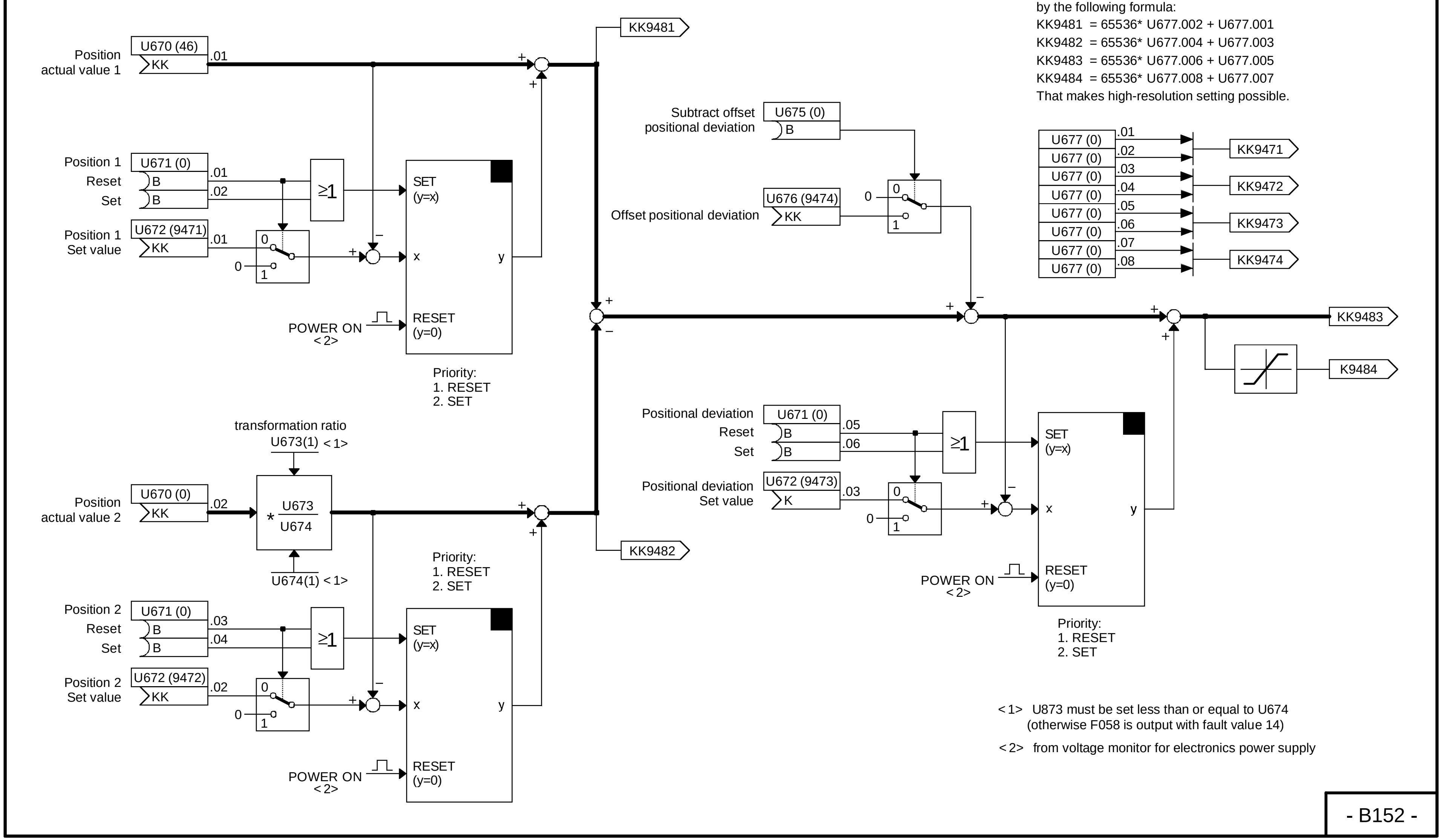
Connector-type converters



Adders / subtracters (for double connectors)



Position/positional deviation acquisition



Fixed values for set values

The output connectors are calculated by the following formula:

KK9481 = 65536* U677.002 + U677.001
KK9482 = 65536* U677.004 + U677.003
KK9483 = 65536* U677.006 + U677.005
KK9484 = 65536* U677.008 + U677.007

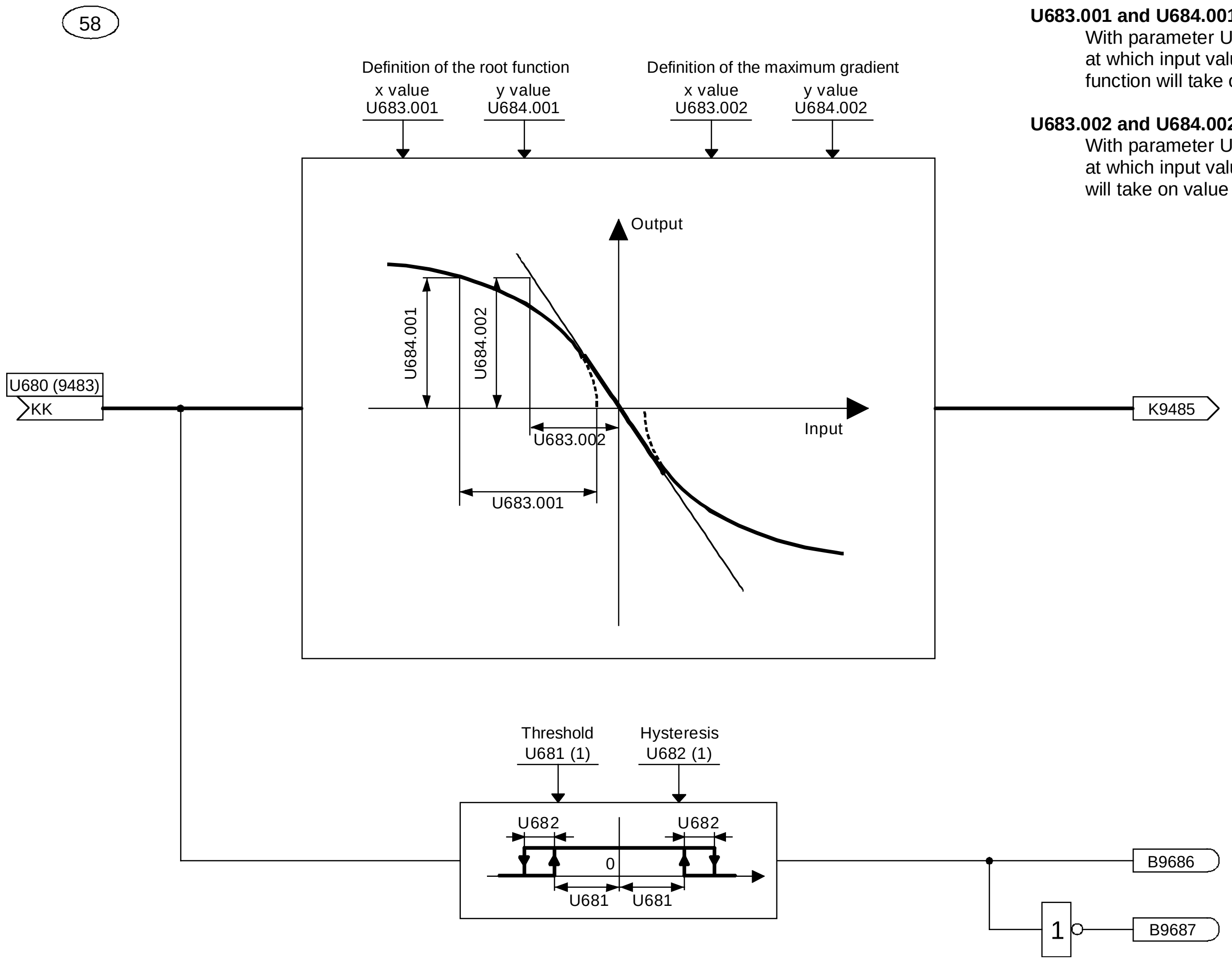
That makes high-resolution setting possible.

< 1> U873 must be set less than or equal to U674 (otherwise F058 is output with fault value 14)

< 2> from voltage monitor for electronics power supply

1	2	3	4	5	6	7	8

Root extractor

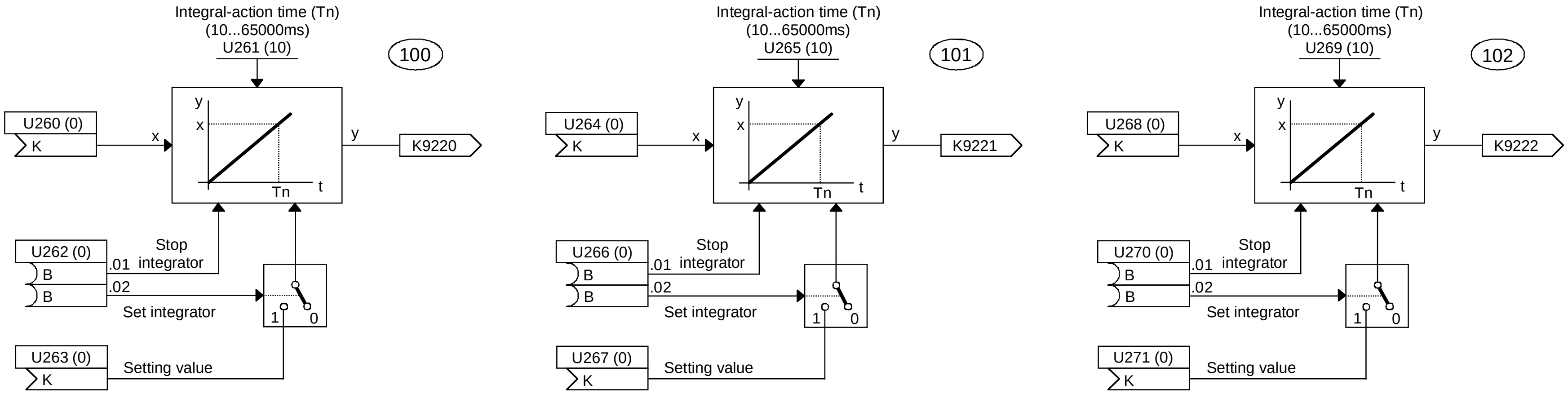


Parameters:

U683.001 and U684.001: Setting of the magnitude of the root function
With parameter U683.001 you can define
at which input value the output of the root
function will take on value U684.001.

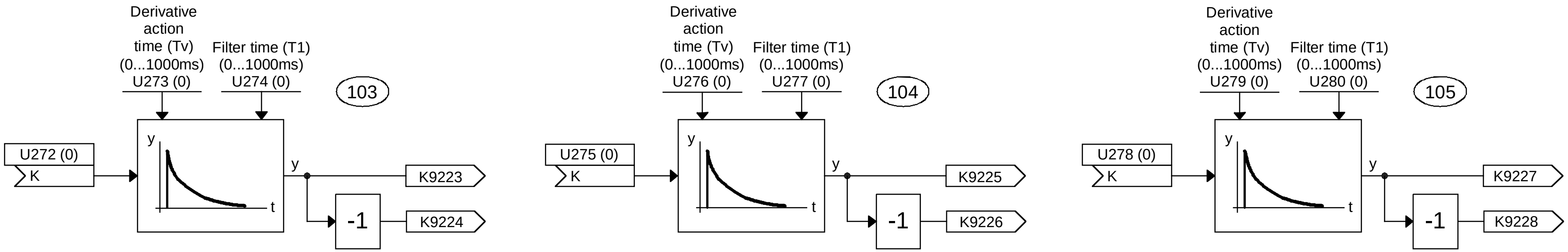
U683.002 and U684.002: Setting of the maximum gradient
With parameter U683.002 you can define
at which input value the limitation straight line
will take on value U684.002.

3 integrators



3 DT1 elements

(transfer function: $G(s) = Tv * \frac{s}{1 + s\,T1}$)

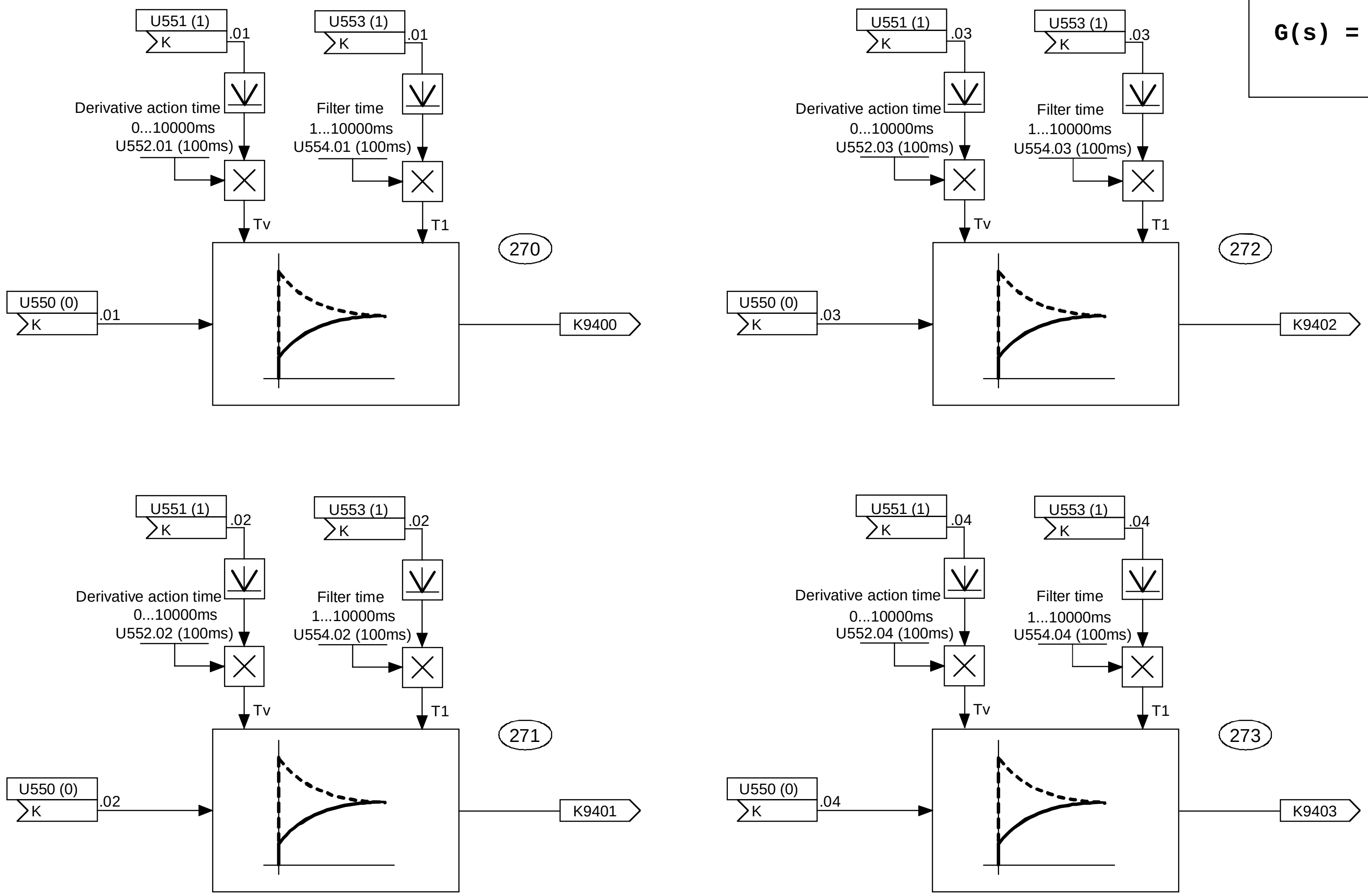


1	2	3	4	5	6	7	8

4 LEAD / LAG blocks

Transfer function:

$$G(s) = \frac{1 + sTv}{1 + sT1}$$

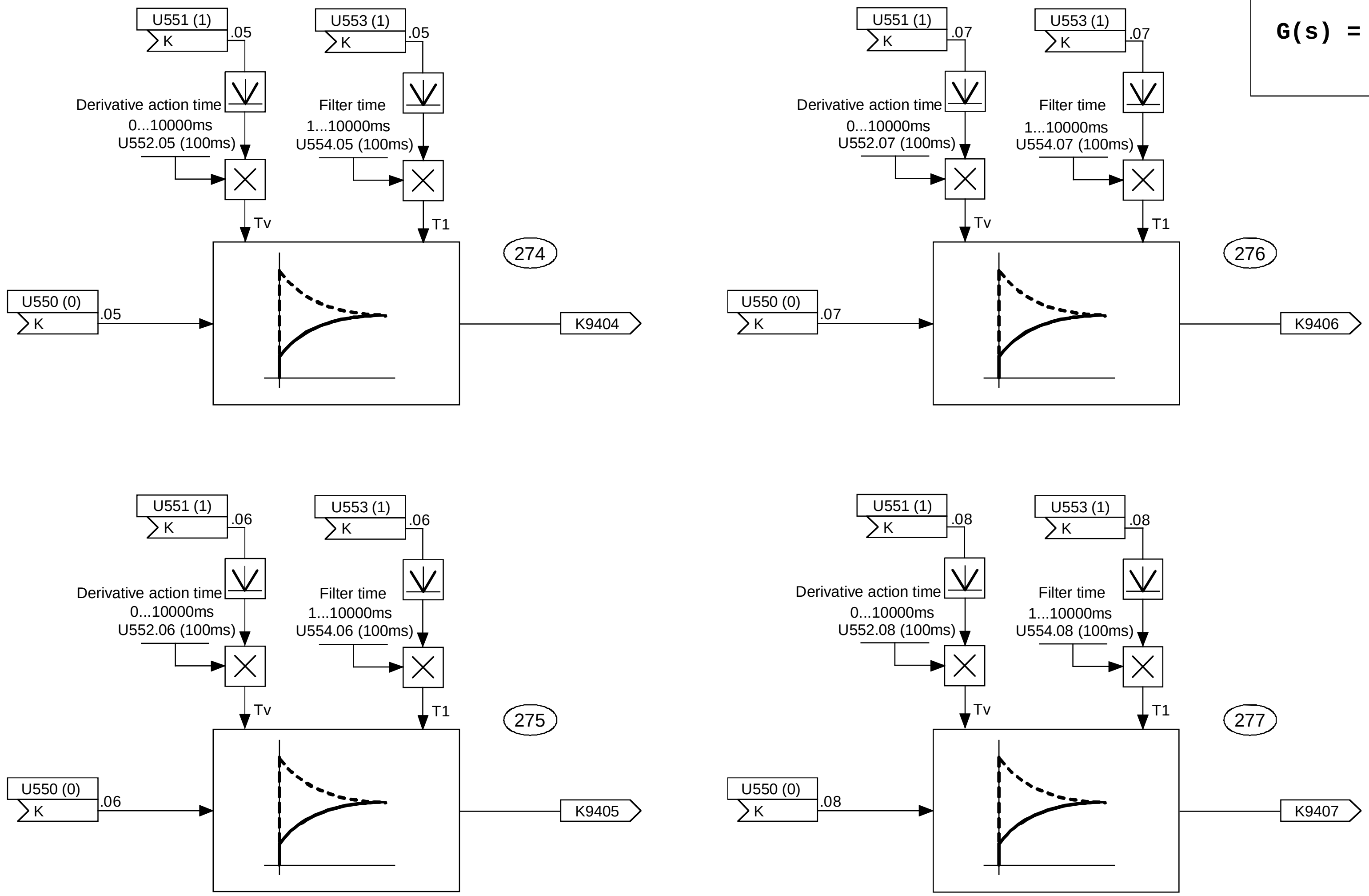


1	2	3	4	5	6	7	8

4 LEAD / LAG blocks

Transfer function:

$$G(s) = \frac{1 + sTv}{1 + sT1}$$

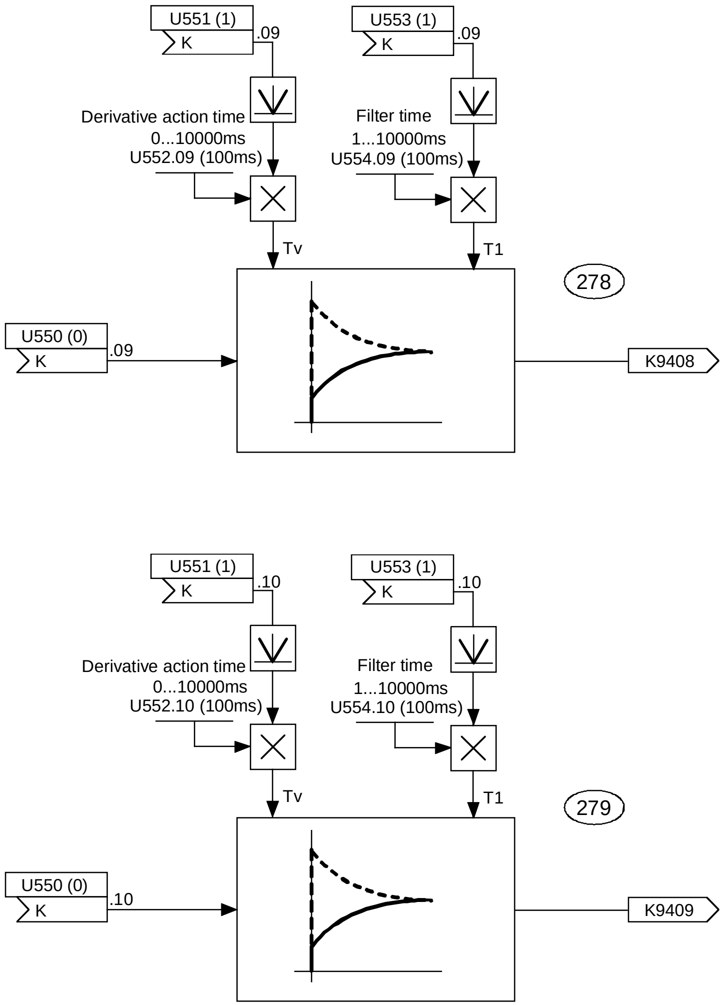


1	2	3	4	5	6	7	8

2 LEAD / LAG blocks

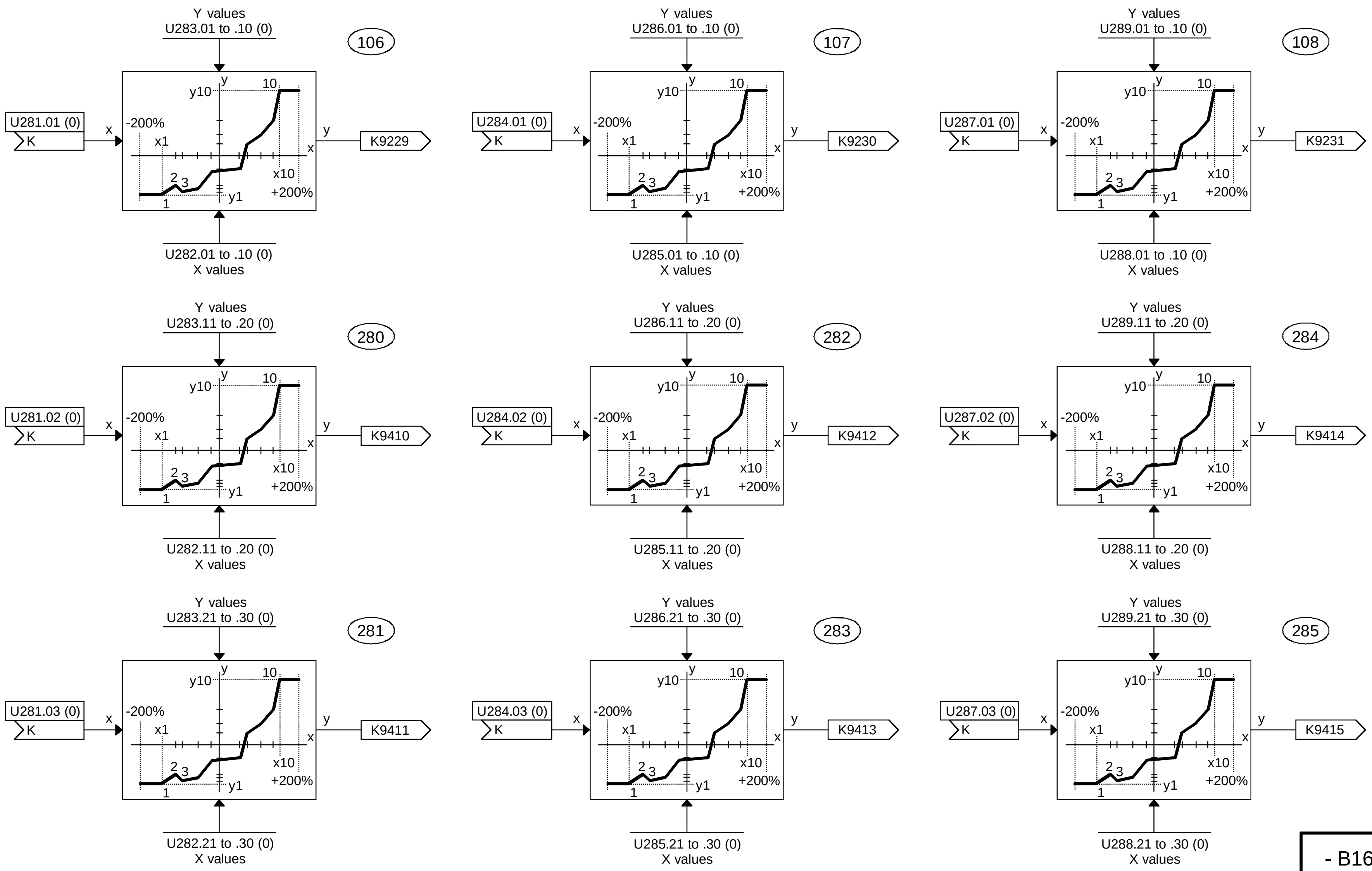
Transfer function:

$$G(s) = \frac{1 + sTv}{1 + sT1}$$



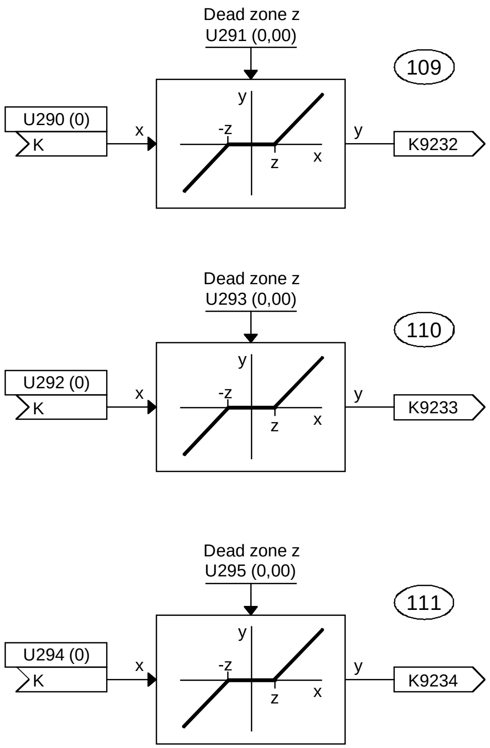
1	2	3	4	5	6	7	8

9 characteristic blocks

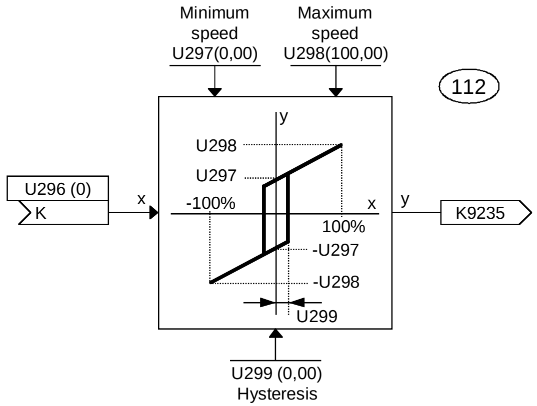


1	2	3	4	5	6	7	8

3 dead zones



Setpoint branching



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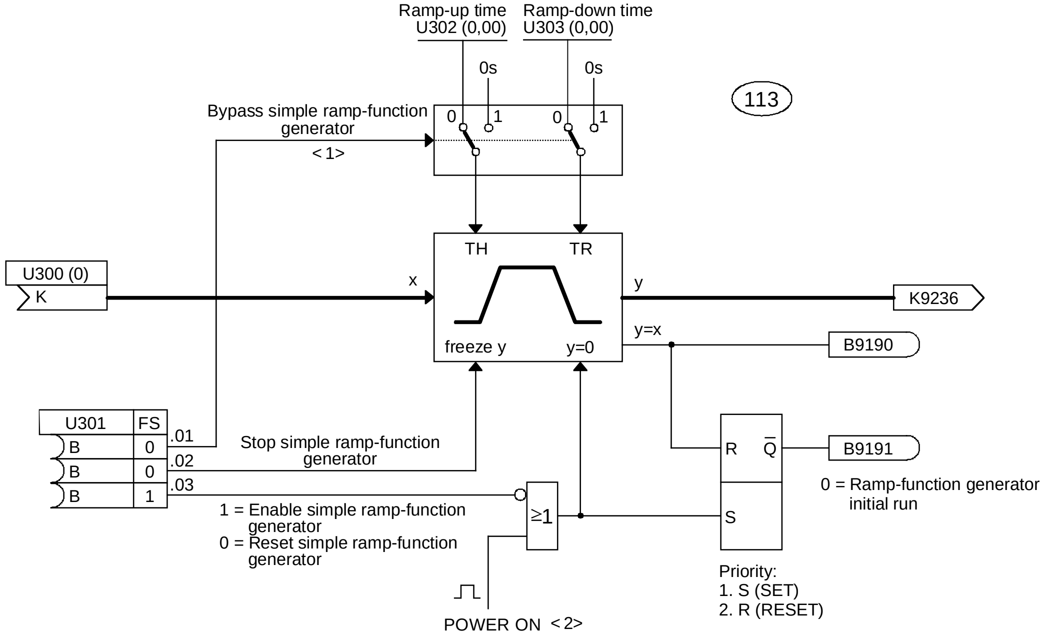
1	2	3	4	5	6	7	8

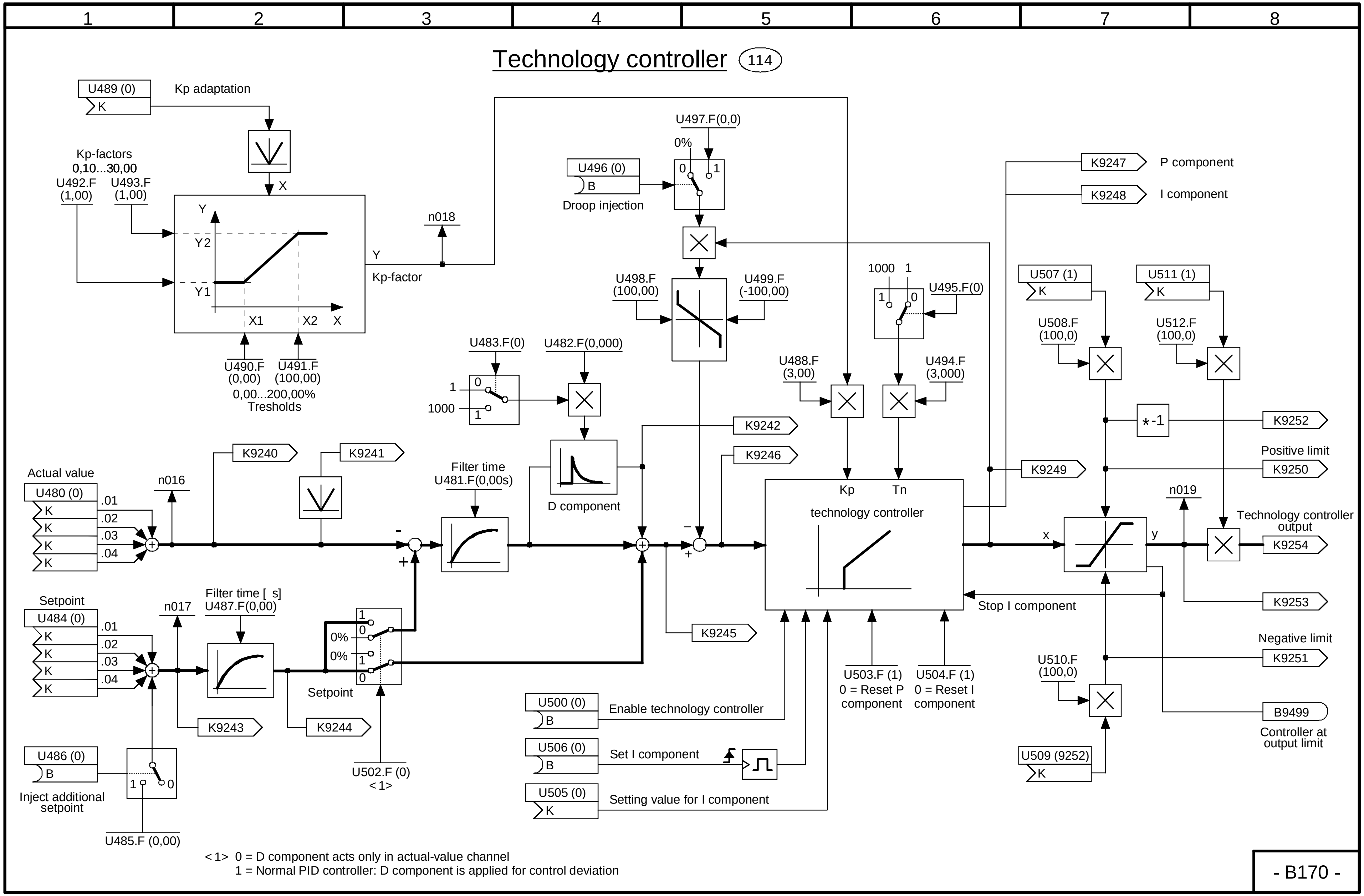
Simple ramp-function generator

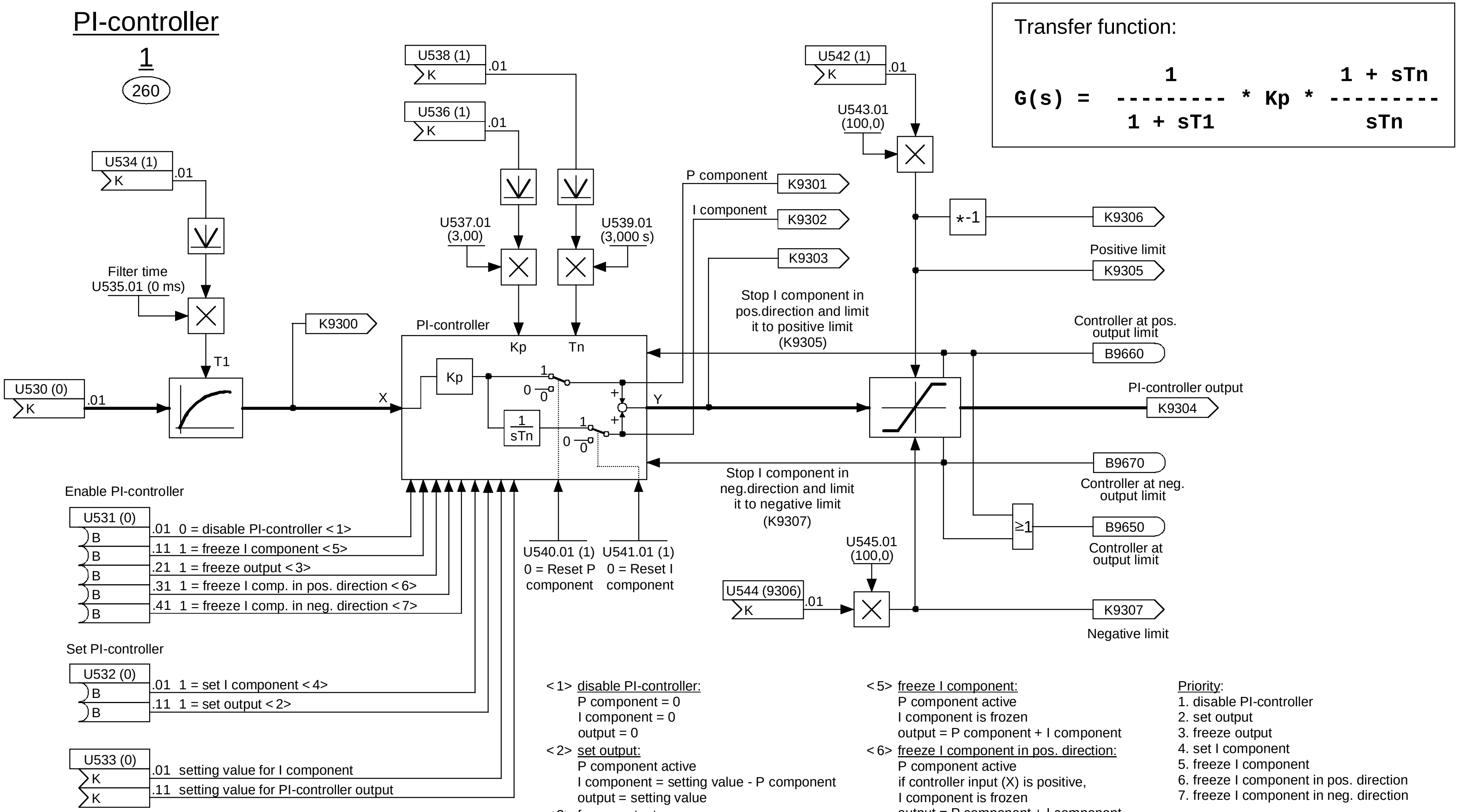


< 1> When U301.01 = 9191, the ramp-function generator operates only once after it has been enabled (edge log. "0" to "1")

< 2> from voltage monitor for electronics power supply

- B165 -


1 2 3 4 5 6 7 8
Technology controller 114
U489 (0)
K
Kp adaptation
Kp-factors
0,10...30,00
U492.F (1,00)
U493.F (1,00)
X
Y
Y2
Y1
X1
X2
X
U490.F (0,00)
U491.F (100,00)
0,00...200,00%
Tresholds
n018
Y
Kp-factor
U497.F(0,0)
0%
U496 (0)
B
Droop injection
0
1
K9247
P component
K9248
I component
U498.F (100,00)
U499.F (-100,00)
1000 1
U495.F(0)
U483.F(0)
U482.F(0,000)
1
1000
U488.F (3,00)
U494.F (3,000)
U507 (1)
K
U511 (1)
K
U508.F (100,0)
U512.F (100,0)
*-1
K9252
K9242
K9246
K9240
K9241
Filter time
U481.F(0,00s)
D component
Actual value
U480 (0)
n016
.01
.02
.03
.04
K
Kp
Tn
technology controller
K9249
Positive limit
K9250
n019
Technology controller output
K9254
x
y
-
+
Setpoint
U484 (0)
n017
Filter time [s]
U487.F(0,00)
0%
0%
Setpoint
K9245
Stop I component
K9253
Negative limit
K9251
U503.F (1)
0 = Reset P component
U504.F (1)
0 = Reset I component
U510.F (100,0)
U500 (0)
B
Enable technology controller
K9243
K9244
B9499
Controller at output limit
U506 (0)
B
Set I component
U509 (9252)
K
U486 (0)
B
Inject additional setpoint
U502.F (0)
<1>
U505 (0)
K
Setting value for I component
U485.F (0,00)
<1> 0 = D component acts only in actual-value channel
1 = Normal PID controller: D component is applied for control deviation
- B170 -



Transfer function:

$$G(s) = \frac{1}{1 + sT1} * Kp * \frac{1 + sTn}{sTn}$$

<1> disable PI-controller:
P component = 0
I component = 0
output = 0

<2> set output:
P component active
I component = setting value - P component
output = setting value

<3> freeze output:
P component active
I component = frozen output - P component
output is frozen

<4> set I component:
P component active
I component = setting value
output = P component + I component

<5> freeze I component:
P component active
I component is frozen
output = P component + I component

<6> freeze I component in pos. direction:
P component active
if controller input (X) is positive,
I component is frozen
output = P component + I component

<7> freeze I component in neg. direction:
P component active
if controller input (X) is negative,
I component is frozen
output = P component + I component

Priority:
1. disable PI-controller
2. set output
3. freeze output
4. set I component
5. freeze I component
6. freeze I component in pos. direction
7. freeze I component in neg. direction

1	2	3	4	5	6	7	8

PI-controller 2

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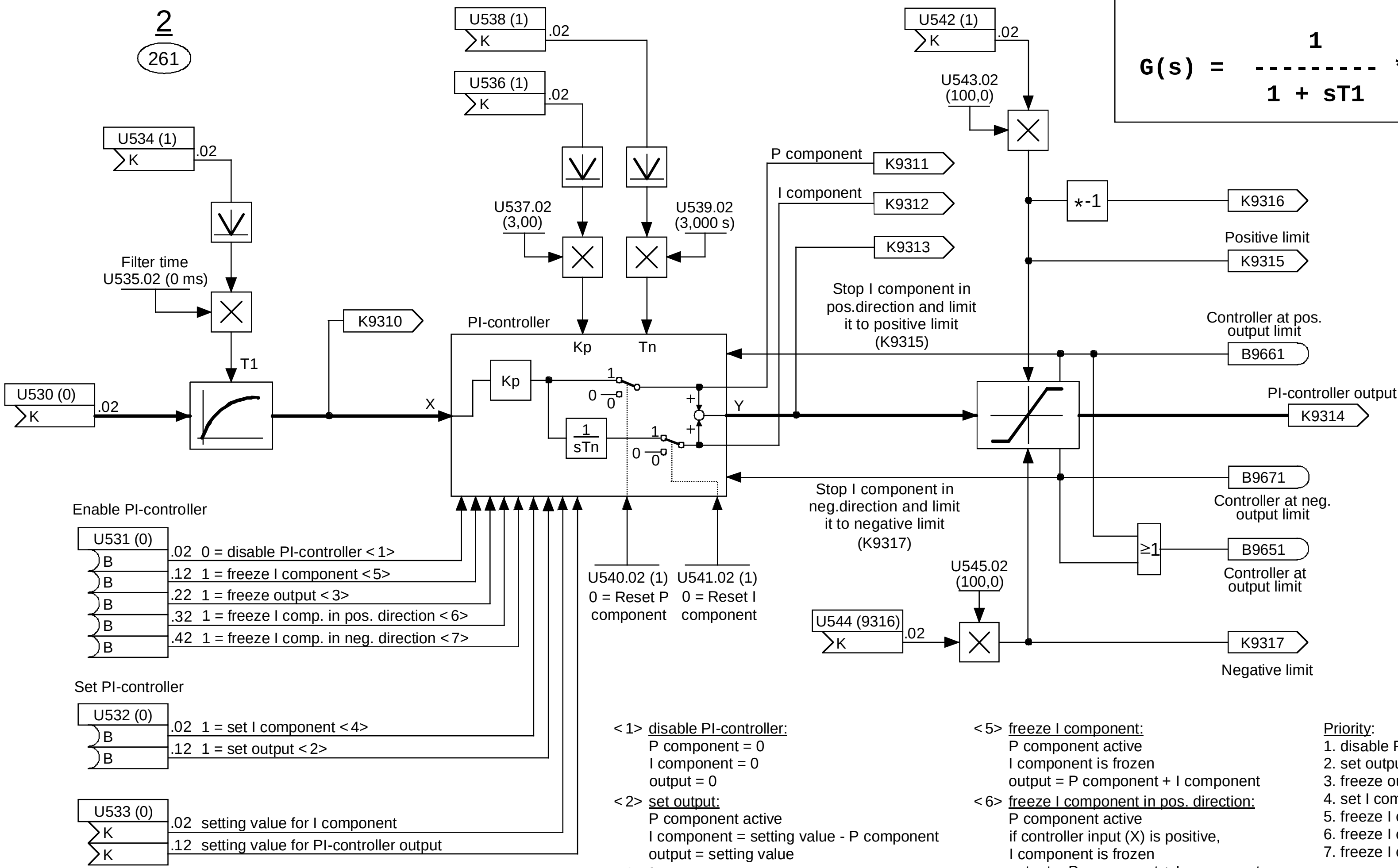
Transfer function:

$$G(s) = \frac{1}{1 + sT1} * Kp * \frac{1 + sTn}{sTn}$$



<1> <u>disable PI-controller:</u>
P component = 0
I component = 0
output = 0

<2> <u>set output:</u>
P component active
I component = setting value - P component
output = setting value

<3> <u>freeze output:</u>
P component active
I component = frozen output - P component
output is frozen

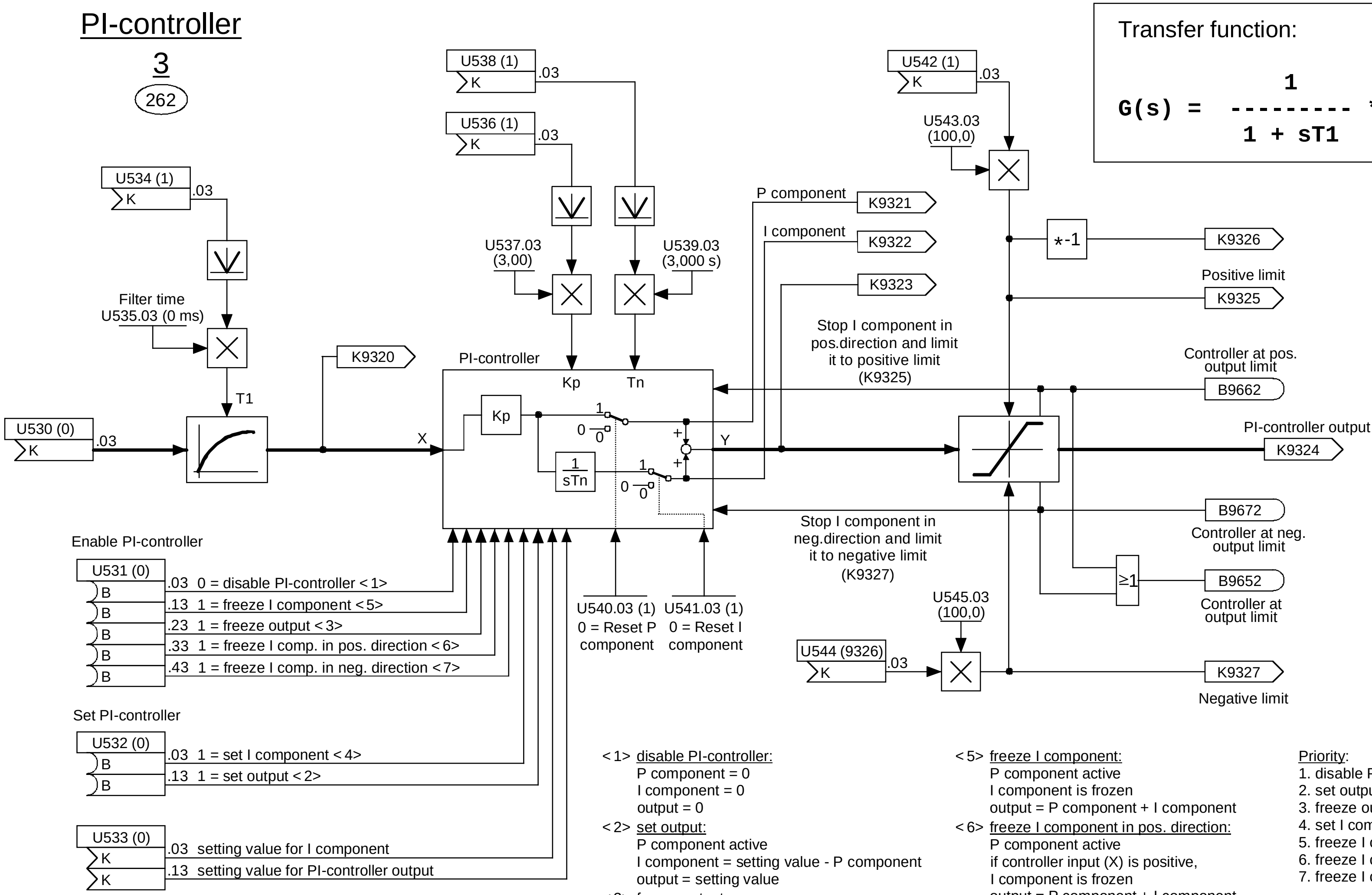
<4> <u>set I component:</u>
P component active
I component = setting value
output = P component + I component

<5> <u>freeze I component:</u>
P component active
I component is frozen
output = P component + I component

<6> <u>freeze I component in pos. direction:</u>
P component active
if controller input (X) is positive,
I component is frozen
output = P component + I component

<7> <u>freeze I component in neg. direction:</u>
P component active
if controller input (X) is negative,
I component is frozen
output = P component + I component

<u>Priority</u>:
1. disable PI-controller
2. set output
3. freeze output
4. set I component
5. freeze I component
6. freeze I component in pos. direction
7. freeze I component in neg. direction



Transfer function:

$$G(s) = \frac{1}{1 + sT1} * Kp * \frac{1 + sTn}{sTn}$$

<1> disable PI-controller:
P component = 0
I component = 0
output = 0

<2> set output:
P component active
I component = setting value - P component
output = setting value

<3> freeze output:
P component active
I component = frozen output - P component
output is frozen

<4> set I component:
P component active
I component = setting value
output = P component + I component

<5> freeze I component:
P component active
I component is frozen
output = P component + I component

<6> freeze I component in pos. direction:
P component active
if controller input (X) is positive,
I component is frozen
output = P component + I component

<7> freeze I component in neg. direction:
P component active
if controller input (X) is negative,
I component is frozen
output = P component + I component

Priority:
1. disable PI-controller
2. set output
3. freeze output
4. set I component
5. freeze I component
6. freeze I component in pos. direction
7. freeze I component in neg. direction

1	2	3	4	5	6	7	8

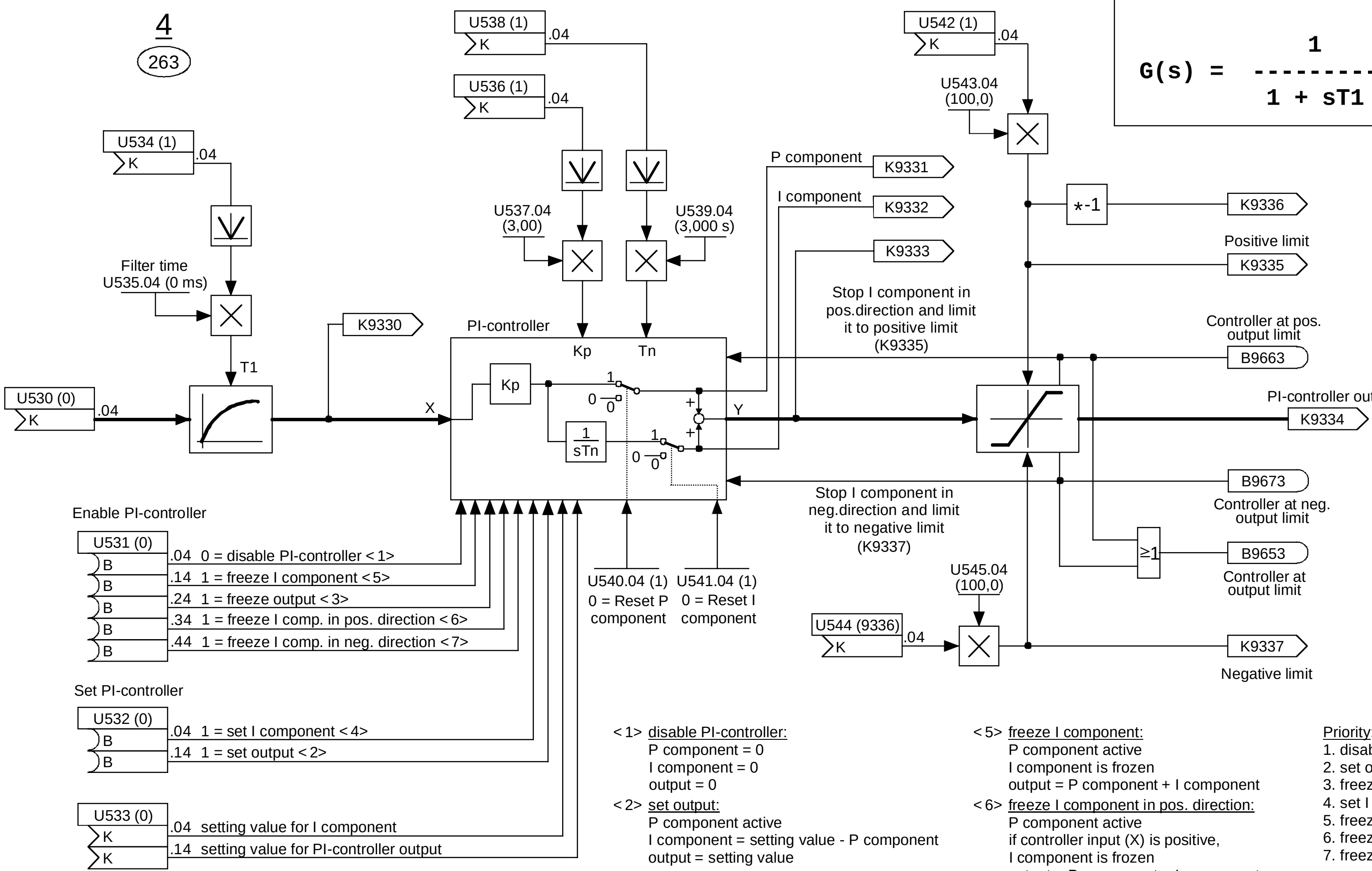
PI-controller

4

263

Transfer function:

$$G(s) = \frac{1}{1 + sT1} * Kp * \frac{1 + sTn}{sTn}$$



<1> disable PI-controller:
P component = 0
I component = 0
output = 0

<2> set output:
P component active
I component = setting value - P component
output = setting value

<3> freeze output:
P component active
I component = frozen output - P component
output is frozen

<4> set I component:
P component active
I component = setting value
output = P component + I component

<5> freeze I component:
P component active
I component is frozen
output = P component + I component

<6> freeze I component in pos. direction:
P component active
if controller input (X) is positive,
I component is frozen
output = P component + I component

<7> freeze I component in neg. direction:
P component active
if controller input (X) is negative,
I component is frozen
output = P component + I component

Priority:
1. disable PI-controller
2. set output
3. freeze output
4. set I component
5. freeze I component
6. freeze I component in pos. direction
7. freeze I component in neg. direction

1	2	3	4	5	6	7	8

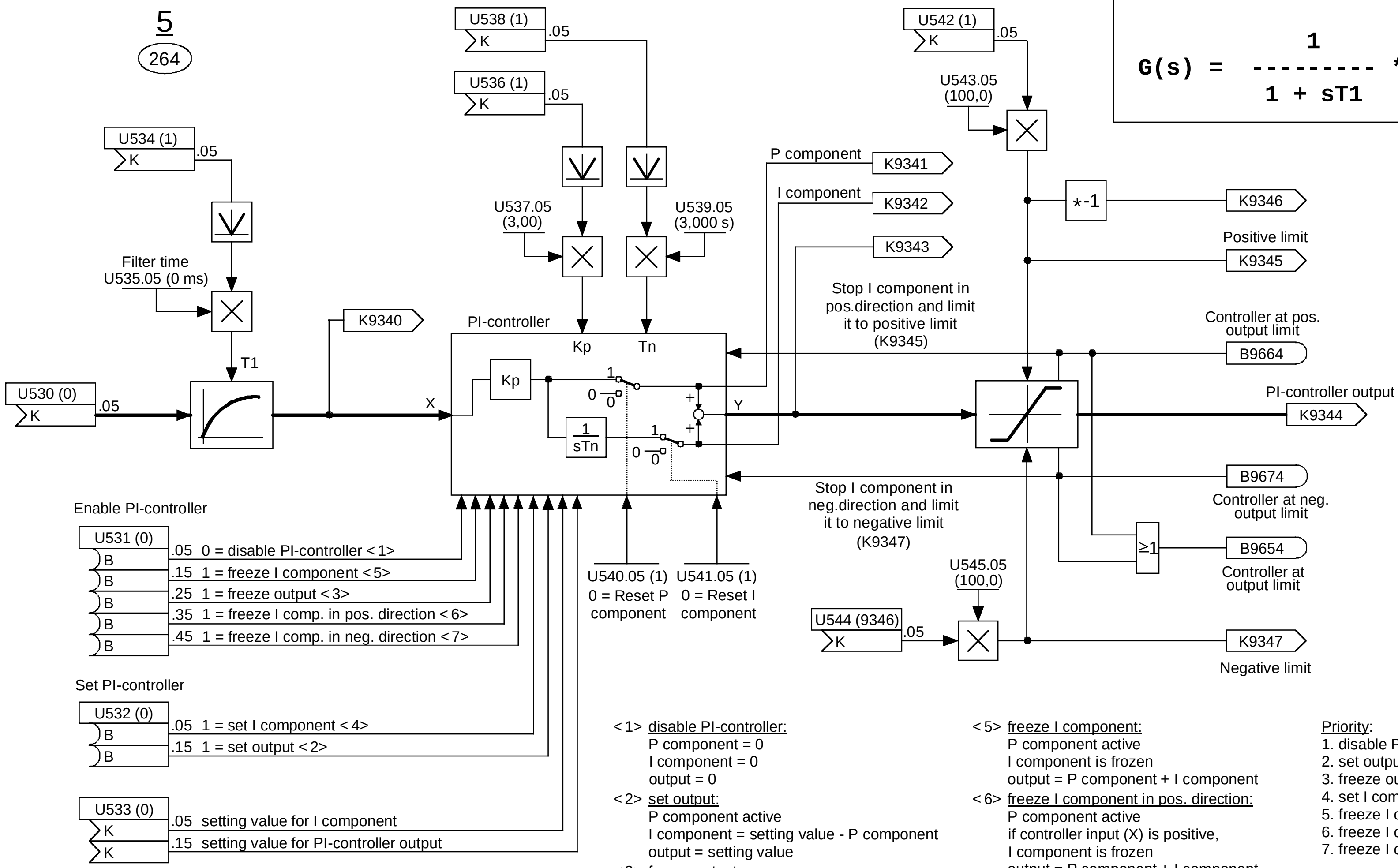
PI-controller

5

(264)

Transfer function:

$$G(s) = \frac{1}{1 + sT1} * Kp * \frac{1 + sTn}{sTn}$$



<1> disable PI-controller:
P component = 0
I component = 0
output = 0

<2> set output:
P component active
I component = setting value - P component
output = setting value

<3> freeze output:
P component active
I component = frozen output - P component
output is frozen

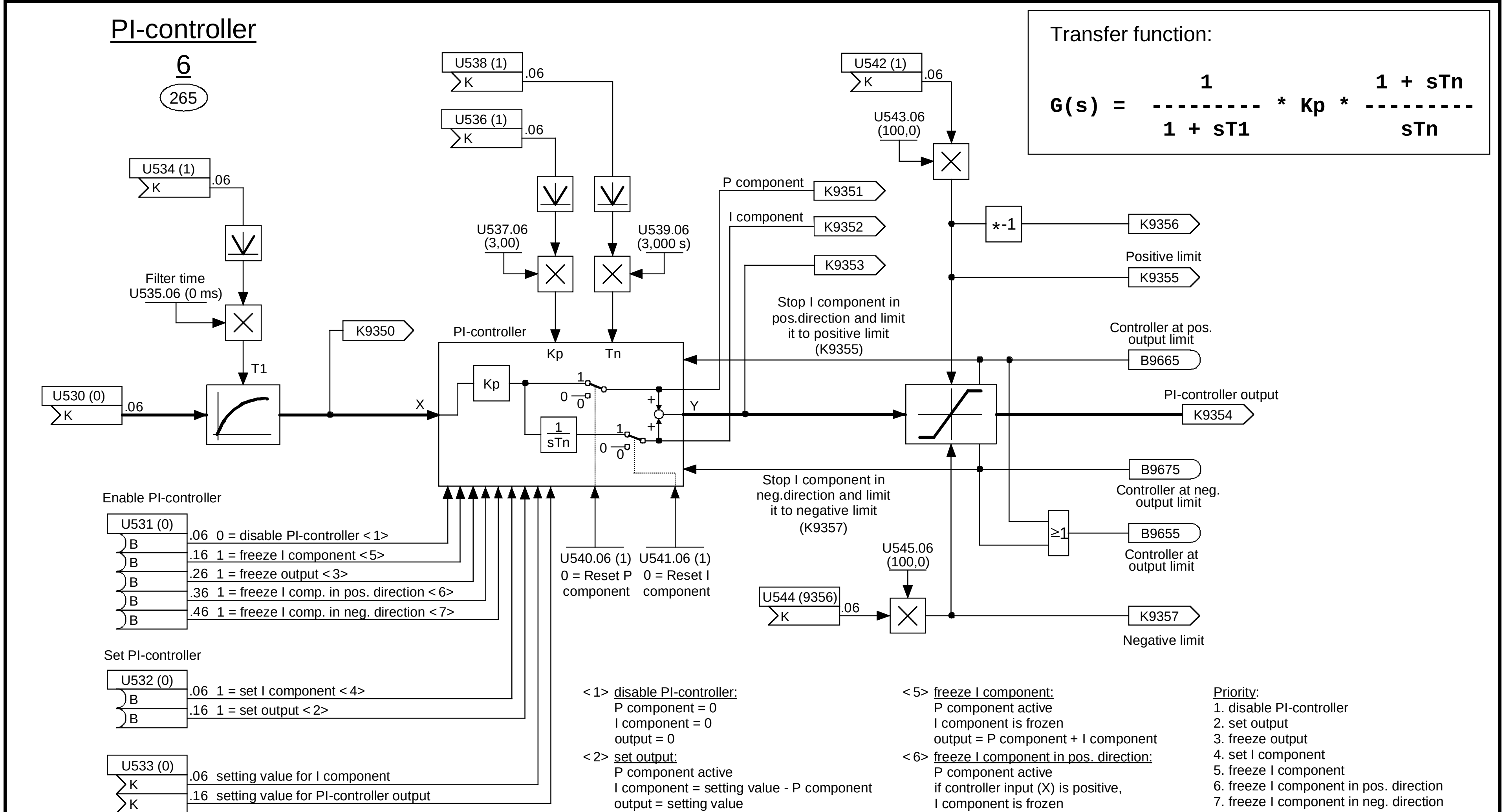
<4> set I component:
P component active
I component = setting value
output = P component + I component

<5> freeze I component:
P component active
I component is frozen
output = P component + I component

<6> freeze I component in pos. direction:
P component active
if controller input (X) is positive,
I component is frozen
output = P component + I component

<7> freeze I component in neg. direction:
P component active
if controller input (X) is negative,
I component is frozen
output = P component + I component

Priority:
1. disable PI-controller
2. set output
3. freeze output
4. set I component
5. freeze I component
6. freeze I component in pos. direction
7. freeze I component in neg. direction



<1> disable PI-controller:
P component = 0
I component = 0
output = 0

<2> set output:
P component active
I component = setting value - P component
output = setting value

<3> freeze output:
P component active
I component = frozen output - P component
output is frozen

<4> set I component:
P component active
I component = setting value
output = P component + I component

<5> freeze I component:
P component active
I component is frozen
output = P component + I component

<6> freeze I component in pos. direction:
P component active
if controller input (X) is positive,
I component is frozen
output = P component + I component

<7> freeze I component in neg. direction:
P component active
if controller input (X) is negative,
I component is frozen
output = P component + I component

Priority:
1. disable PI-controller
2. set output
3. freeze output
4. set I component
5. freeze I component
6. freeze I component in pos. direction
7. freeze I component in neg. direction

1	2	3	4	5	6	7	8

PI-controller

7

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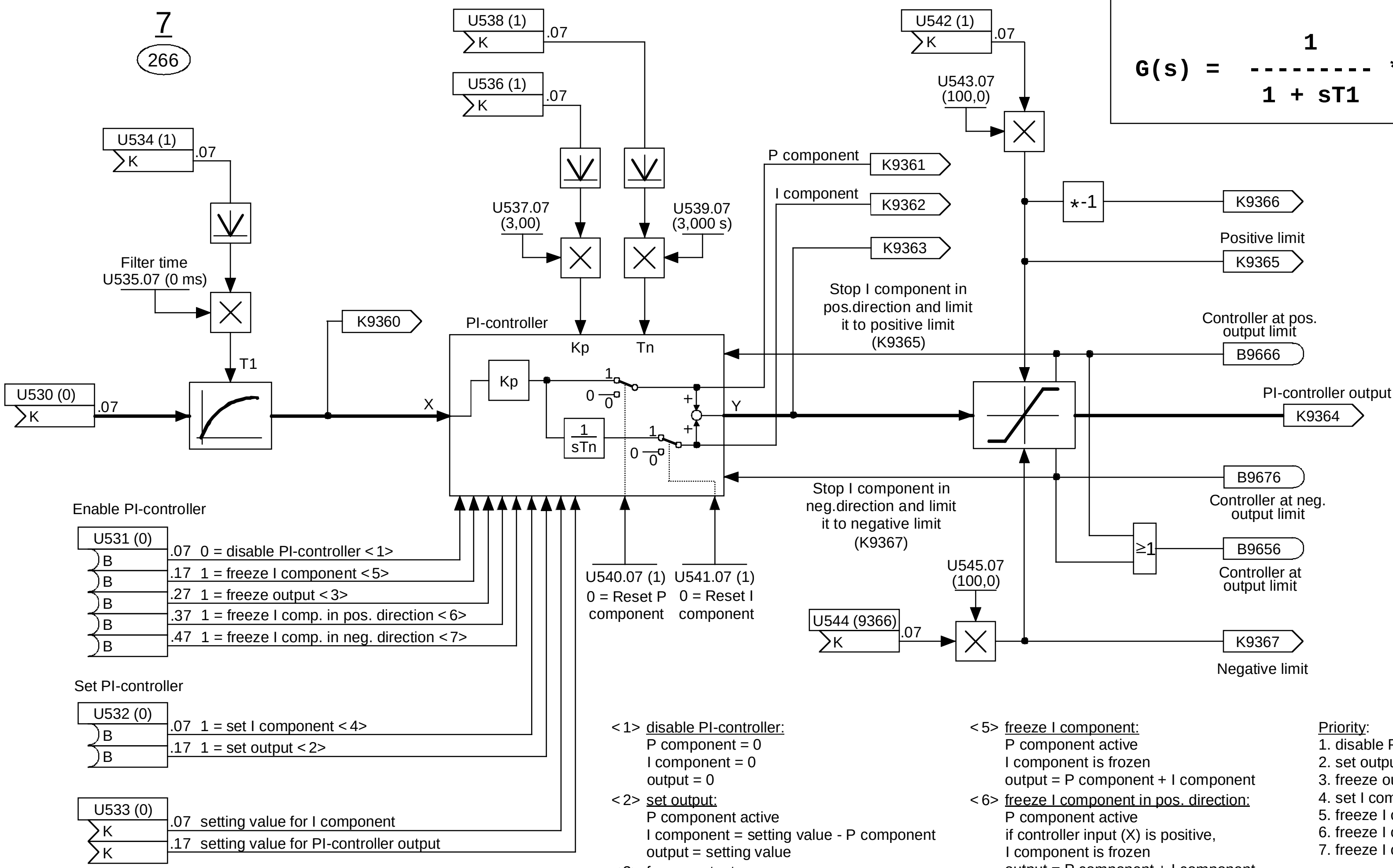
Transfer function:

$$G(s) = \frac{1}{1 + sT1} * Kp * \frac{1 + sTn}{sTn}$$



<1> <u>disable PI-controller:</u>
P component = 0
I component = 0
output = 0

<2> <u>set output:</u>
P component active
I component = setting value - P component
output = setting value

<3> <u>freeze output:</u>
P component active
I component = frozen output - P component
output is frozen

<4> <u>set I component:</u>
P component active
I component = setting value
output = P component + I component

<5> <u>freeze I component:</u>
P component active
I component is frozen
output = P component + I component

<6> <u>freeze I component in pos. direction:</u>
P component active
if controller input (X) is positive,
I component is frozen
output = P component + I component

<7> <u>freeze I component in neg. direction:</u>
P component active
if controller input (X) is negative,
I component is frozen
output = P component + I component

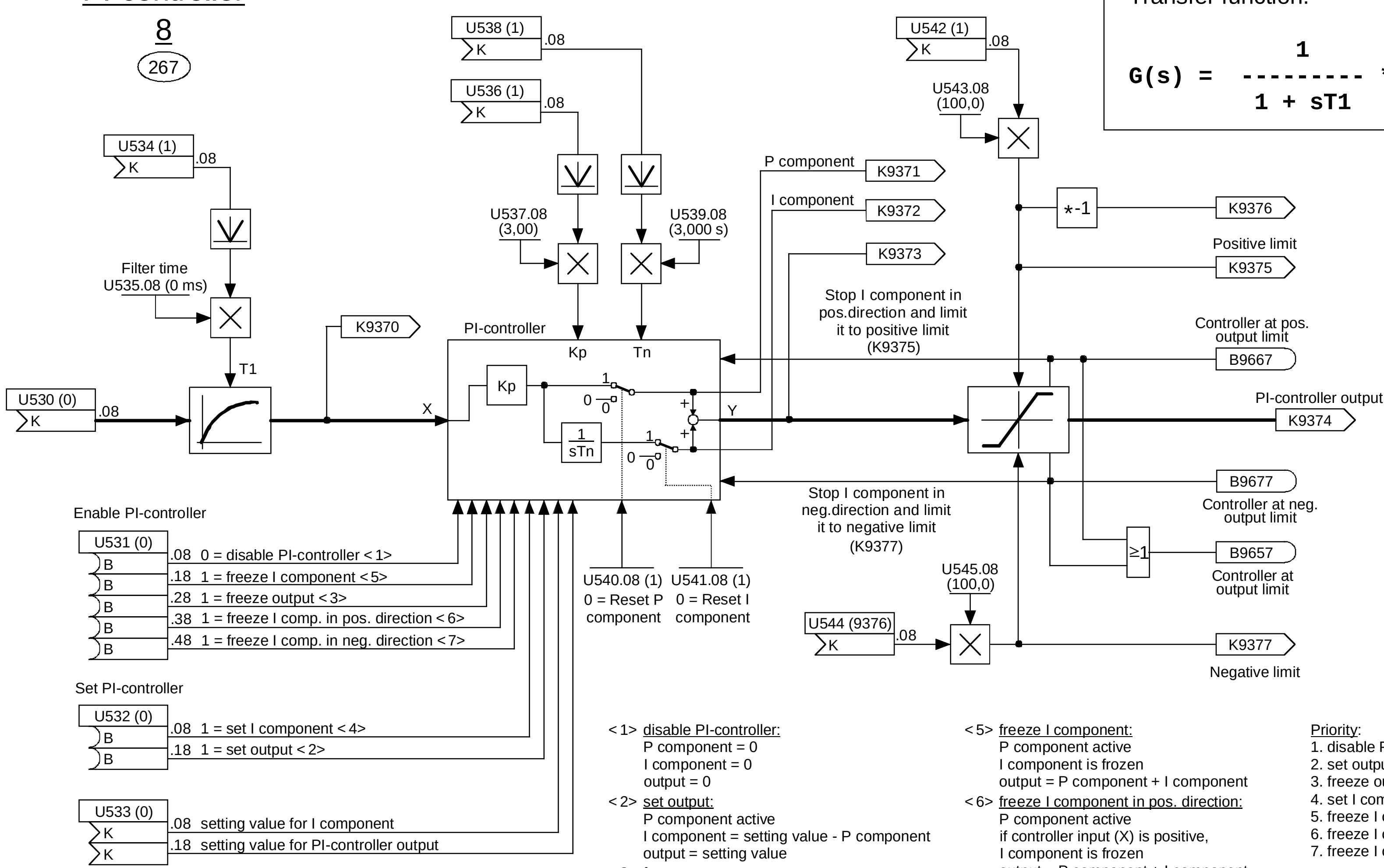
<u>Priority</u>:
1. disable PI-controller
2. set output
3. freeze output
4. set I component
5. freeze I component
6. freeze I component in pos. direction
7. freeze I component in neg. direction

1	2	3	4	5	6	7	8

PI-controller

Transfer function:

$$G(s) = \frac{1}{1 + sT1} * Kp * \frac{1 + sTn}{sTn}$$



<1> disable PI-controller:
P component = 0
I component = 0
output = 0

<2> set output:
P component active
I component = setting value - P component
output = setting value

<3> freeze output:
P component active
I component = frozen output - P component
output is frozen

<4> set I component:
P component active
I component = setting value
output = P component + I component

<5> freeze I component:
P component active
I component is frozen
output = P component + I component

<6> freeze I component in pos. direction:
P component active
if controller input (X) is positive,
I component is frozen
output = P component + I component

<7> freeze I component in neg. direction:
P component active
if controller input (X) is negative,
I component is frozen
output = P component + I component

Priority:
1. disable PI-controller
2. set output
3. freeze output
4. set I component
5. freeze I component
6. freeze I component in pos. direction
7. freeze I component in neg. direction

1	2	3	4	5	6	7	8

PI-controller

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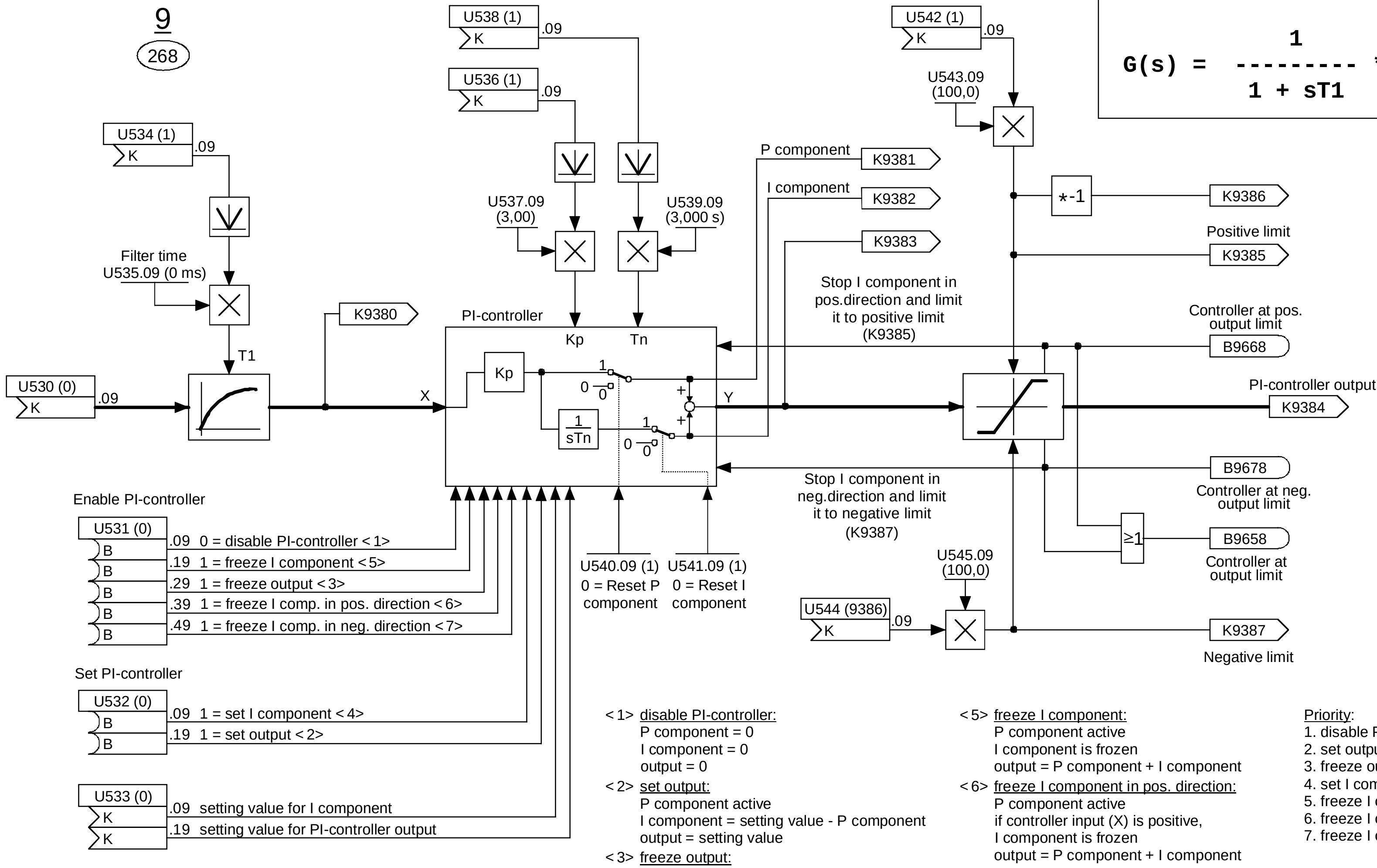
Transfer function:

$$G(s) = \frac{1}{1 + sT1} * Kp * \frac{1 + sTn}{sTn}$$



<1> disable PI-controller:
P component = 0
I component = 0
output = 0

<2> set output:
P component active
I component = setting value - P component
output = setting value

<3> freeze output:
P component active
I component = frozen output - P component
output is frozen

<4> set I component:
P component active
I component = setting value
output = P component + I component

<5> freeze I component:
P component active
I component is frozen
output = P component + I component

<6> freeze I component in pos. direction:
P component active
if controller input (X) is positive,
I component is frozen
output = P component + I component

<7> freeze I component in neg. direction:
P component active
if controller input (X) is negative,
I component is frozen
output = P component + I component

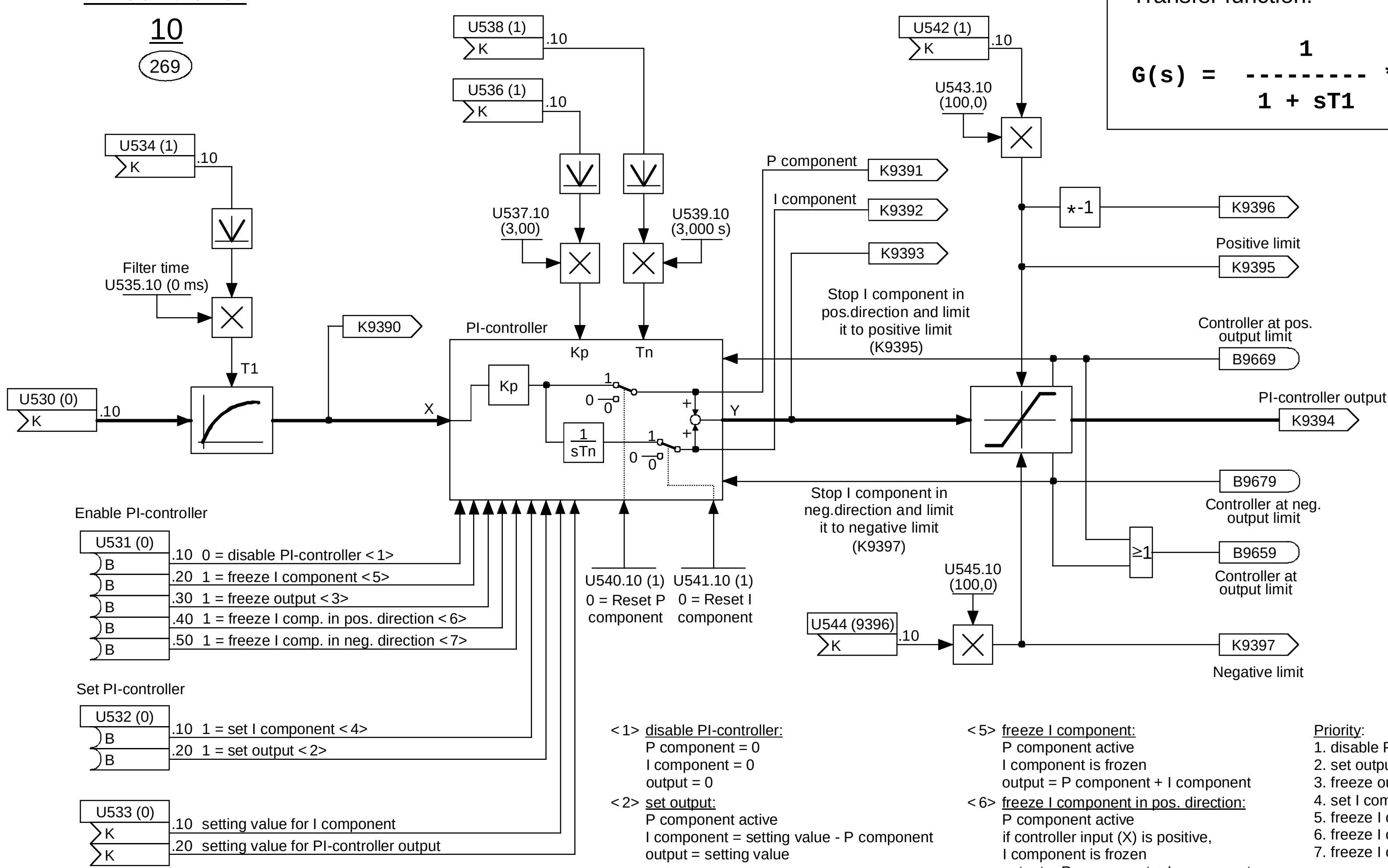
Priority:
1. disable PI-controller
2. set output
3. freeze output
4. set I component
5. freeze I component
6. freeze I component in pos. direction
7. freeze I component in neg. direction

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

PI-controller

10

(269)



Transfer function:

$$G(s) = \frac{1}{1 + sT1} * Kp * \frac{1 + sTn}{sTn}$$

<1> disable PI-controller:
P component = 0
I component = 0
output = 0

<2> set output:
P component active
I component = setting value - P component
output = setting value

<3> freeze output:
P component active
I component = frozen output - P component
output is frozen

<4> set I component:
P component active
I component = setting value
output = P component + I component

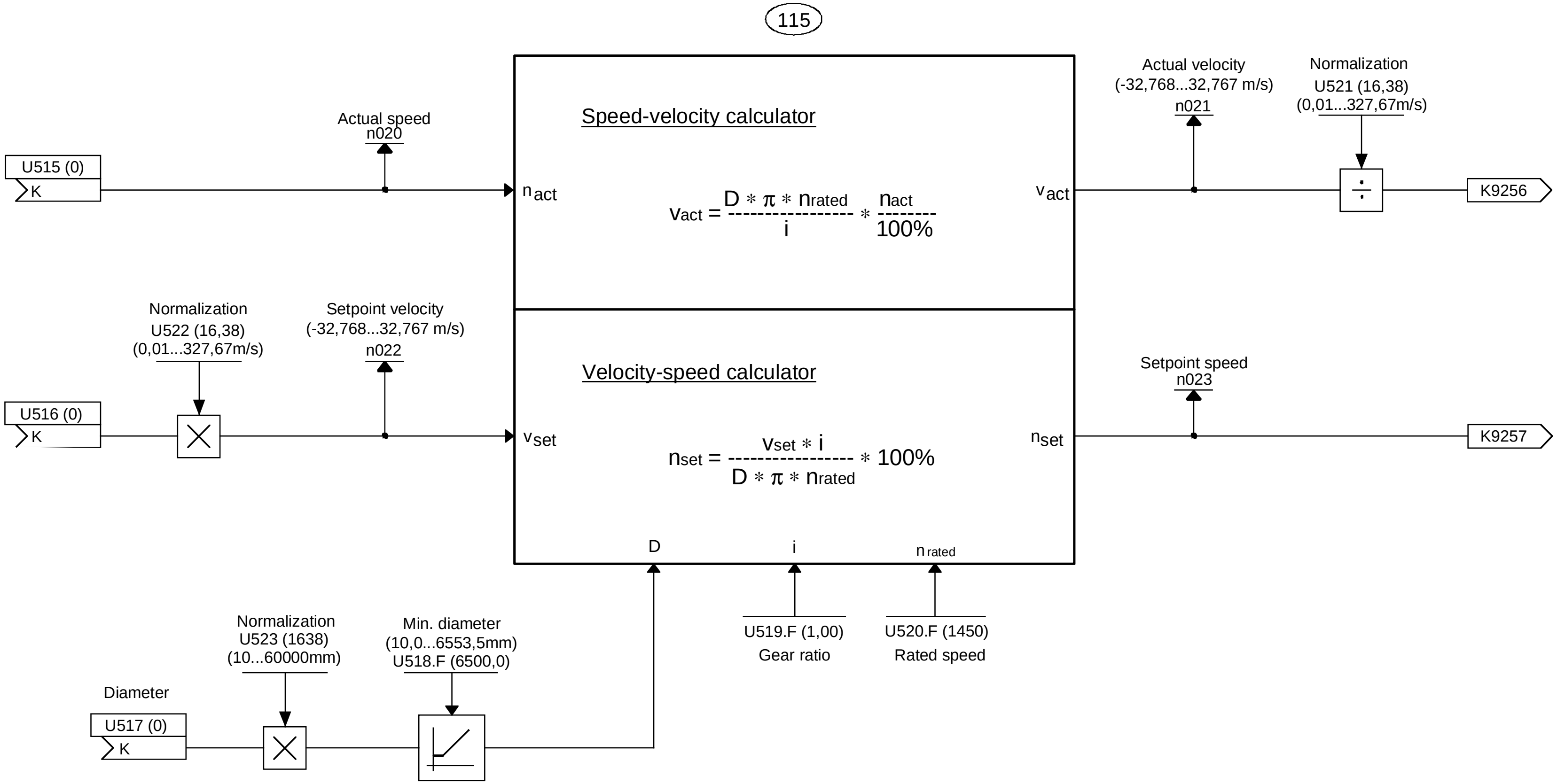
<5> freeze I component:
P component active
I component is frozen
output = P component + I component

<6> freeze I component in pos. direction:
P component active
if controller input (X) is positive,
I component is frozen
output = P component + I component

<7> freeze I component in neg. direction:
P component active
if controller input (X) is negative,
I component is frozen
output = P component + I component

Priority:
1. disable PI-controller
2. set output
3. freeze output
4. set I component
5. freeze I component
6. freeze I component in pos. direction
7. freeze I component in neg. direction

Velocity / speed calculator



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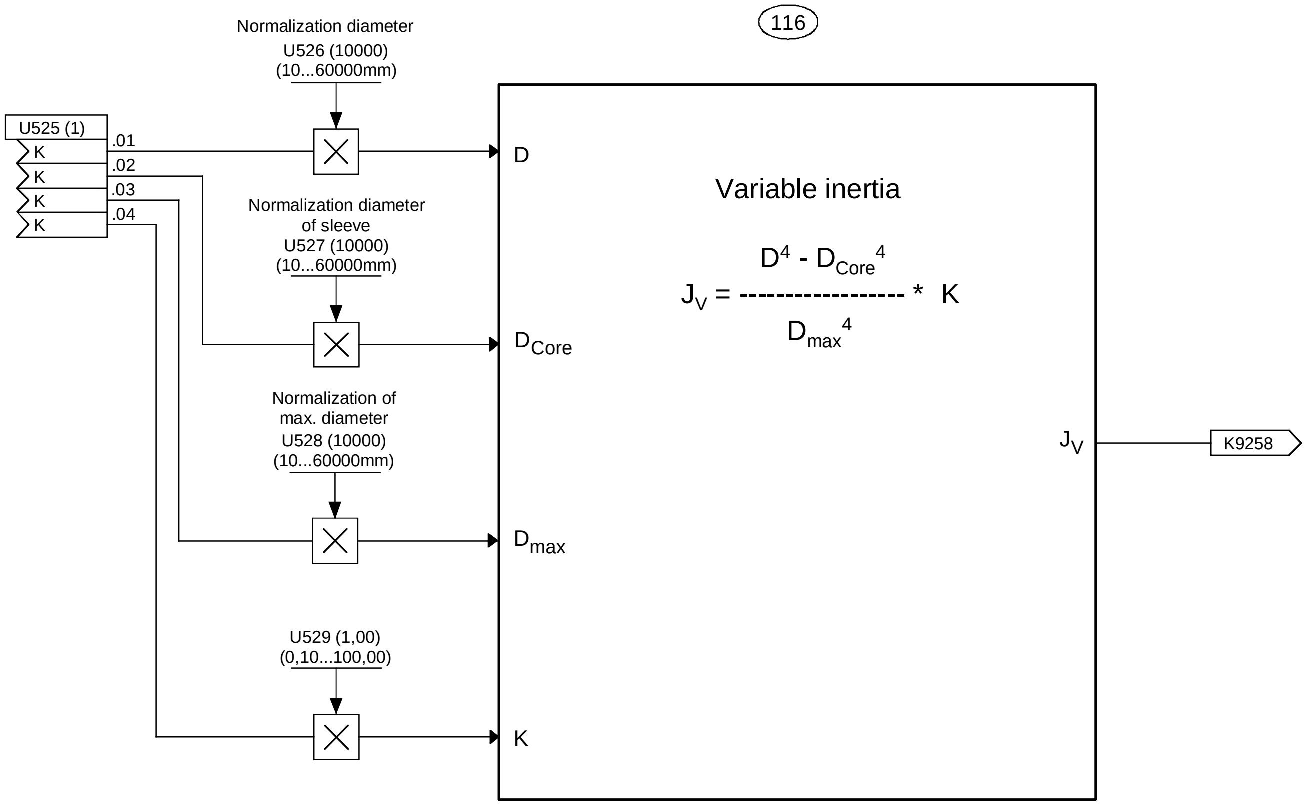
1	2	3	4	5	6	7	8

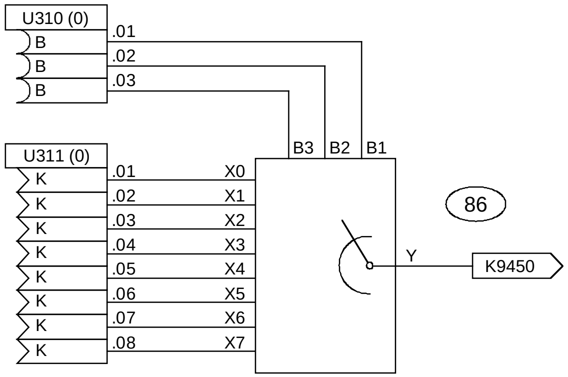
Variable inertia

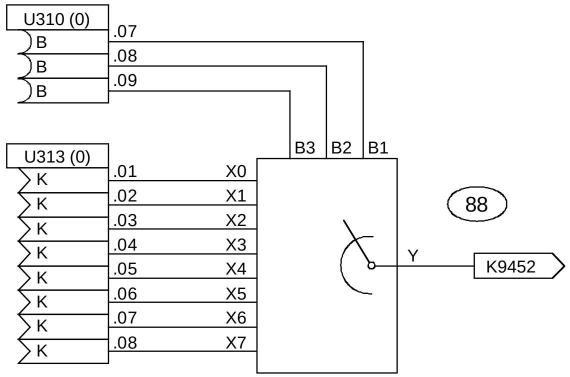


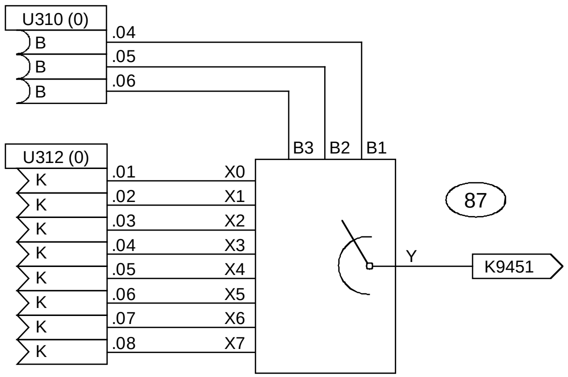
- B191 -

1 2 3 4 5 6 7 8

3 Multiplexers





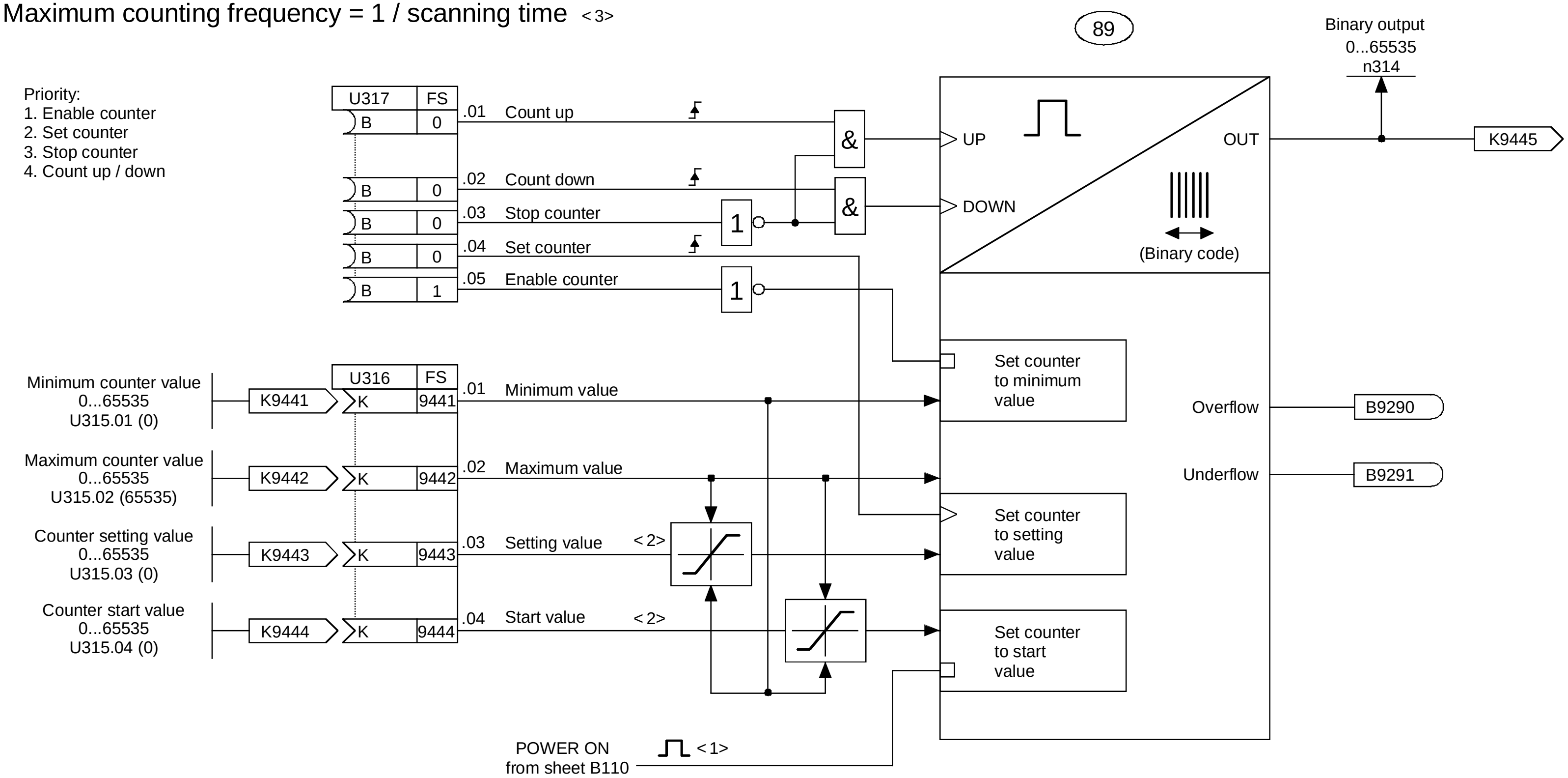


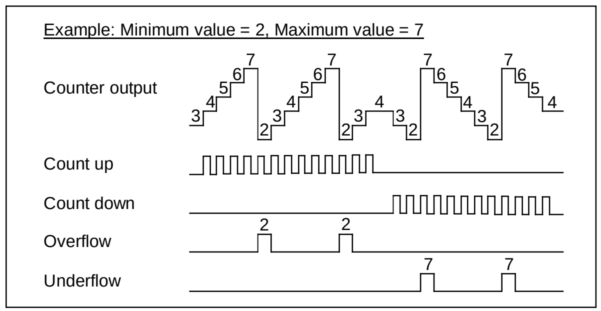
B3	B2	B1	Y
0	0	0	X0
0	0	1	X1
0	1	0	X2
0	1	1	X3
1	0	0	X4
1	0	1	X5
1	1	0	X6
1	1	1	X7

1	2	3	4	5	6	7	8

16-bit software counter

Maximum counting frequency = 1 / scanning time <3>





<1> The counter is set to the start value after POWER ON

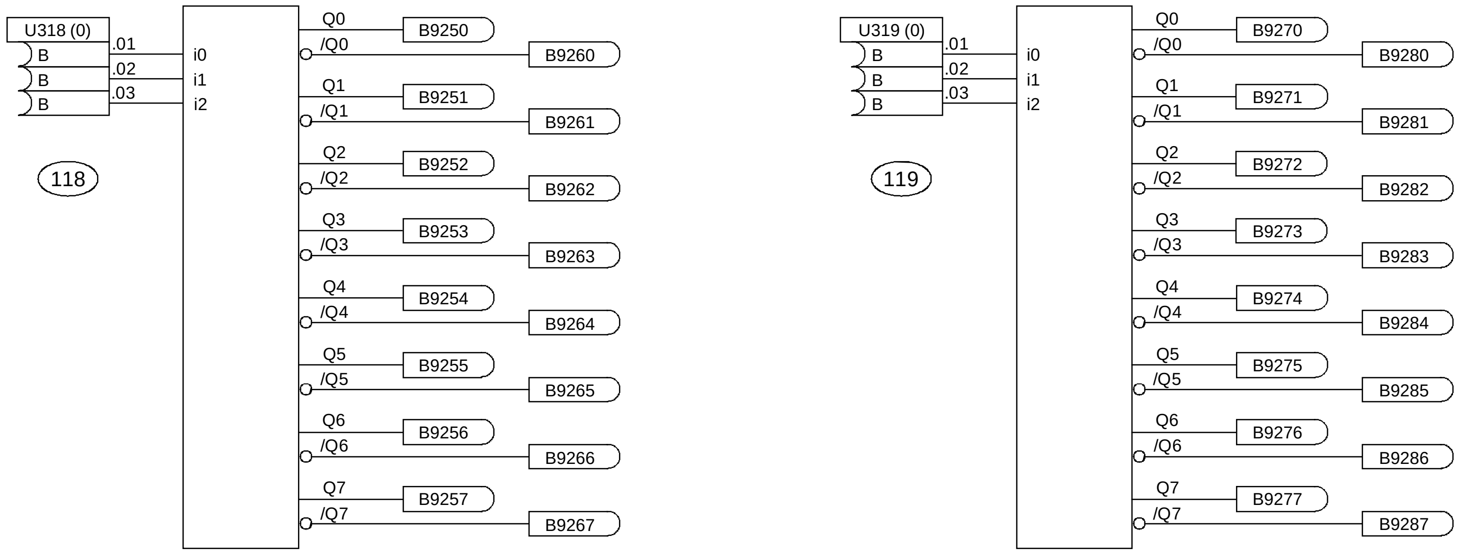
<2> The start and setting values are limited to the range (minimum value..maximum value)

<3> Example: The counter operates in the time slice 1→ max. counting frequency = 300 Hz

Note: The sampling time and sequence of the upstream signal processor must also be taken into account

- B196 -

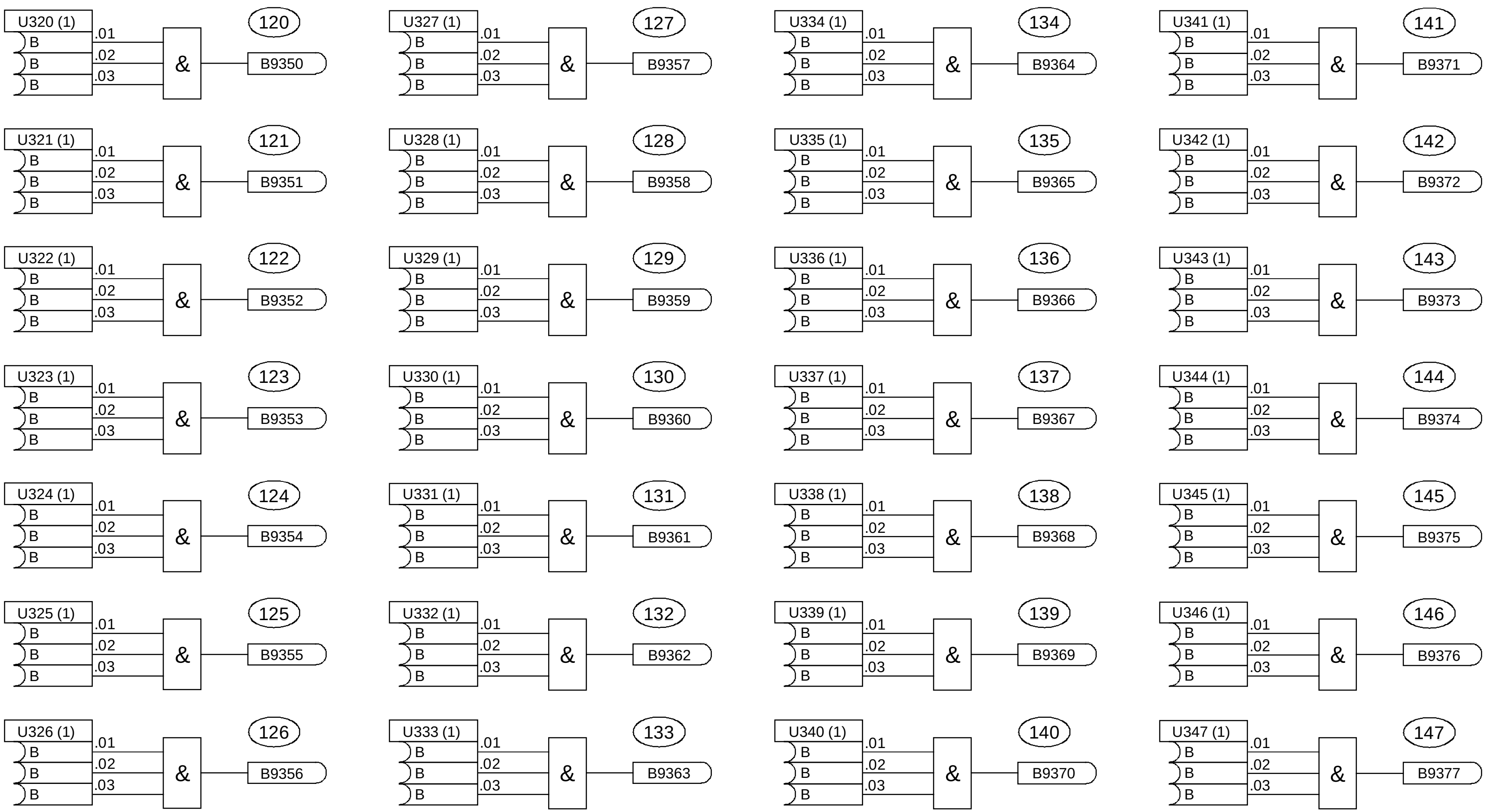
2 decoders / demultiplexers, binary to 1 of 8



i2-i1-i0	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	/Q0	/Q1	/Q2	/Q3	/Q4	/Q5	/Q6	/Q7
0 0 0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
0 0 1	0	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1
0 1 0	0	0	1	0	0	0	0	0	1	1	0	1	1	1	1	1
0 1 1	0	0	0	1	0	0	0	0	1	1	1	0	1	1	1	1
1 0 0	0	0	0	0	1	0	0	0	1	1	1	1	0	1	1	1
1 0 1	0	0	0	0	0	1	0	0	1	1	1	1	1	0	1	1
1 1 0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	1
1 1 1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0

1	2	3	4	5	6	7	8

28 AND elements with 3 inputs each

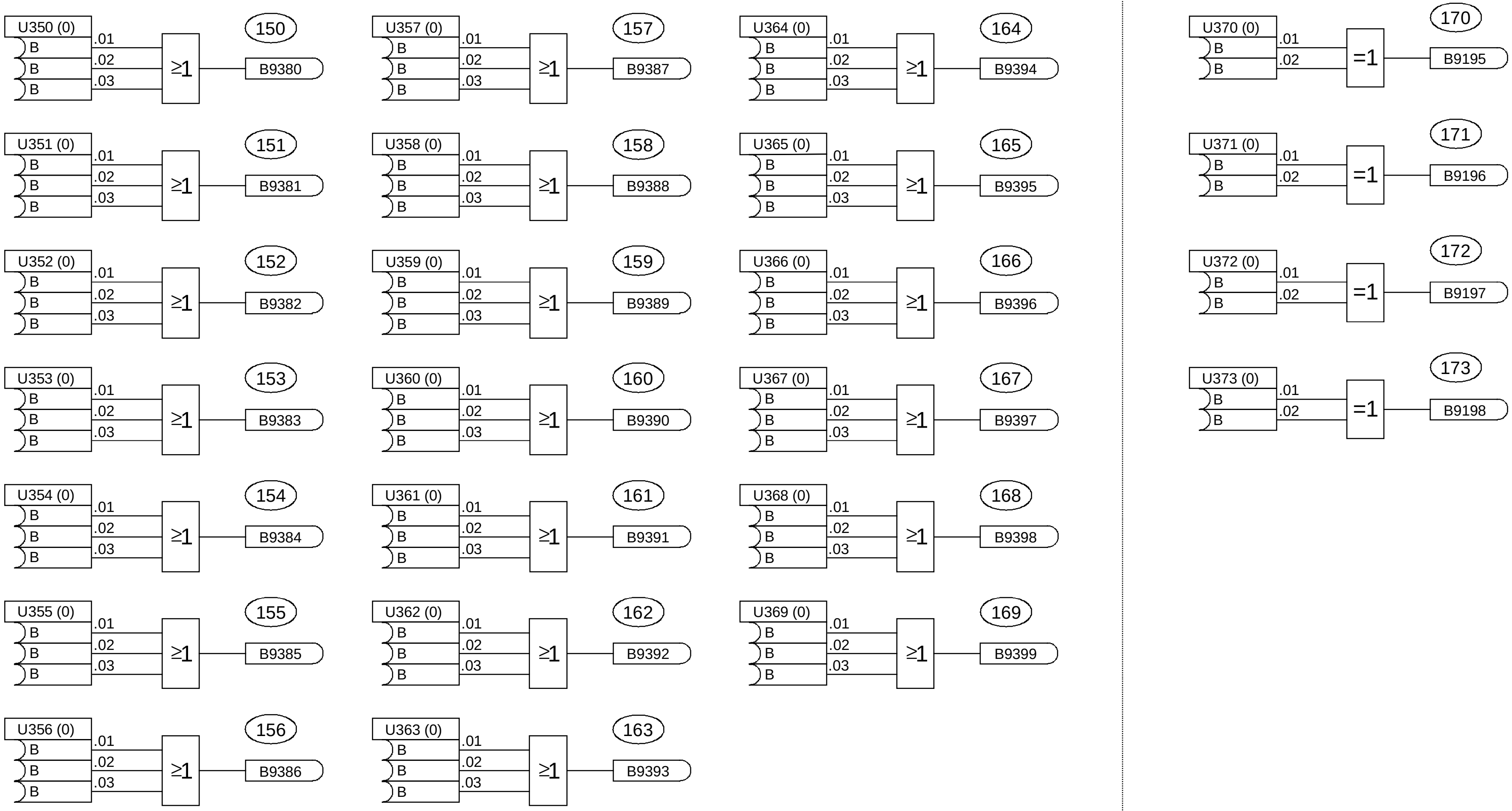


- B205 -

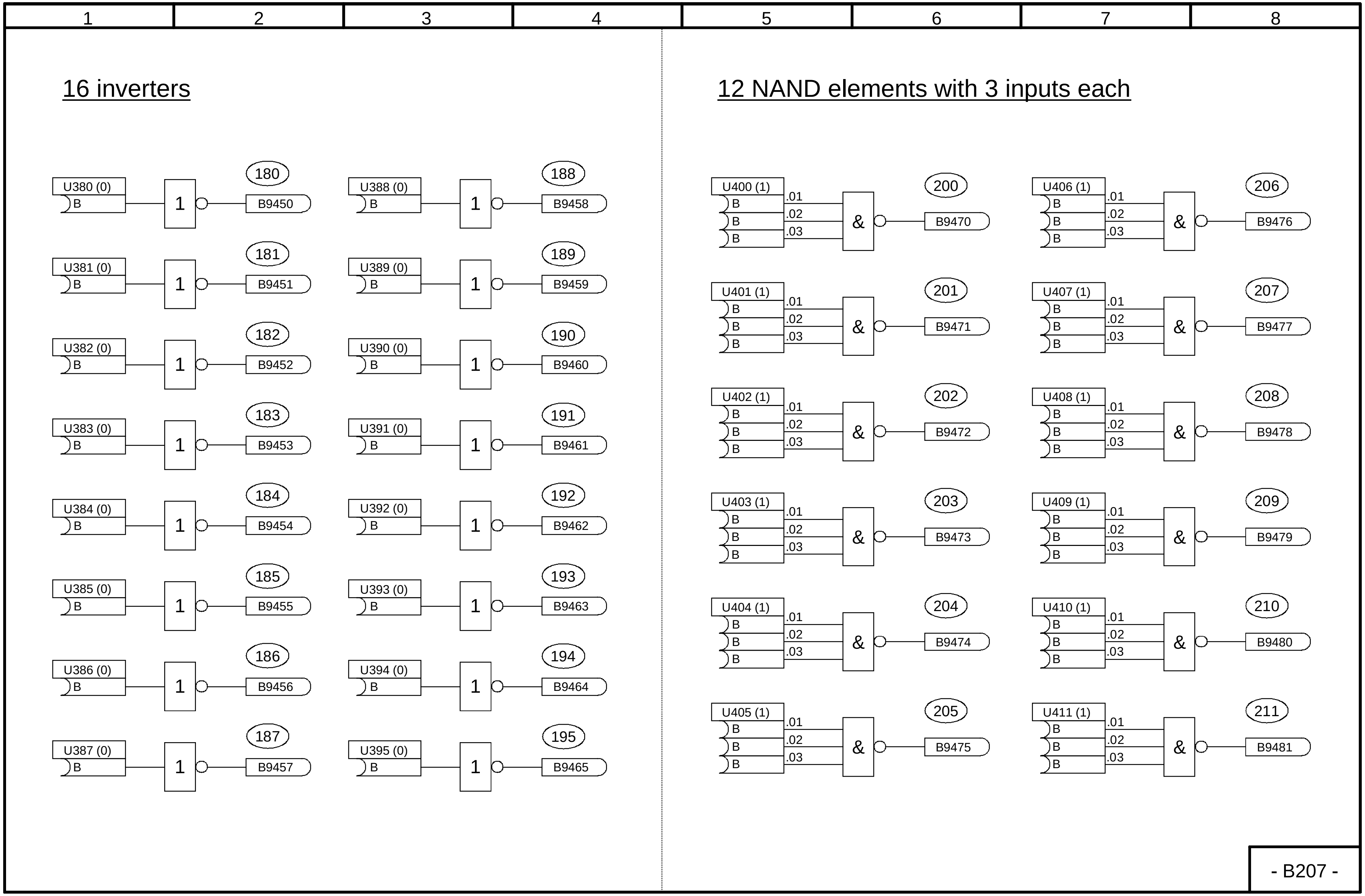
1	2	3	4	5	6	7	8

20 OR elements with 3 inputs each

4 EXCLUSIVE OR elements with 2 inputs each

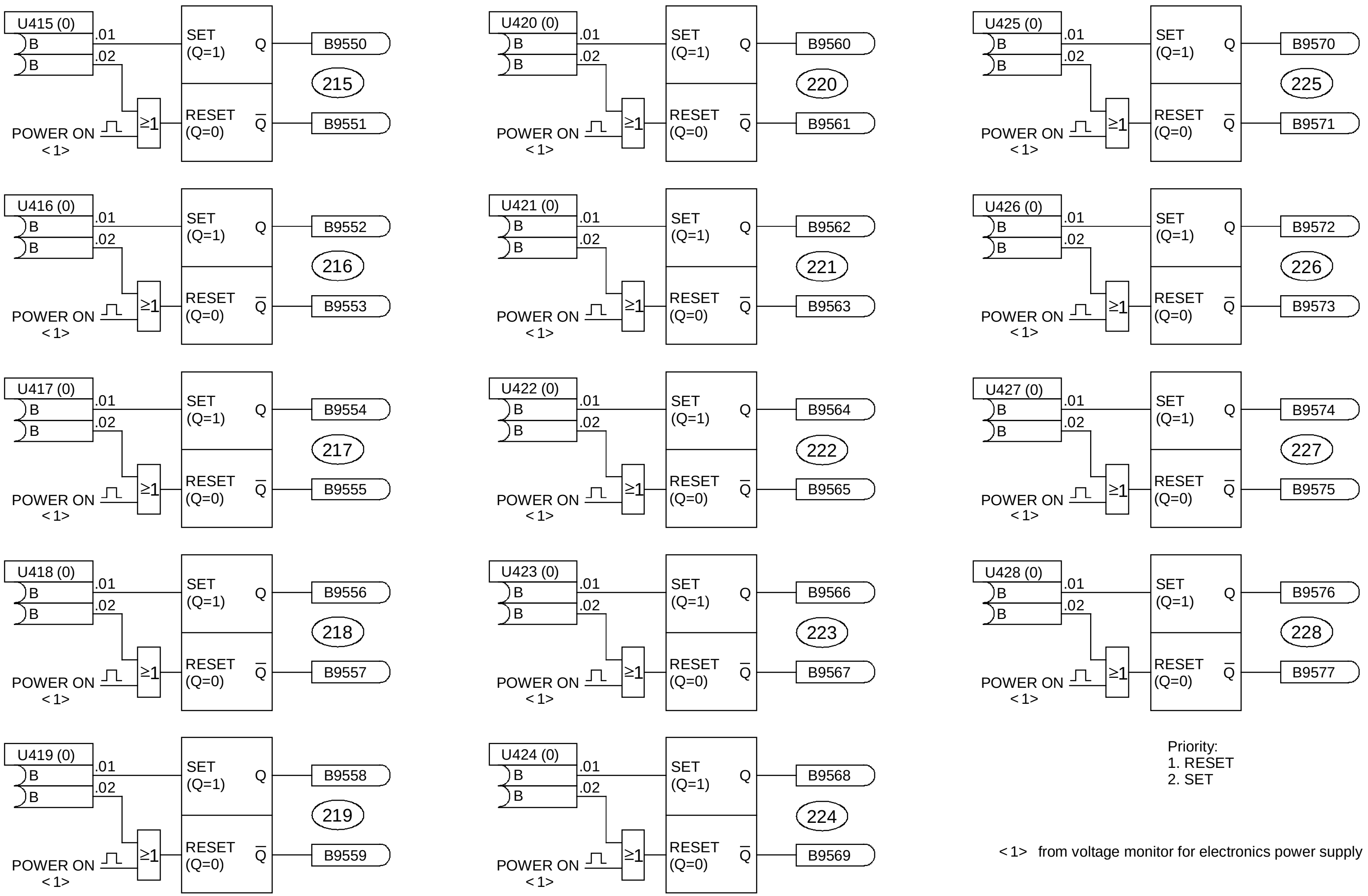


- B206 -


1
2
3
4
5
6
7
8
16 inverters
12 NAND elements with 3 inputs each
U380 (0) B 1 180 B9450
U381 (0) B 1 181 B9451
U382 (0) B 1 182 B9452
U383 (0) B 1 183 B9453
U384 (0) B 1 184 B9454
U385 (0) B 1 185 B9455
U386 (0) B 1 186 B9456
U387 (0) B 1 187 B9457
U388 (0) B 1 188 B9458
U389 (0) B 1 189 B9459
U390 (0) B 1 190 B9460
U391 (0) B 1 191 B9461
U392 (0) B 1 192 B9462
U393 (0) B 1 193 B9463
U394 (0) B 1 194 B9464
U395 (0) B 1 195 B9465
U400 (1) .01 B .02 B .03 B & 200 B9470
U401 (1) .01 B .02 B .03 B & 201 B9471
U402 (1) .01 B .02 B .03 B & 202 B9472
U403 (1) .01 B .02 B .03 B & 203 B9473
U404 (1) .01 B .02 B .03 B & 204 B9474
U405 (1) .01 B .02 B .03 B & 205 B9475
U406 (1) .01 B .02 B .03 B & 206 B9476
U407 (1) .01 B .02 B .03 B & 207 B9477
U408 (1) .01 B .02 B .03 B & 208 B9478
U409 (1) .01 B .02 B .03 B & 209 B9479
U410 (1) .01 B .02 B .03 B & 210 B9480
U411 (1) .01 B .02 B .03 B & 211 B9481
- B207 -

1	2	3	4	5	6	7	8

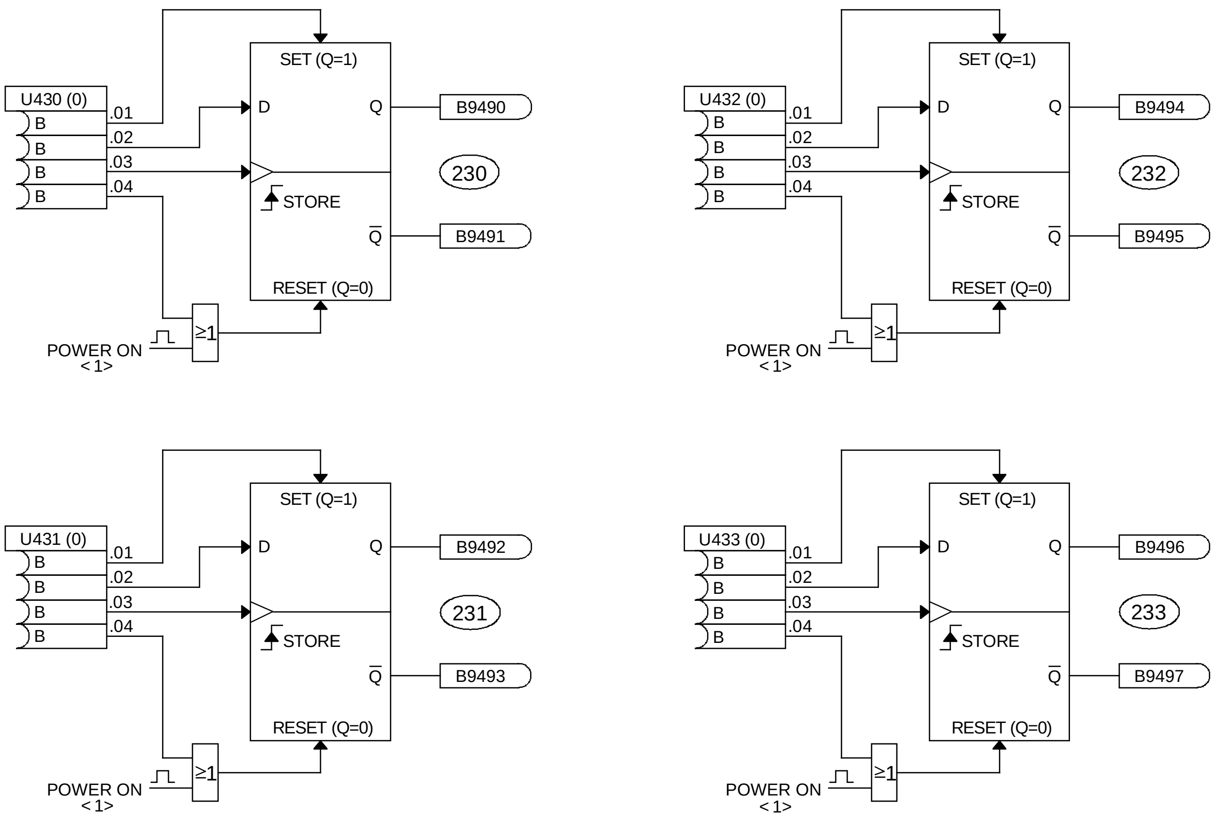
14 RS flipflops



- B210 -

1 2 3 4 5 6 7 8

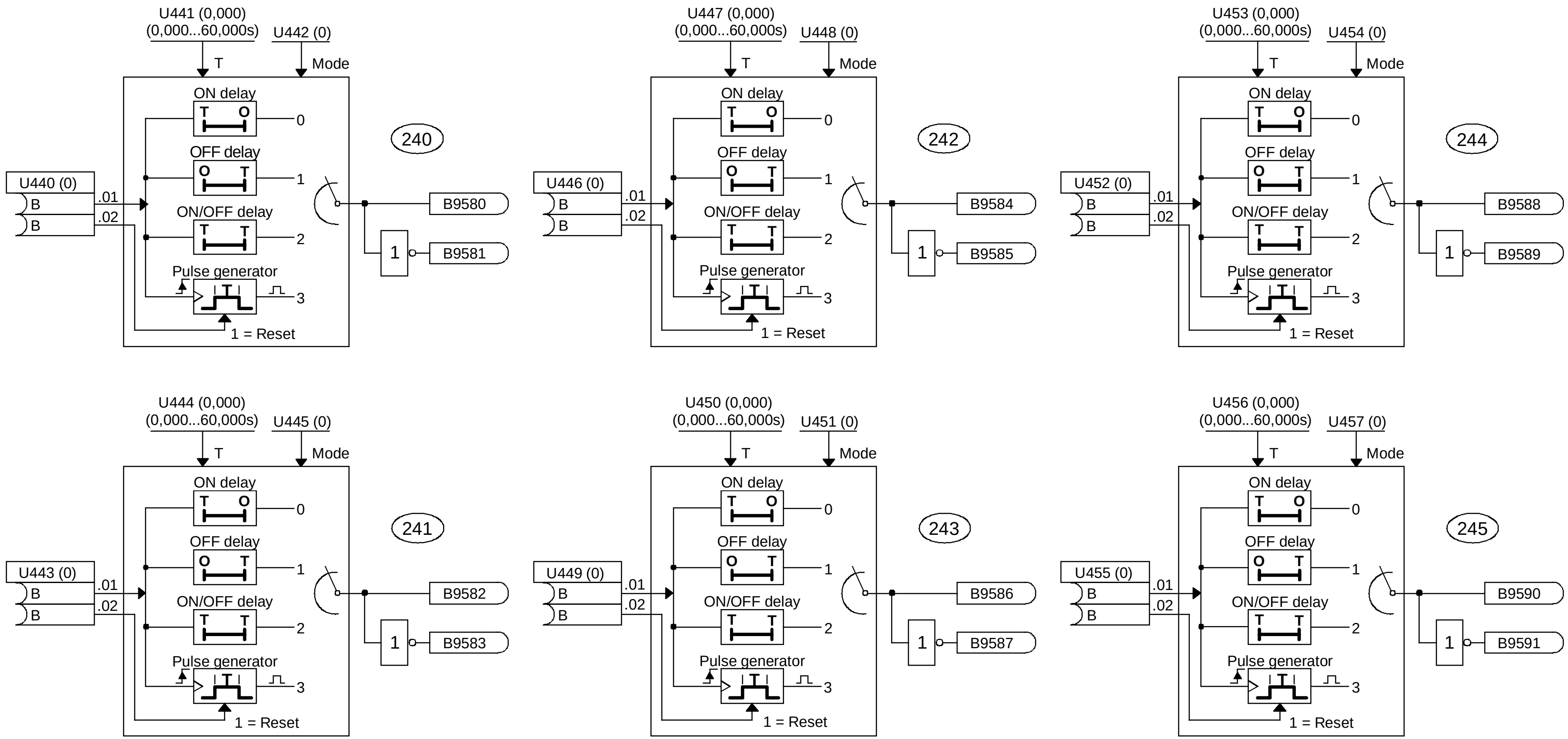
4 D flipflops



Priority:
1. RESET
2. SET
3. STORE

< 1> from voltage monitor for electronics power supply

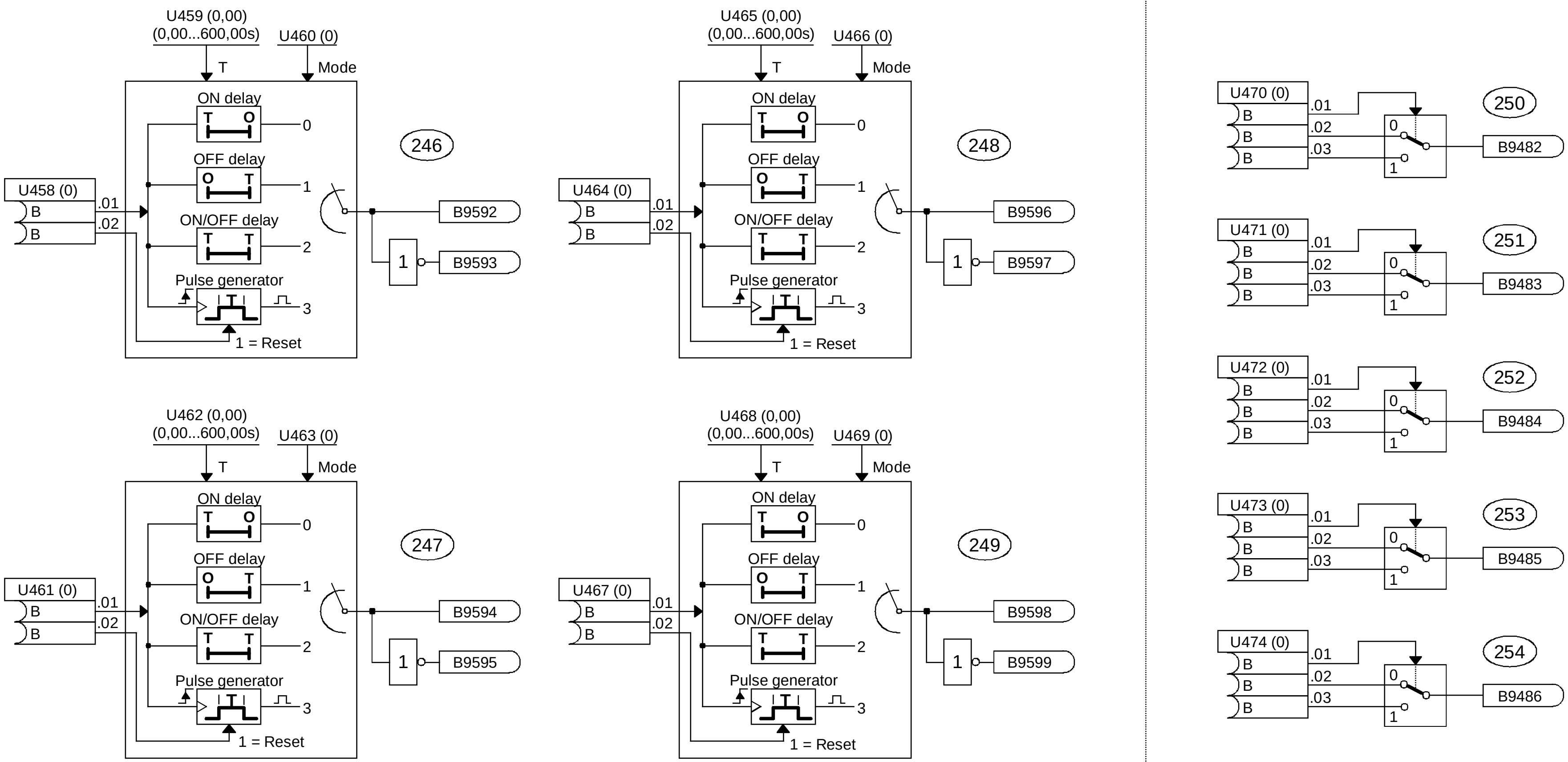
6 timers


U441 (0,000)
(0,000...60,000s)
U442 (0)
T
Mode
ON delay
OFF delay
ON/OFF delay
Pulse generator
1 = Reset
U440 (0)
B
B
.01
.02
240
B9580
B9581
U447 (0,000)
(0,000...60,000s)
U448 (0)
U446 (0)
242
B9584
B9585
U453 (0,000)
(0,000...60,000s)
U454 (0)
U452 (0)
244
B9588
B9589
U444 (0,000)
(0,000...60,000s)
U445 (0)
U443 (0)
241
B9582
B9583
U450 (0,000)
(0,000...60,000s)
U451 (0)
U449 (0)
243
B9586
B9587
U456 (0,000)
(0,000...60,000s)
U457 (0)
U455 (0)
245
B9590
B9591

1 2 3 4 5 6 7 8

4 timers

5 binary signal selector switches



- B216 -

1 2 3 4 5 6 7 8

Function diagram SIMOREG 6RA70 - Contents of optional supplementary boards

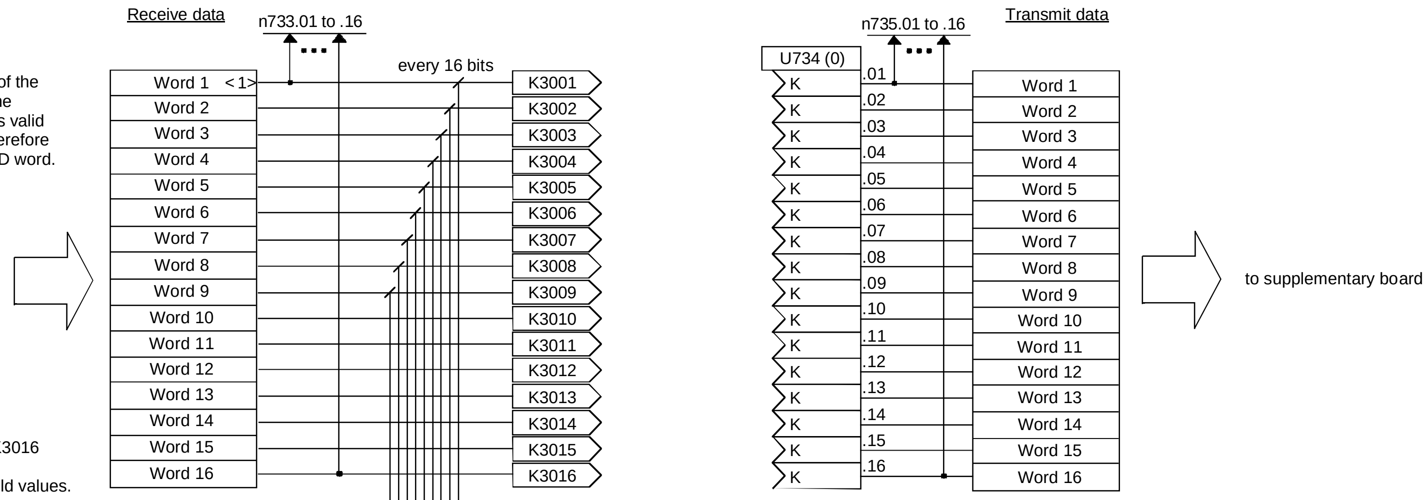
- Z100 -

1	2	3	4	5	6	7	8

Data exchange with a technology board (TB) or the 1st communications board (CB)

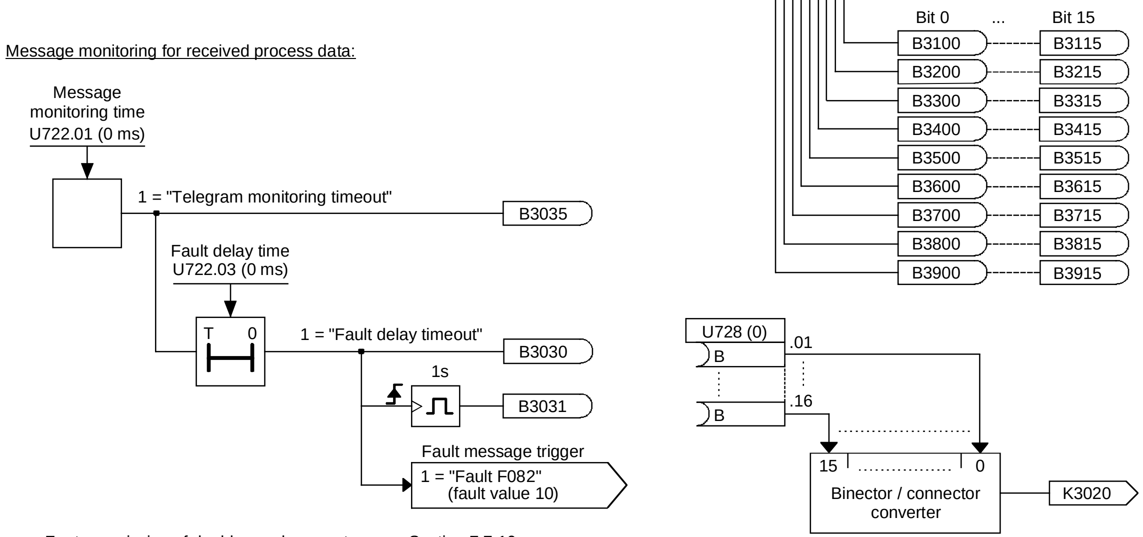
Bit 10 must be set in word 1 of the receive data to ensure that the process data are accepted as valid data. Control word 1 must therefore be transferred as the first PZD word.

from supplementary board



<1>

When bit 10 ("control by PLC") = 0, the other bits of word 1, as well as words 2 to 16 are not written to connectors K3001 to K3016 or to binectors B3100 to 3915. All these connectors and binectors retain their old values.



Parameters for the 1st CB board

U710 Index.01	Initialize link to supplementary boards
U711-U720 Index.01	CB parameters 1 to 10
U721 Index.01-.05	CB parameter 11
n732 Index.01-.32	CB or TB diagnosis
n738 Index.01-.04	Display parameter job (PKW) from CB
n738 Index.09-.12	Display parameter job (PKW) from TB
n739 Index.01-.04	Display parameter response (PKW) to CB
n739 Index.09-.12	Display parameter response (PKW) to TB
P918 Index.01	Bus address
P927	Enable parameterization

Valid for the following configurations:
- CB only
- TB only
- CB after TB (CB in slot G)
- 2 CBs (for CB with the lower slot letter)

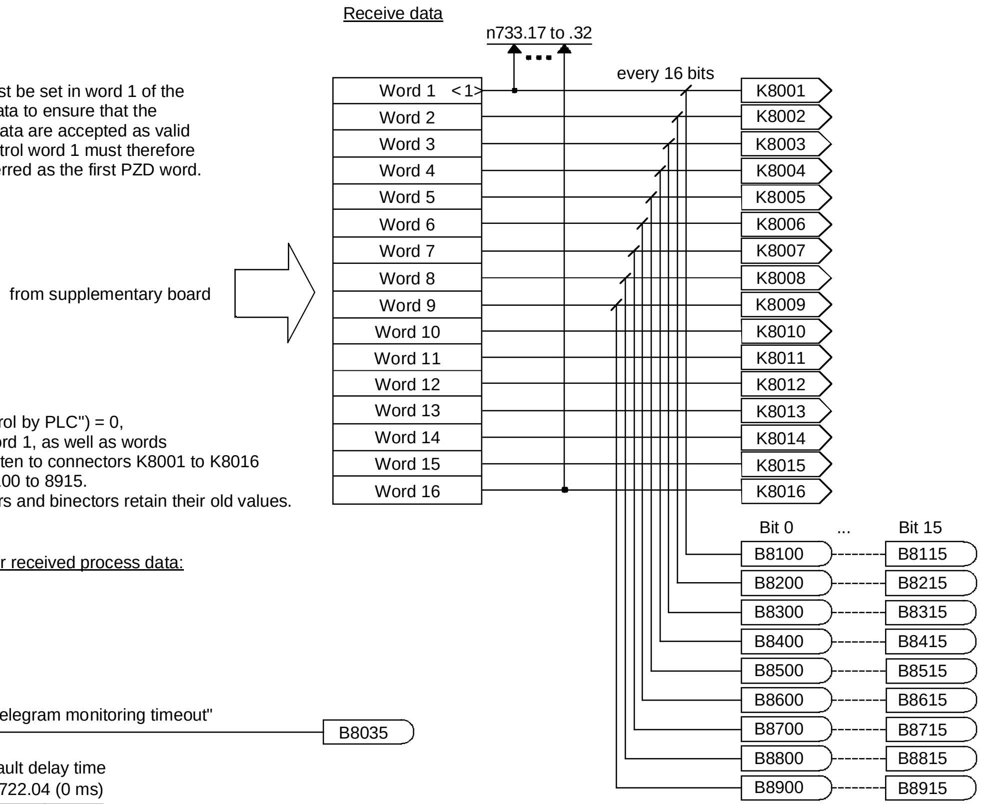
For transmission of double-word connectors see Section 7.7.10

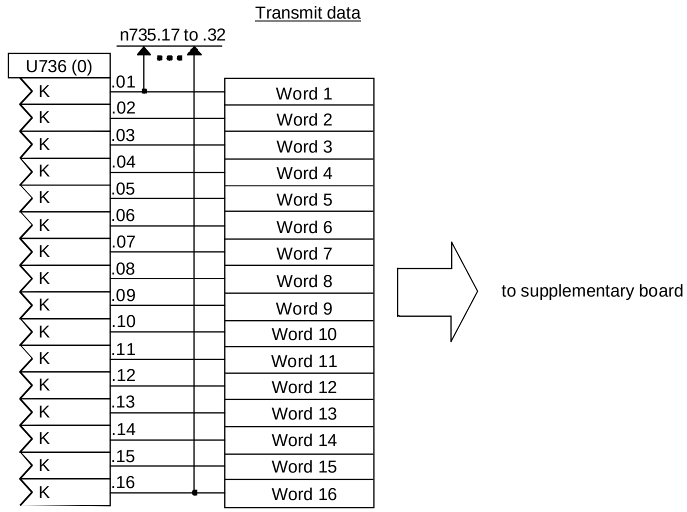
See also connector type converter on sheet Z124

1	2	3	4	5	6	7	8

Data exchange with the 2nd communications board (CB)

Bit 10 must be set in word 1 of the receive data to ensure that the process data are accepted as valid data. Control word 1 must therefore be transferred as the first PZD word.

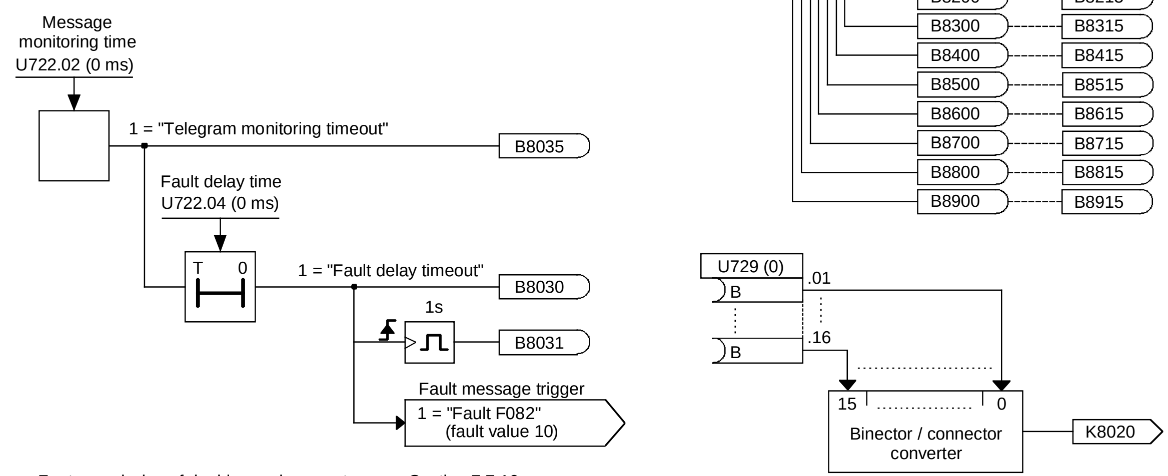




<1>

When bit 10 ("control by PLC") = 0, the other bits of word 1, as well as words 2 to 16 are <u>not</u> written to connectors K8001 to K8016 or to binectors B8100 to 8915. All these connectors and binectors retain their old values.

Message monitoring for received process data:



Parameters for the 2nd CB board

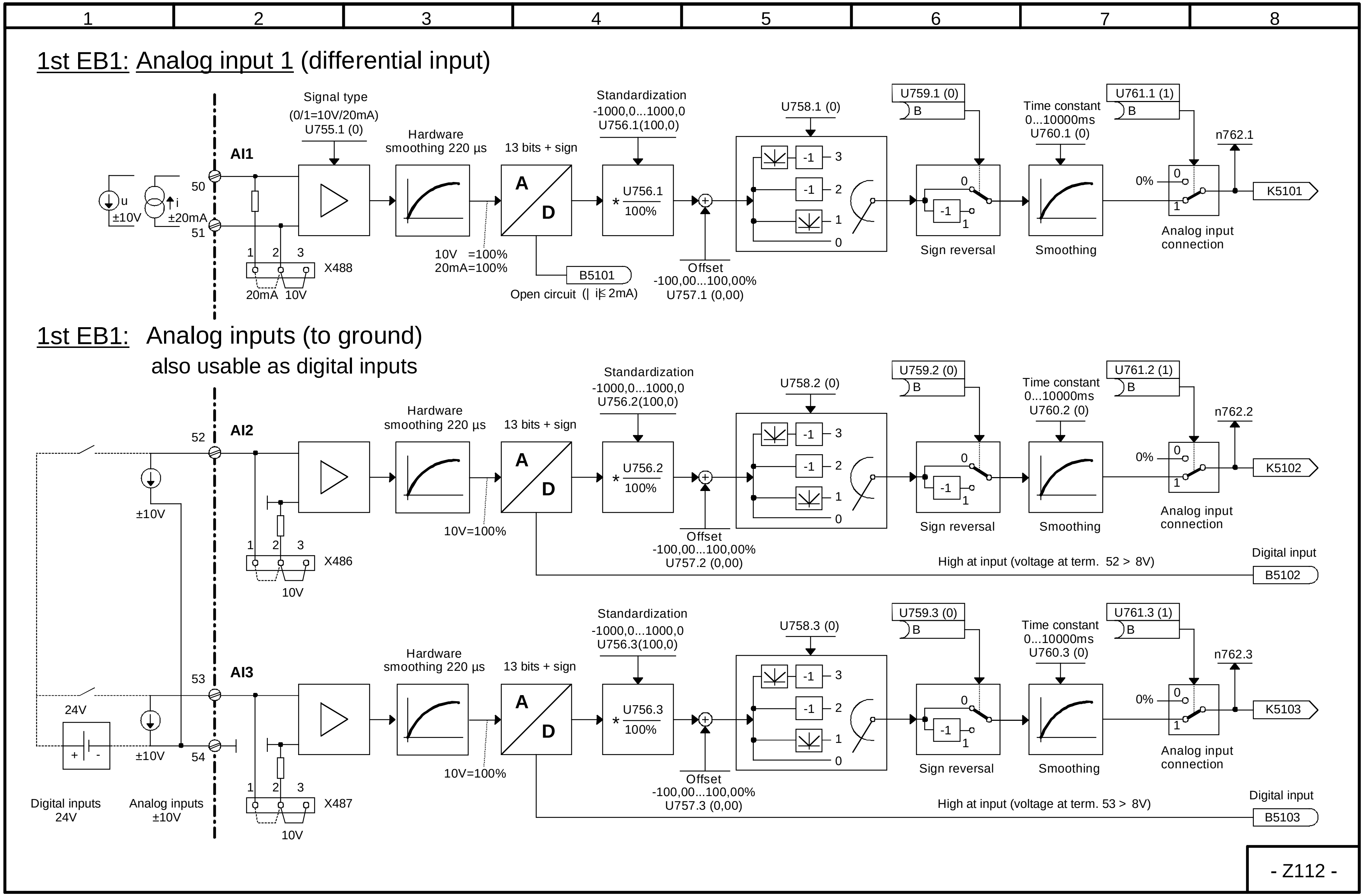
U710 Index.02	Initialize link to supplementary boards
U711-U720 Index.02	CB parameters 1 to 10
U721 Index.06-.10	CB parameter 11
n732 Index.33-.64	CB or TB diagnosis
n738 Index.05-.08	Display parameter job (PKW) from CB
n739 Index.05-.08	Display parameter response (PKW) to CB
P918 Index.02	Bus address
P927	Enable parameterization

Valid for the following configurations:

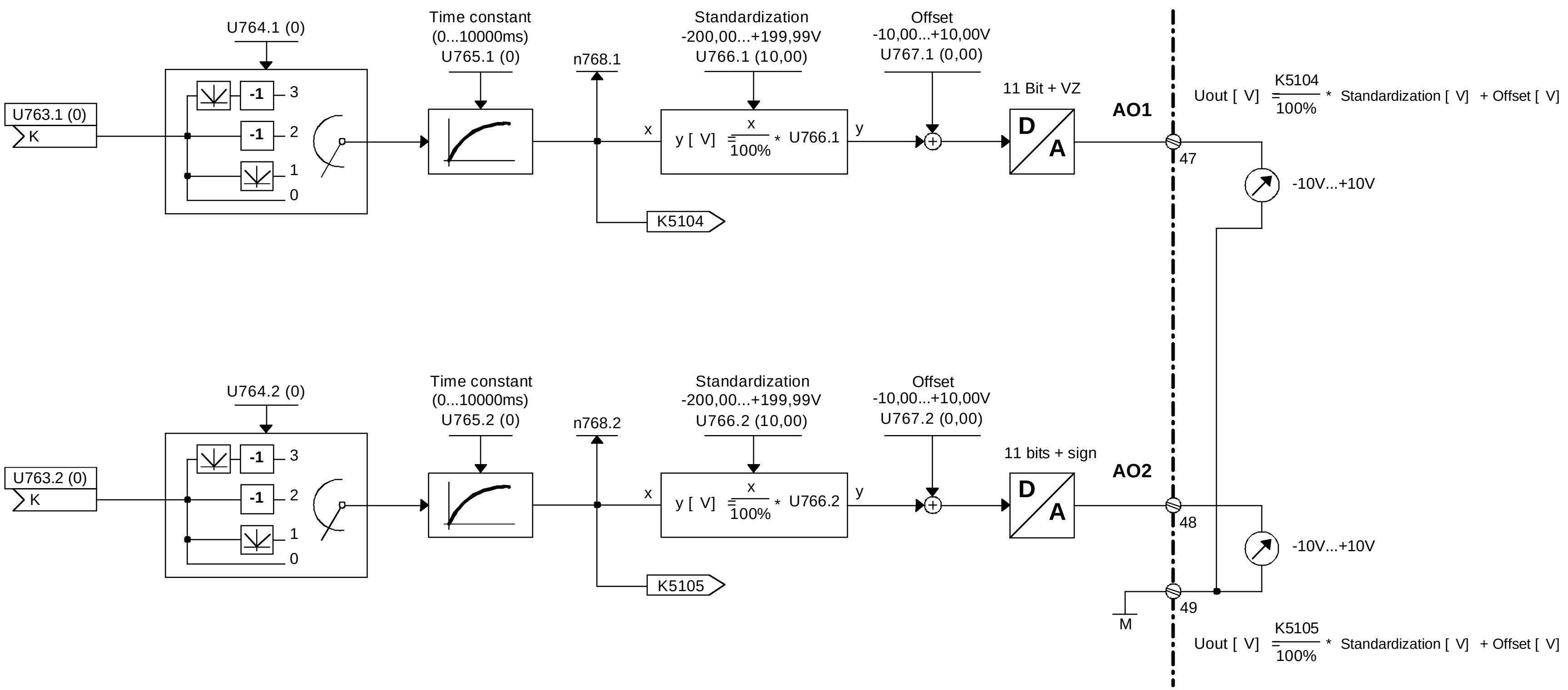
- 2 CBs (for CB with the higher slot letter)

For transmission of double-word connectors see Section 7.7.10

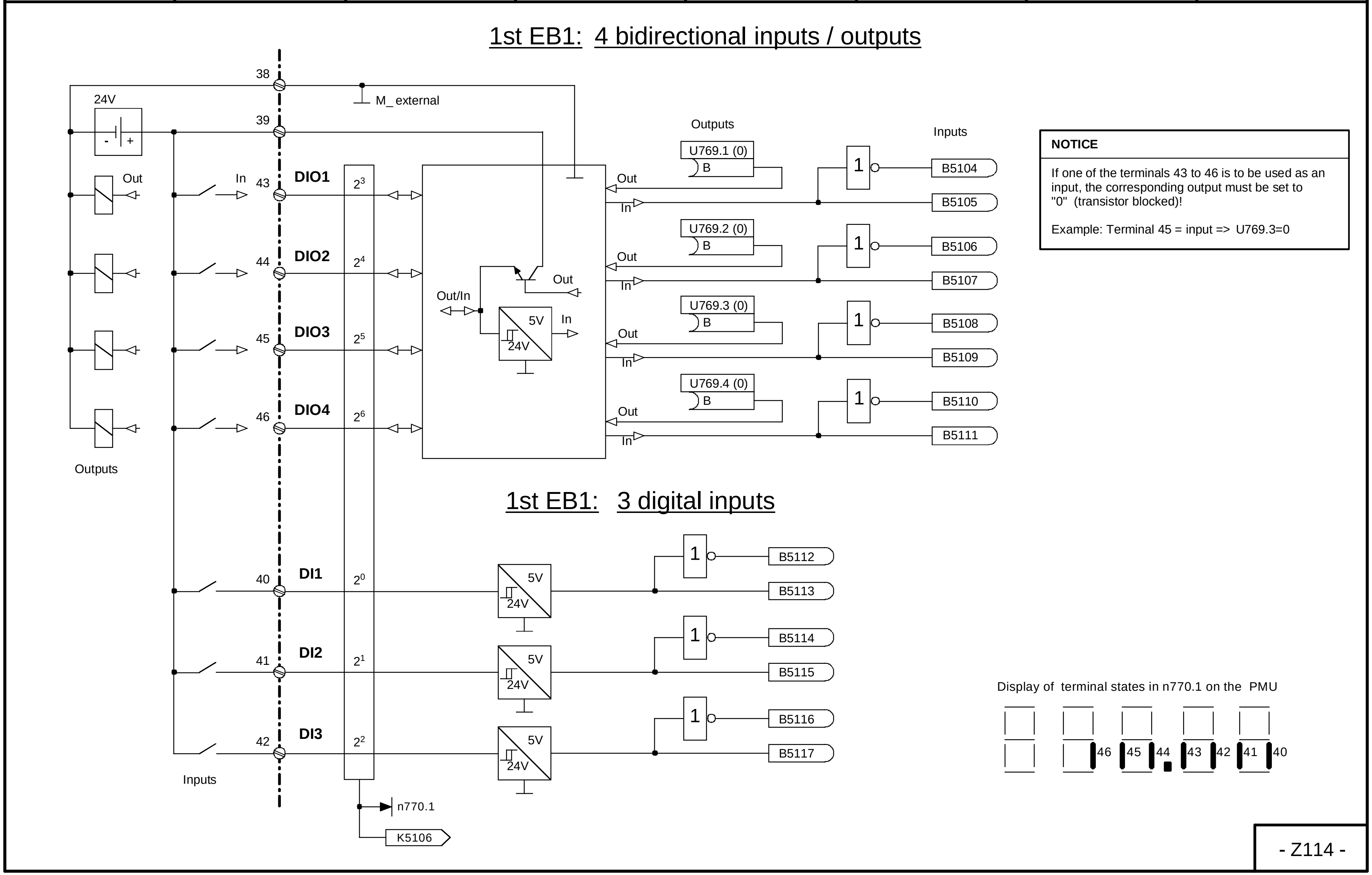
See also connector type converter on sheet Z124


1 2 3 4 5 6 7 8
1st EB1: Analog input 1 (differential input)
Signal type
(0/1=10V/20mA)
U755.1 (0)
Hardware
smoothing 220 µs
13 bits + sign
Standardization
-1000,0...1000,0
U756.1(100,0)
U758.1 (0)
U759.1 (0)
B
Time constant
0...10000ms
U760.1 (0)
U761.1 (1)
B
n762.1
AI1
50
51
u
±10V
i
±20mA
A
D
U756.1
*
100%
-1
3
2
1
0
0%
K5101
1 2 3
X488
20mA 10V
10V =100%
20mA=100%
B5101
Open circuit (| i|≤ 2mA)
Offset
-100,00...100,00%
U757.1 (0,00)
Sign reversal
Smoothing
Analog input
connection
1st EB1: Analog inputs (to ground)
also usable as digital inputs
Standardization
-1000,0...1000,0
U756.2(100,0)
U758.2 (0)
U759.2 (0)
B
Time constant
0...10000ms
U760.2 (0)
U761.2 (1)
B
n762.2
Hardware
smoothing 220 µs
13 bits + sign
52
AI2
U756.2
100%
K5102
±10V
10V=100%
X486
10V
Offset
-100,00...100,00%
U757.2 (0,00)
Sign reversal
Smoothing
Analog input
connection
Digital input
High at input (voltage at term. 52 > 8V)
B5102
Standardization
-1000,0...1000,0
U756.3(100,0)
U758.3 (0)
U759.3 (0)
B
Time constant
0...10000ms
U760.3 (0)
U761.3 (1)
B
n762.3
Hardware
smoothing 220 µs
13 bits + sign
53
AI3
24V
U756.3
100%
K5103
±10V
54
10V=100%
X487
10V
Offset
-100,00...100,00%
U757.3 (0,00)
Sign reversal
Smoothing
Analog input
connection
Digital input
High at input (voltage at term. 53 > 8V)
B5103
Digital inputs
24V
Analog inputs
±10V
- Z112 -

1st EB1: Analog outputs



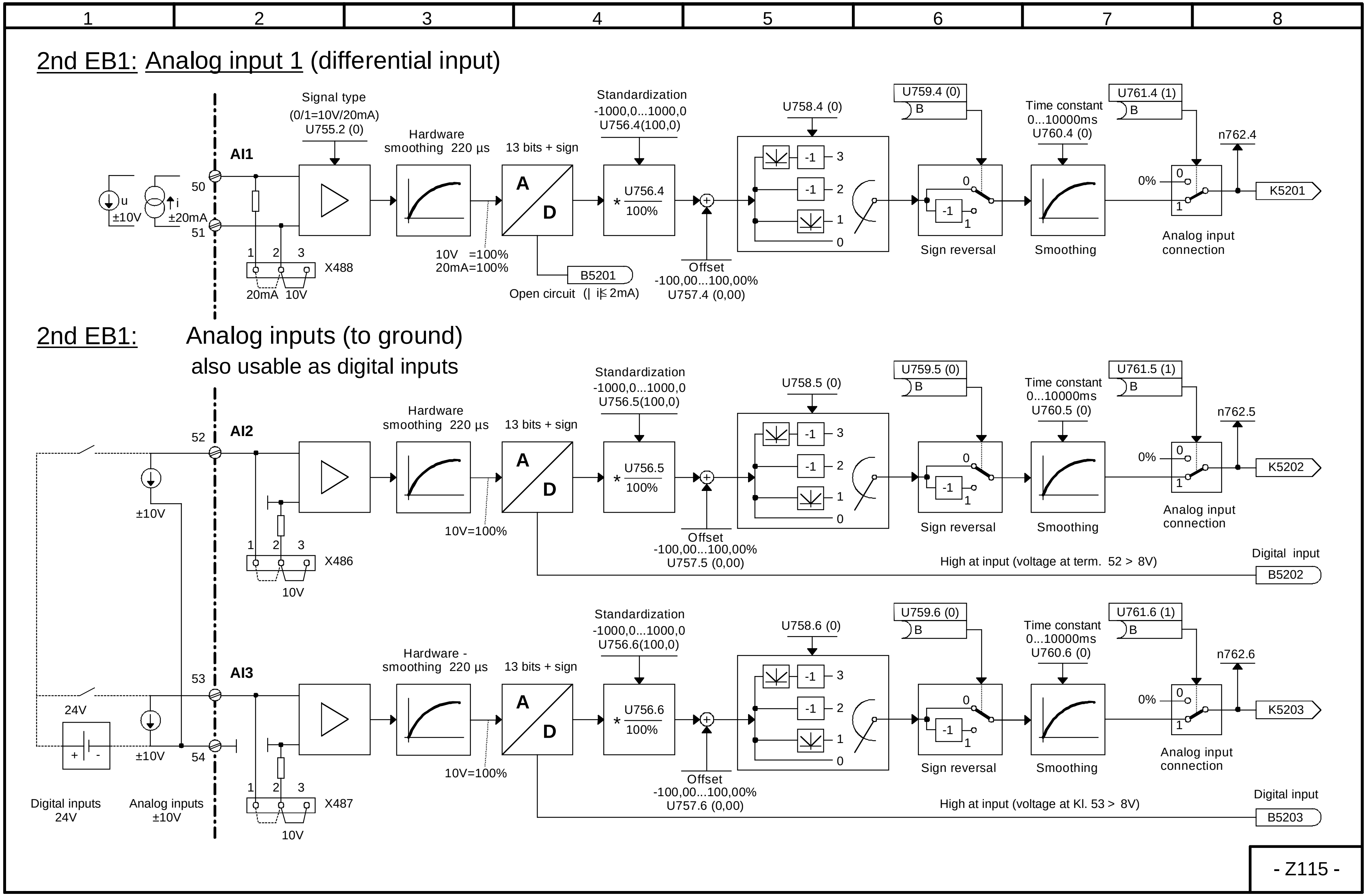
1st EB1: 4 bidirectional inputs / outputs



NOTICE

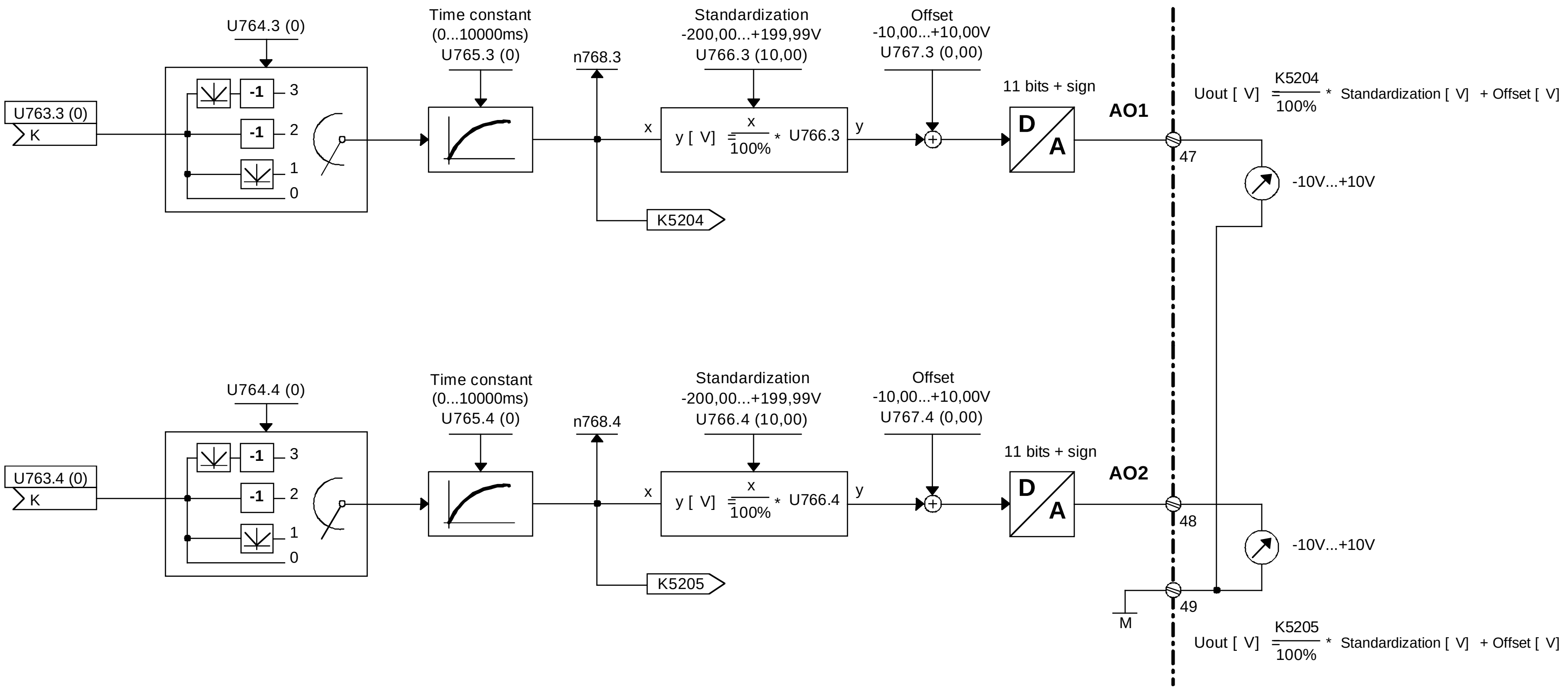
If one of the terminals 43 to 46 is to be used as an input, the corresponding output must be set to "0" (transistor blocked)!

Example: Terminal 45 = input => U769.3=0

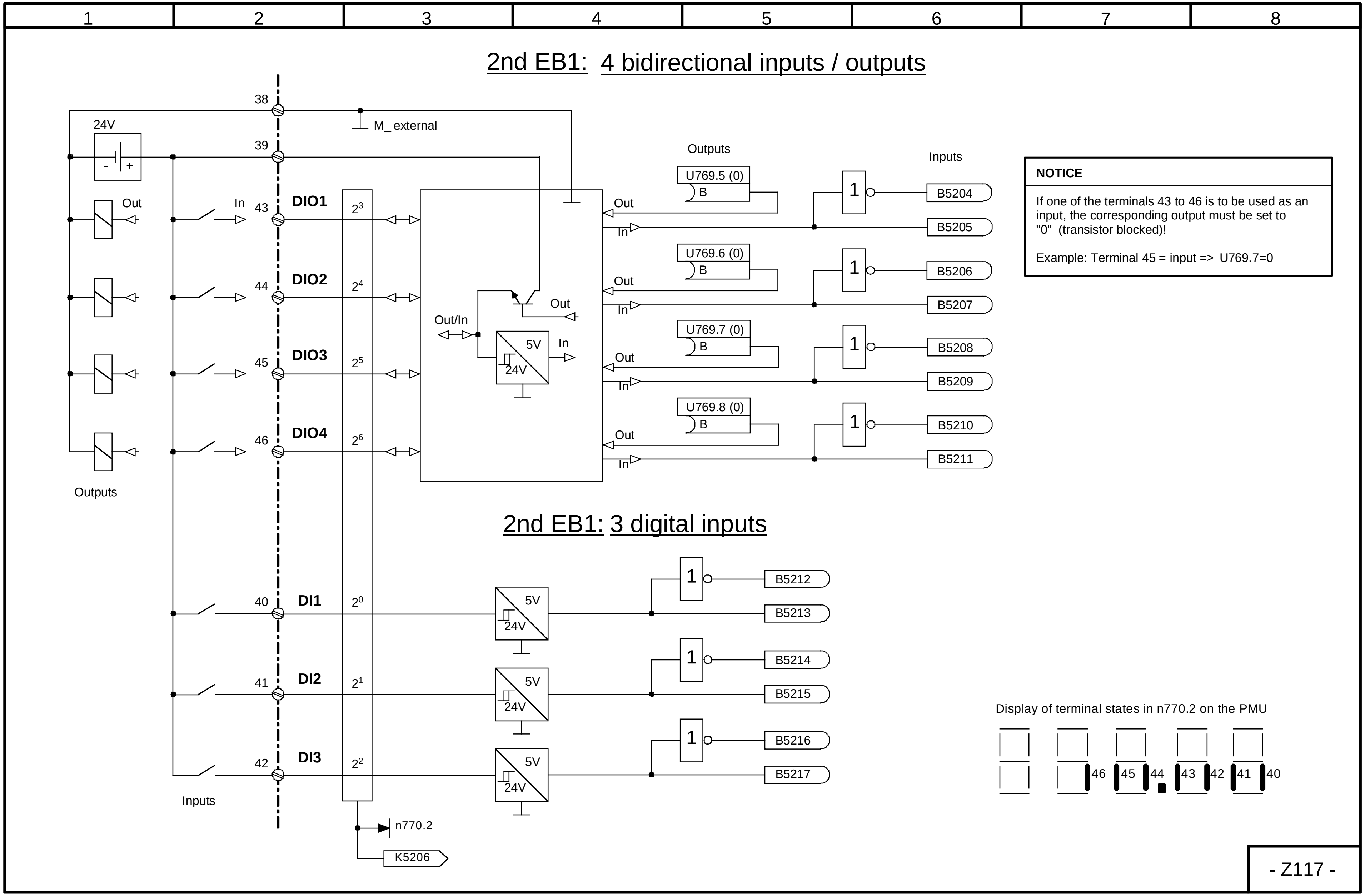

1 2 3 4 5 6 7 8
2nd EB1: Analog input 1 (differential input)
Signal type
(0/1=10V/20mA)
U755.2 (0)
Hardware
smoothing 220 µs
13 bits + sign
Standardization
-1000,0...1000,0
U756.4(100,0)
U758.4 (0)
U759.4 (0)
B
Time constant
0...10000ms
U760.4 (0)
U761.4 (1)
B
n762.4
AI1
50
51
u
±10V
i
±20mA
A
D
U756.4
100%
-1
3
2
1
0
0%
K5201
1 2 3
X488
20mA 10V
10V =100%
20mA=100%
B5201
Open circuit (| i|≤ 2mA)
Offset
-100,00...100,00%
U757.4 (0,00)
Sign reversal
Smoothing
Analog input
connection
2nd EB1: Analog inputs (to ground)
also usable as digital inputs
Standardization
-1000,0...1000,0
U756.5(100,0)
U758.5 (0)
U759.5 (0)
B
Time constant
0...10000ms
U760.5 (0)
U761.5 (1)
B
n762.5
Hardware
smoothing 220 µs
13 bits + sign
52
AI2
±10V
U756.5
100%
K5202
X486
10V
10V=100%
Offset
-100,00...100,00%
U757.5 (0,00)
Sign reversal
Smoothing
Analog input
connection
High at input (voltage at term. 52 > 8V)
Digital input
B5202
Standardization
-1000,0...1000,0
U756.6(100,0)
U758.6 (0)
U759.6 (0)
B
Time constant
0...10000ms
U760.6 (0)
U761.6 (1)
B
n762.6
Hardware -
smoothing 220 µs
13 bits + sign
53
AI3
24V
±10V
54
U756.6
100%
K5203
X487
10V
10V=100%
Offset
-100,00...100,00%
U757.6 (0,00)
Sign reversal
Smoothing
Analog input
connection
High at input (voltage at Kl. 53 > 8V)
Digital input
B5203
Digital inputs
24V
Analog inputs
±10V
- Z115 -

1	2	3	4	5	6	7	8

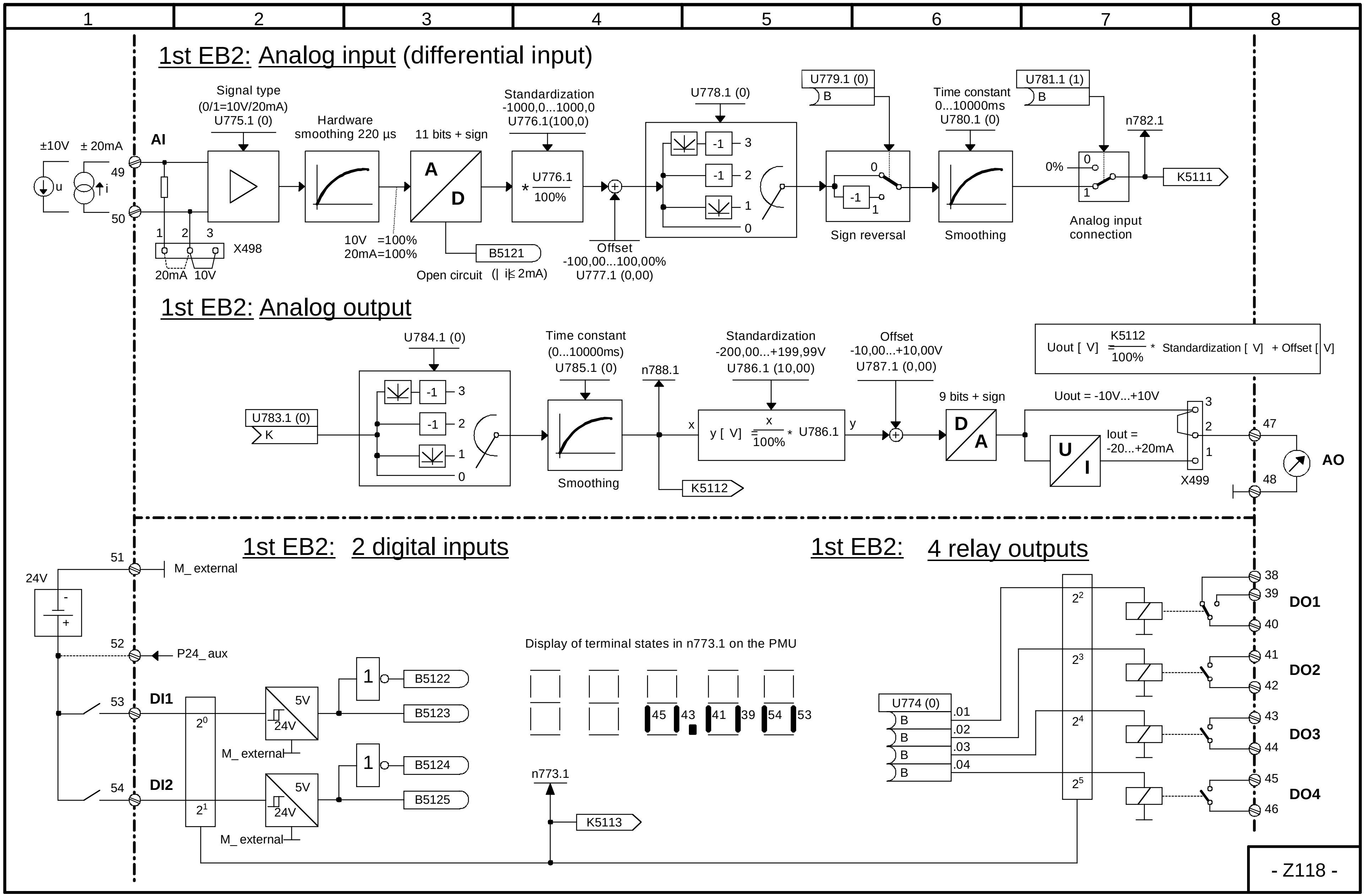
2nd EB1: Analog outputs



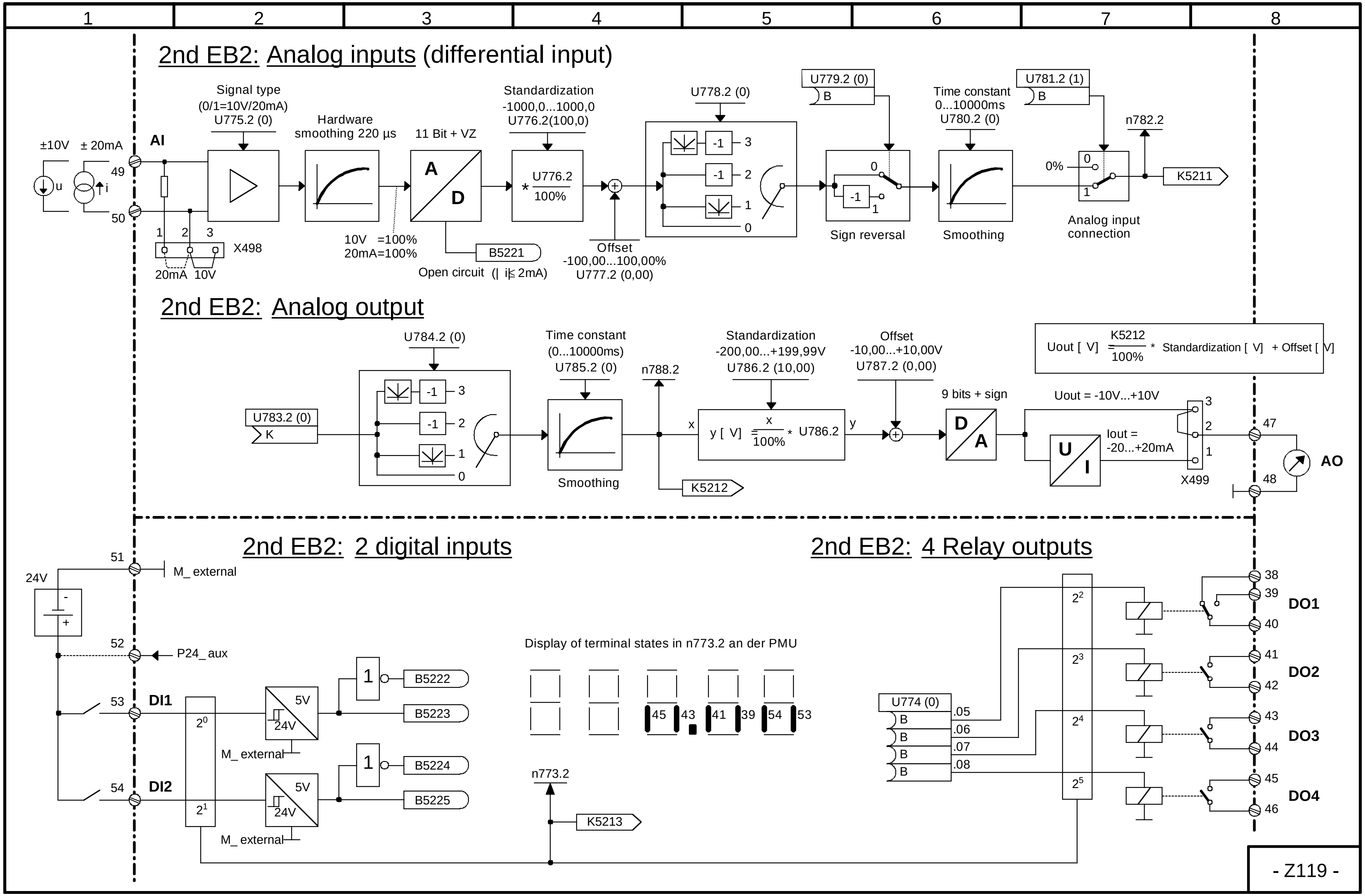
- Z116 -


2nd EB1: 4 bidirectional inputs / outputs
38
39
24V
M_external
Outputs
Inputs
Out
In
43
44
45
46
DIO1
DIO2
DIO3
DIO4
Out/In
5V
24V
U769.5 (0)
U769.6 (0)
U769.7 (0)
U769.8 (0)
B
B5204
B5205
B5206
B5207
B5208
B5209
B5210
B5211
NOTICE
If one of the terminals 43 to 46 is to be used as an input, the corresponding output must be set to "0" (transistor blocked)!
Example: Terminal 45 = input => U769.7=0
2nd EB1: 3 digital inputs
40
41
42
DI1
DI2
DI3
B5212
B5213
B5214
B5215
B5216
B5217
n770.2
K5206
Display of terminal states in n770.2 on the PMU
46
45
44
43
42
41
40
- Z117 -

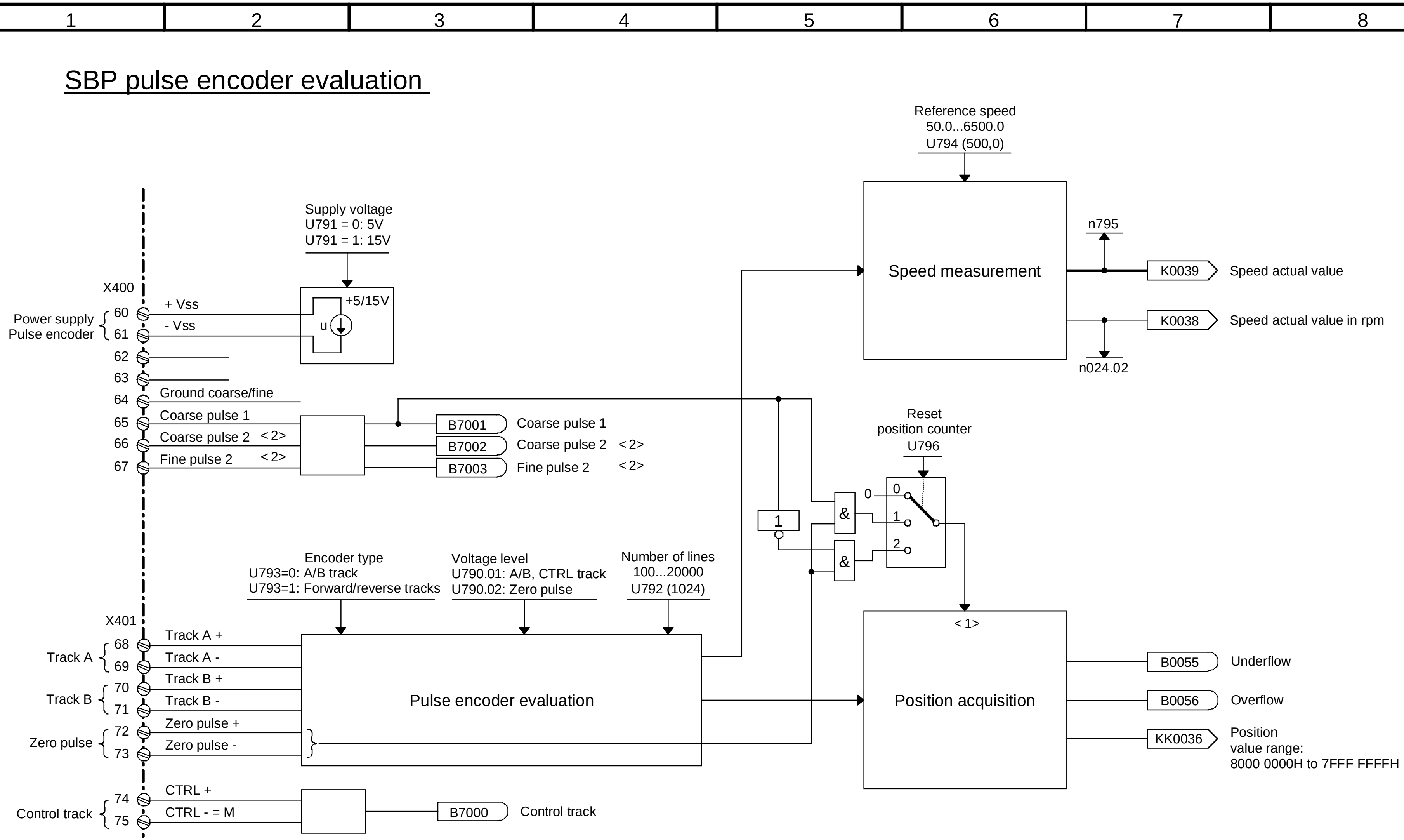
Sheet Z118 1st EB2: Analog input, Analog output, 2 digital inputs, 4 relay outputs



Function diagrams


1
2
3
4
5
6
7
8
2nd EB2: Analog inputs (differential input)
±10V
± 20mA
AI
49
50
u
i
Signal type
(0/1=10V/20mA)
U775.2 (0)
Hardware
smoothing 220 µs
11 Bit + VZ
A
D
Standardization
-1000,0...1000,0
U776.2(100,0)
U776.2
100%
1
2
3
X498
20mA
10V
10V =100%
20mA=100%
B5221
Open circuit (| i|≤ 2mA)
Offset
-100,00...100,00%
U777.2 (0,00)
U778.2 (0)
-1
3
2
1
0
U779.2 (0)
B
Sign reversal
Time constant
0...10000ms
U780.2 (0)
Smoothing
U781.2 (1)
B
0%
Analog input
connection
n782.2
K5211
2nd EB2: Analog output
U784.2 (0)
U783.2 (0)
K
Time constant
(0...10000ms)
U785.2 (0)
Smoothing
n788.2
K5212
Standardization
-200,00...+199,99V
U786.2 (10,00)
y [V] = x / 100% * U786.2
Offset
-10,00...+10,00V
U787.2 (0,00)
9 bits + sign
D
A
Uout = -10V...+10V
U
I
Iout =
-20...+20mA
X499
47
48
AO
Uout [V] = K5212 / 100% * Standardization [V] + Offset [V]
2nd EB2: 2 digital inputs
24V
51
M_ external
52
P24_ aux
53
DI1
54
DI2
5V
24V
M_ external
B5222
B5223
B5224
B5225
Display of terminal states in n773.2 an der PMU
45
43
41
39
54
53
n773.2
K5213
2nd EB2: 4 Relay outputs
U774 (0)
B
.05
.06
.07
.08
38
39
DO1
40
41
DO2
42
43
DO3
44
45
DO4
46
- Z119 -

SBP pulse encoder evaluation

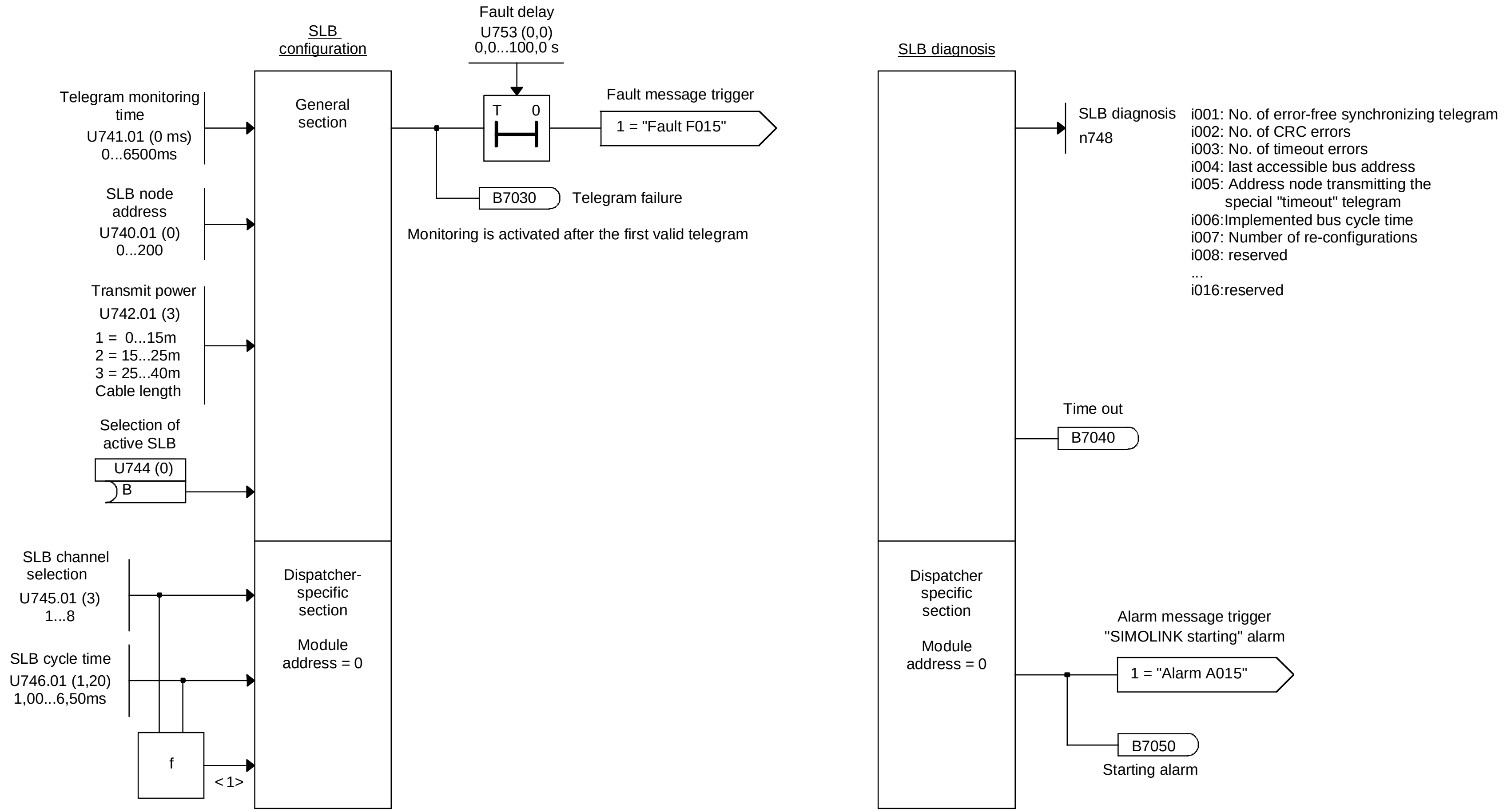


<1> 0=Enable position counter (KK0038)
1=Reset (KK0038:=0)

<2> The signals "coarse pulse 2" and "fine pulse 2" are only routed to binectors B7002 and B7003 in the SIMOREG DC Master. They have no other function.

1	2	3	4	5	6	7	8

SIMOLINK board: Configuration, diagnosis



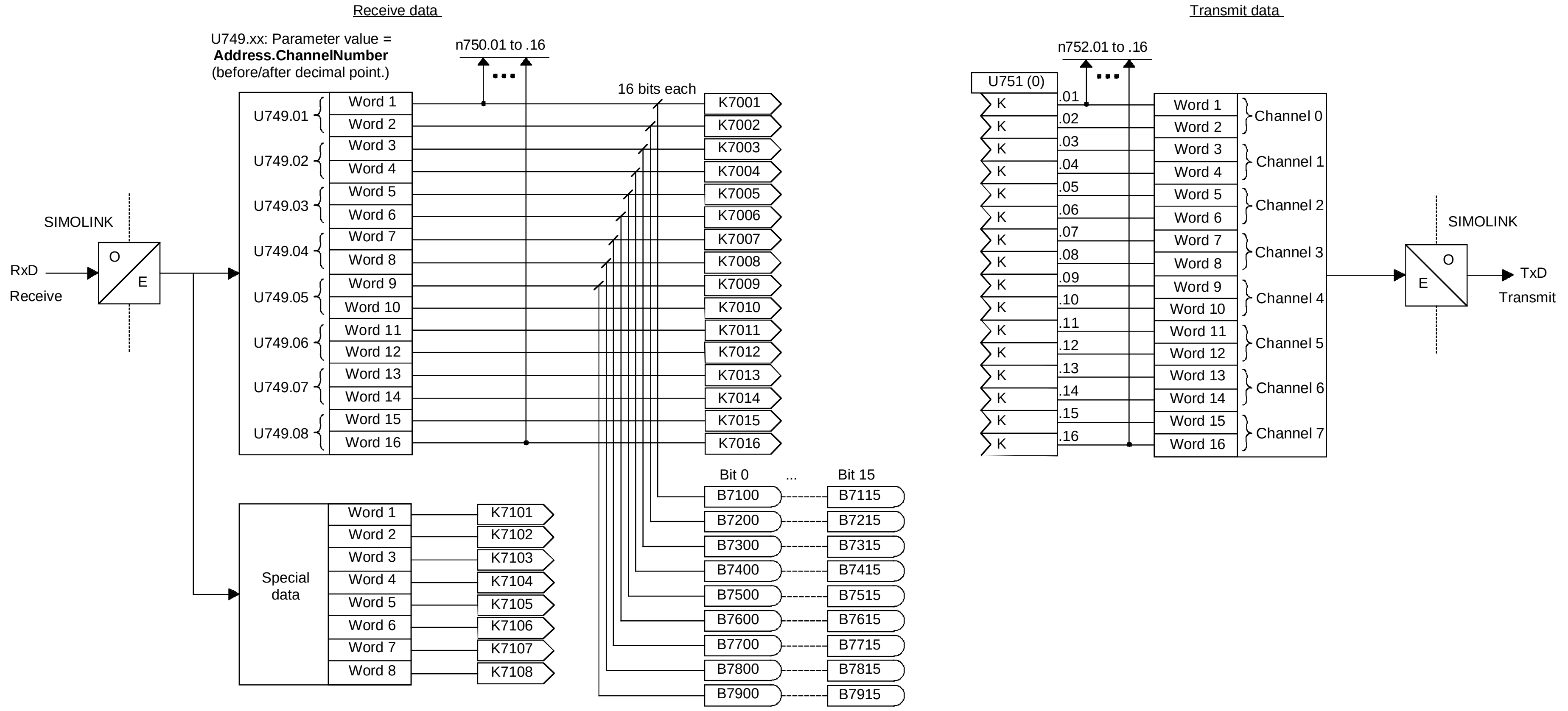
< 1> f: No. of addressed nodes = $\left(\frac{U746 + 3{,}18\ \mu s}{6{,}36\ \mu s} - 2 \right) \cdot \frac{1}{U745}$

6,36 µs = time for 1 telegram

- Z121 -

1 2 3 4 5 6 7 8

SIMOLINK board: Receiving, transmitting

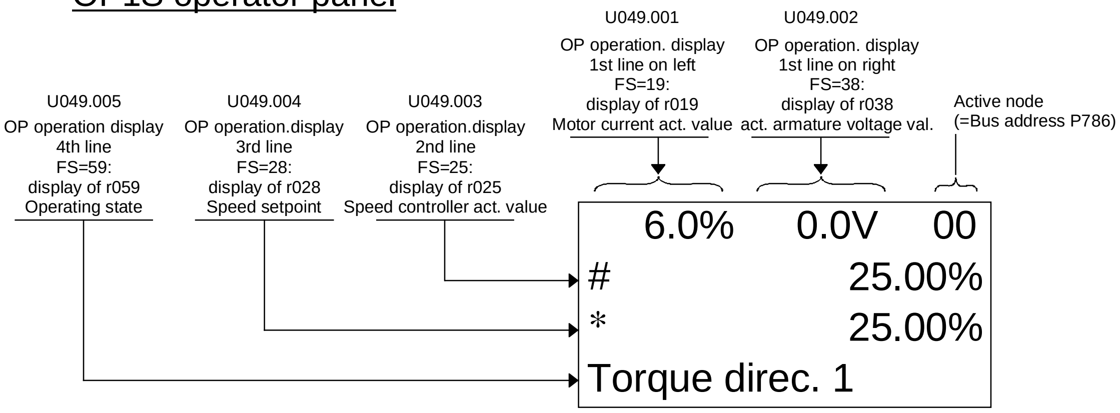


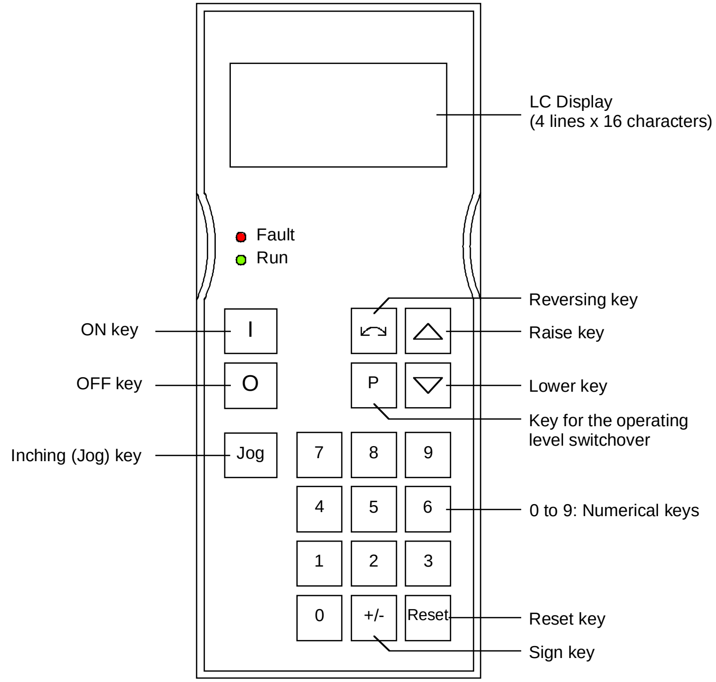
For transmission of double-word connectors see Section 7.7.4 "Procedure for starting up SIMOLINK boards"

See also connector type converter on sheet Z124

1	2	3	4	5	6	7	8

OP1S operator panel





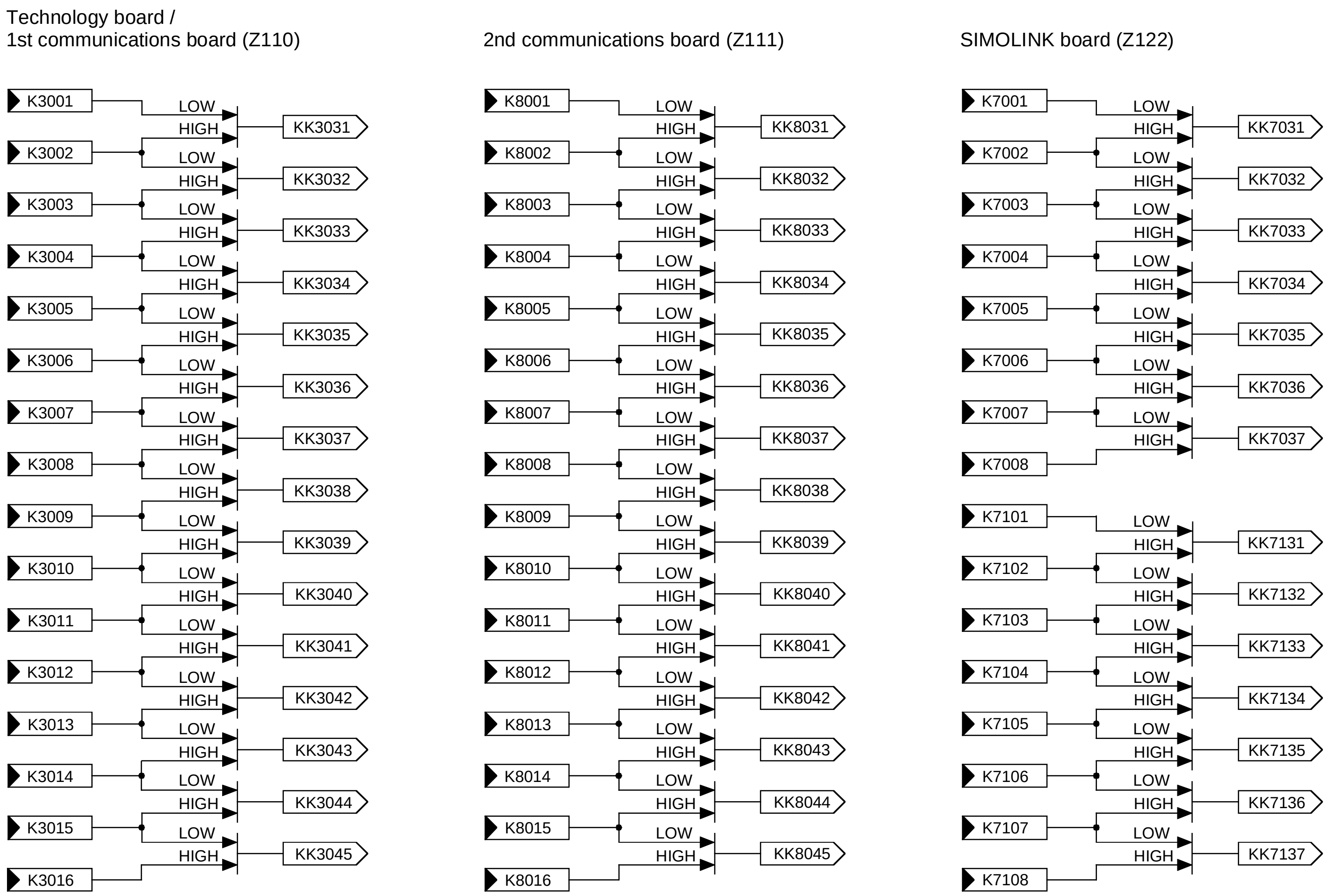
The control commands from the OP1S panel are transferred via word 1 in the USS protocol and can be wired up to other functions via the binectors below (see also Section 7.2.2).

Key	Binector	Function
I, O	B2100	ON / OFF1 (B2100 must also be connected to bit 1 or 2 in control word 1 for OFF2 or OFF3.)
Reset	B2107	Acknowledge <1>
Jog	B2108	Inching 1
Reversing	B2111	Positive direction of rotation
	B2112	Negative direction of rotation
Raise	B2113	Raise motor pot. <1>
Lower	B2114	Lower motor pot. <1>

<1> This key works only when the OP1S is in the "Operational display" state

1	2	3	4	5	6	7	8

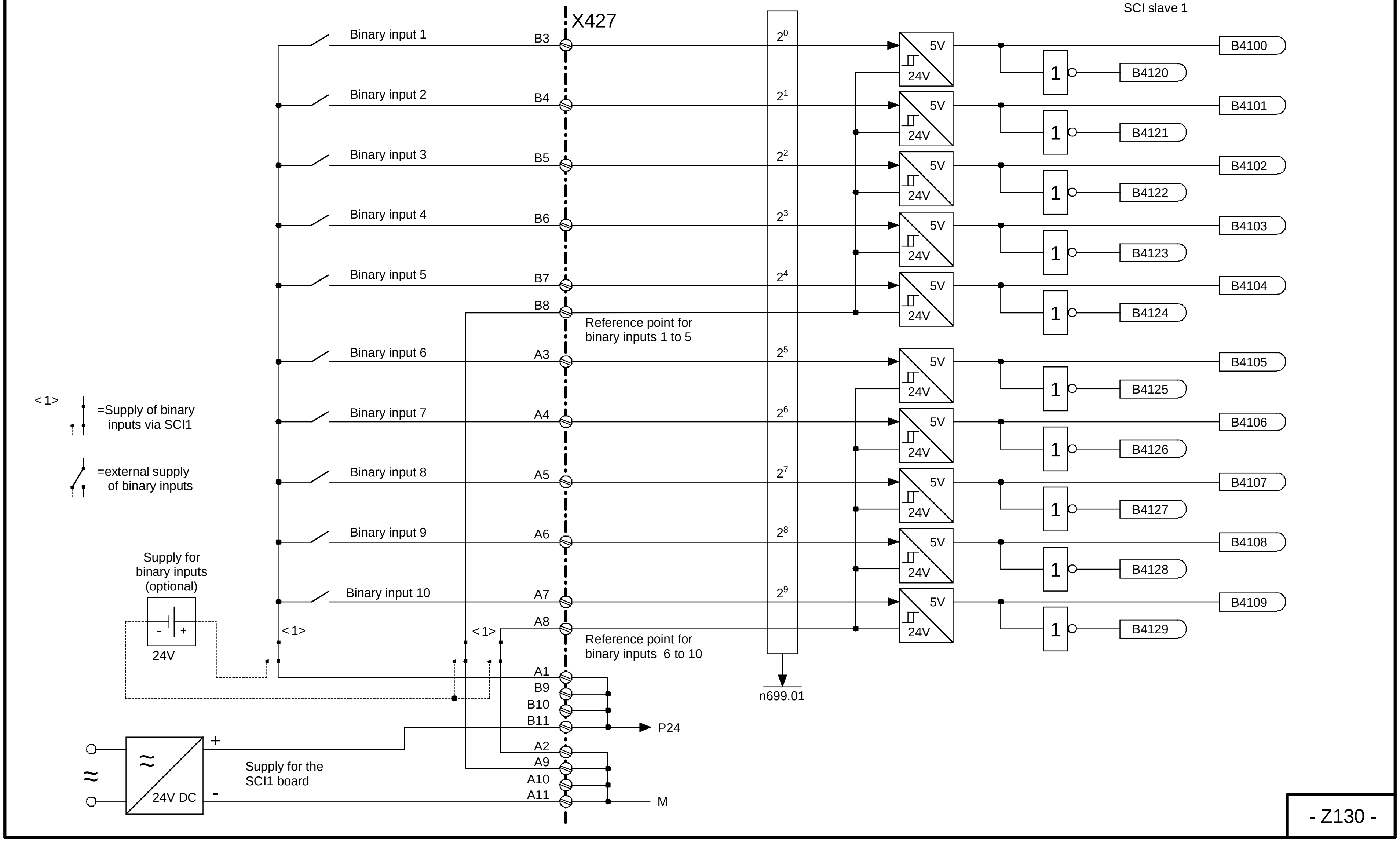
Interfaces: connector-type converters



- Z124 -

1	2	3	4	5	6	7	8

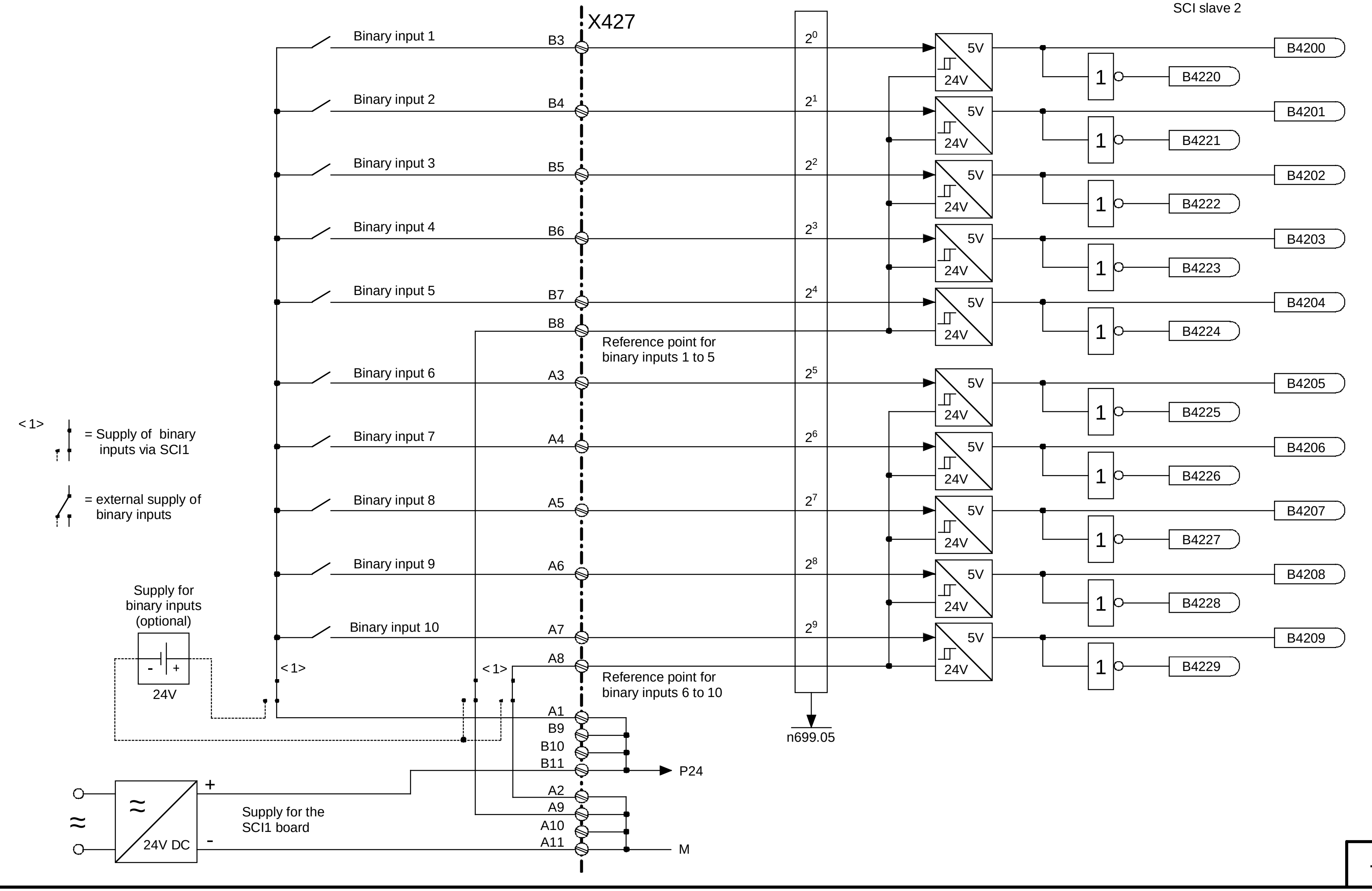
SCB1 with SCI1: SCI1 - binary inputs slave 1



- Z130 -

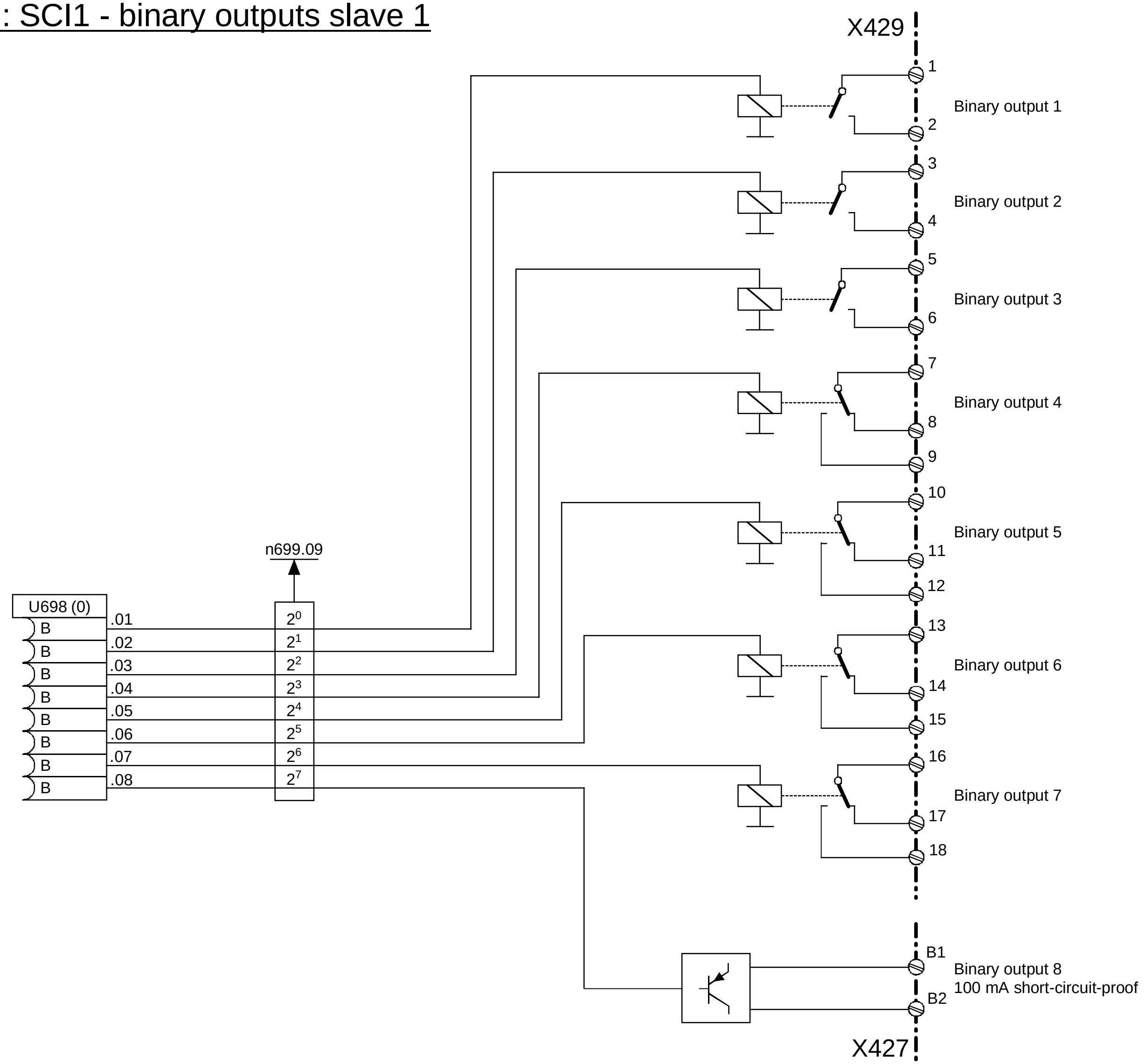
1	2	3	4	5	6	7	8

SCB1 with SCI1: SCI1 - binary inputs slave 2



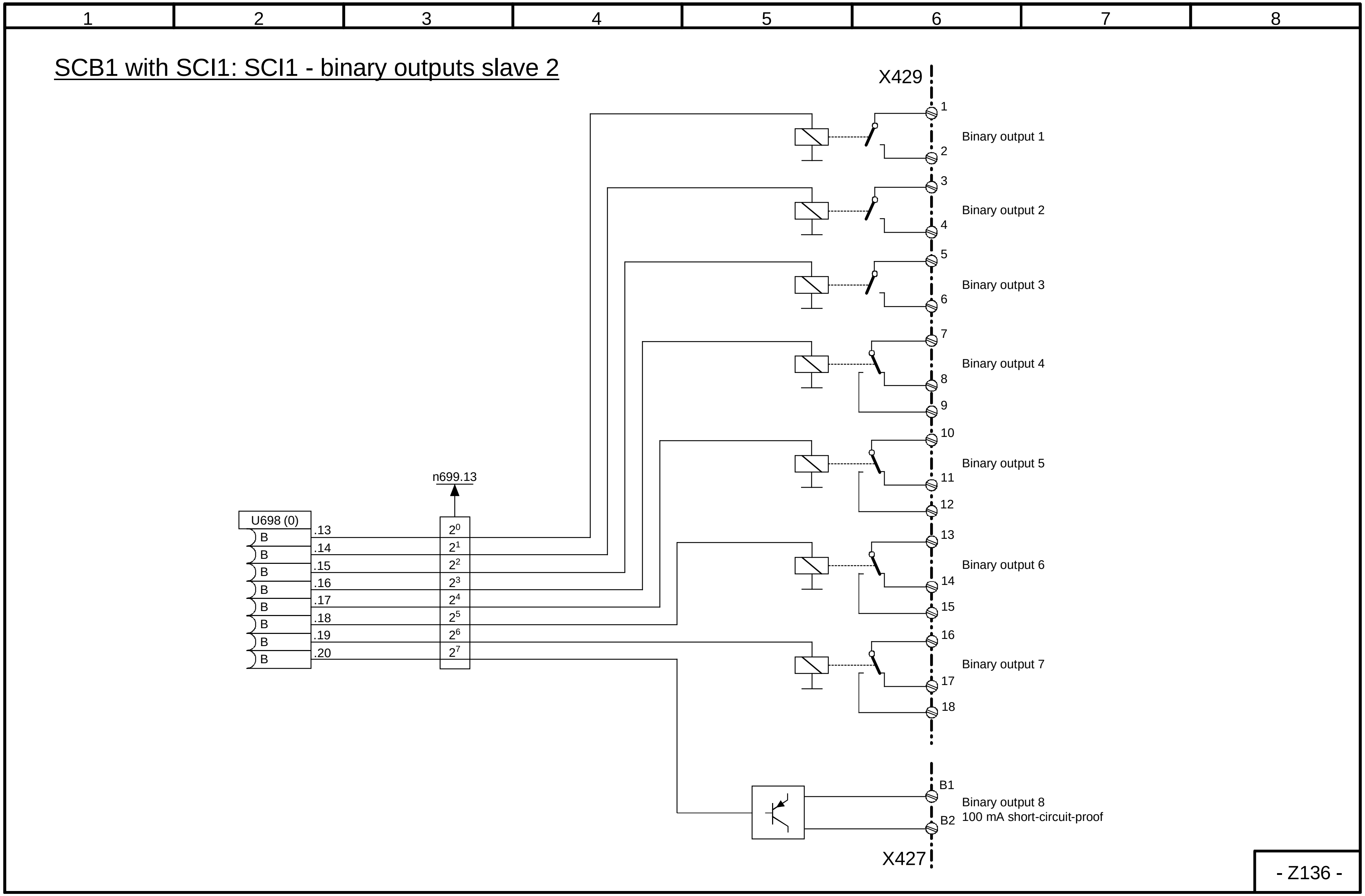
- Z131 -

SCB1 with SCI1: SCI1 - binary outputs slave 1



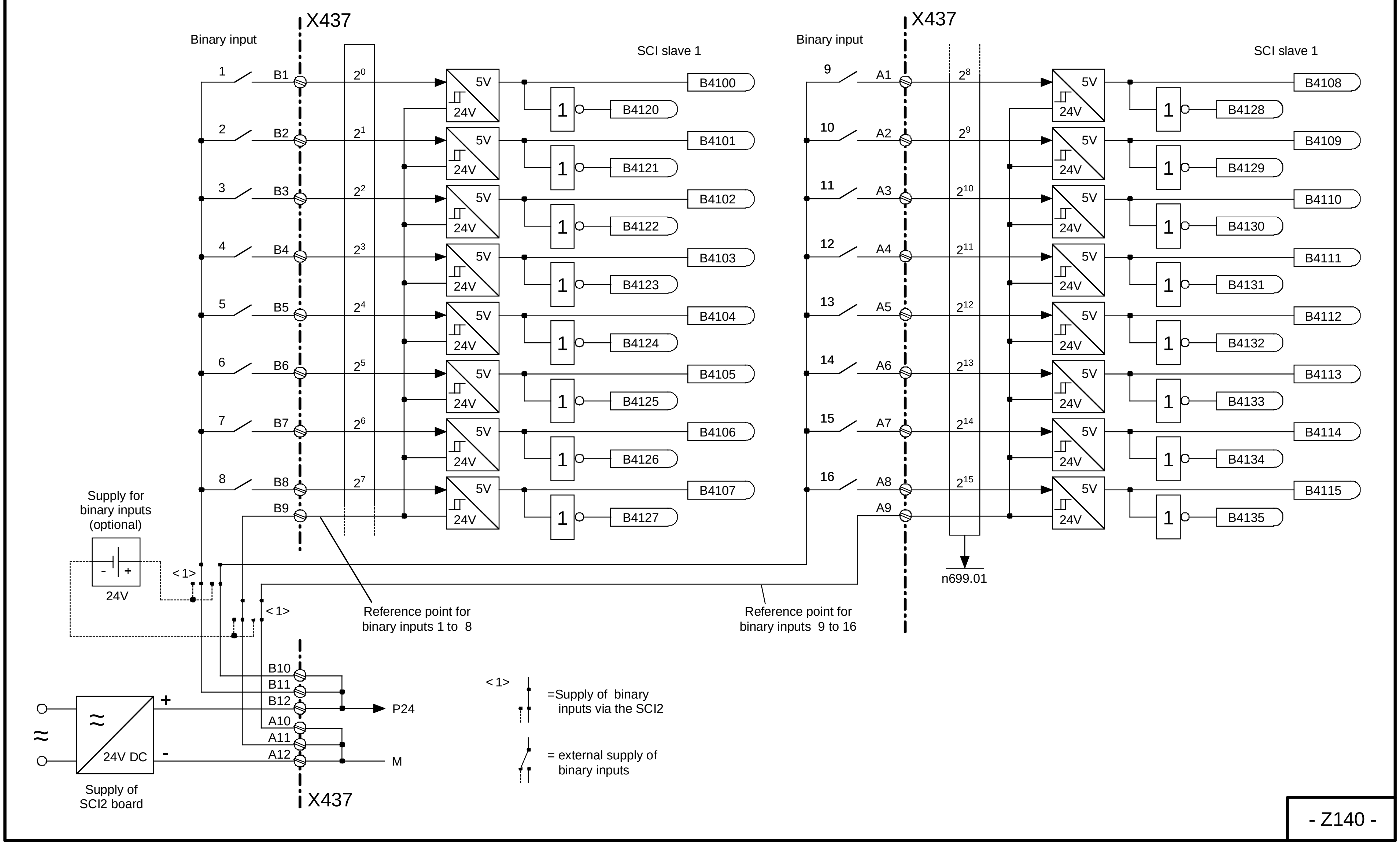
- Z135 -

SCB1 with SCI1: SCI1 - binary outputs slave 2



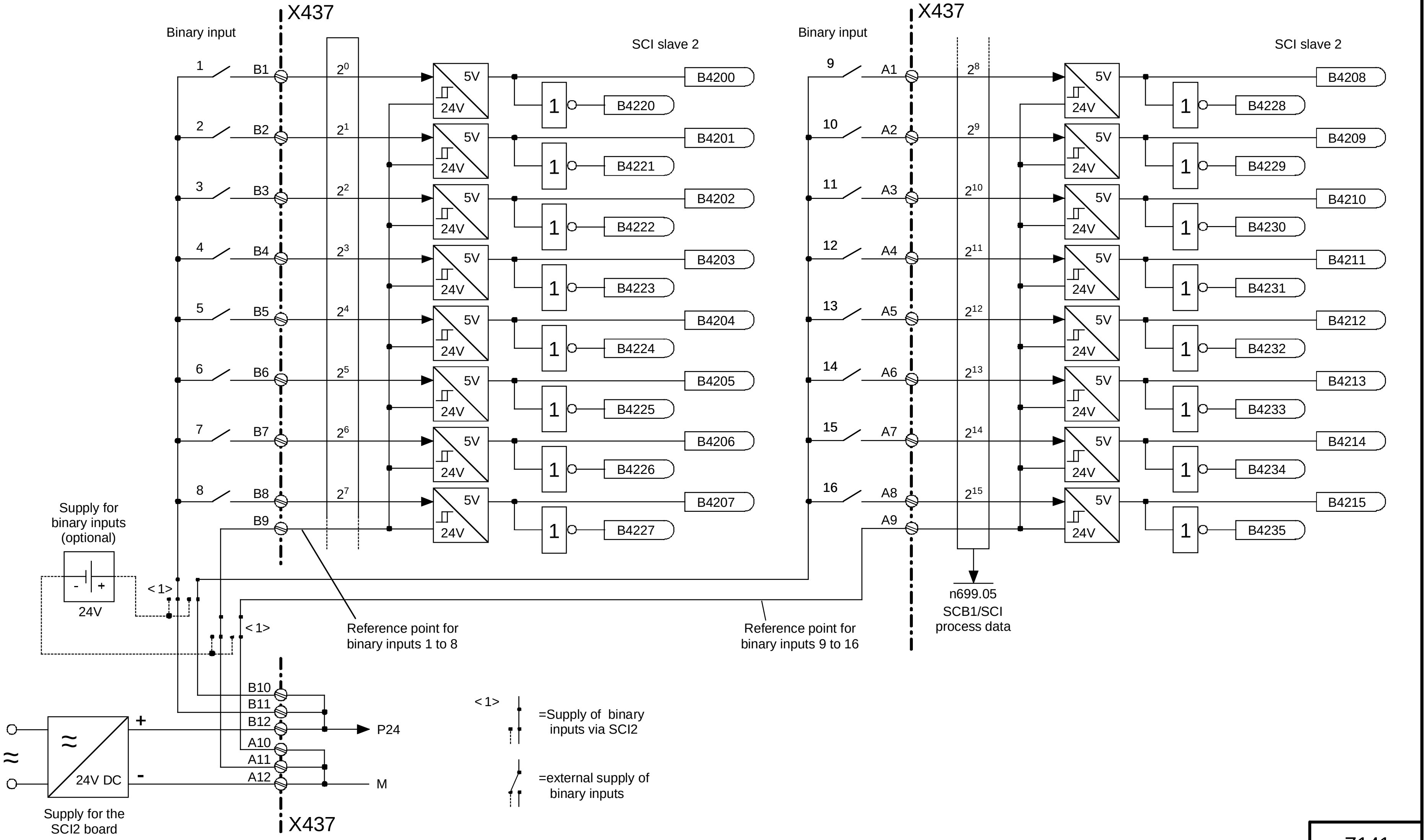
1	2	3	4	5	6	7	8

SCB1 with SCI2: SCI2 - binary inputs slave 1



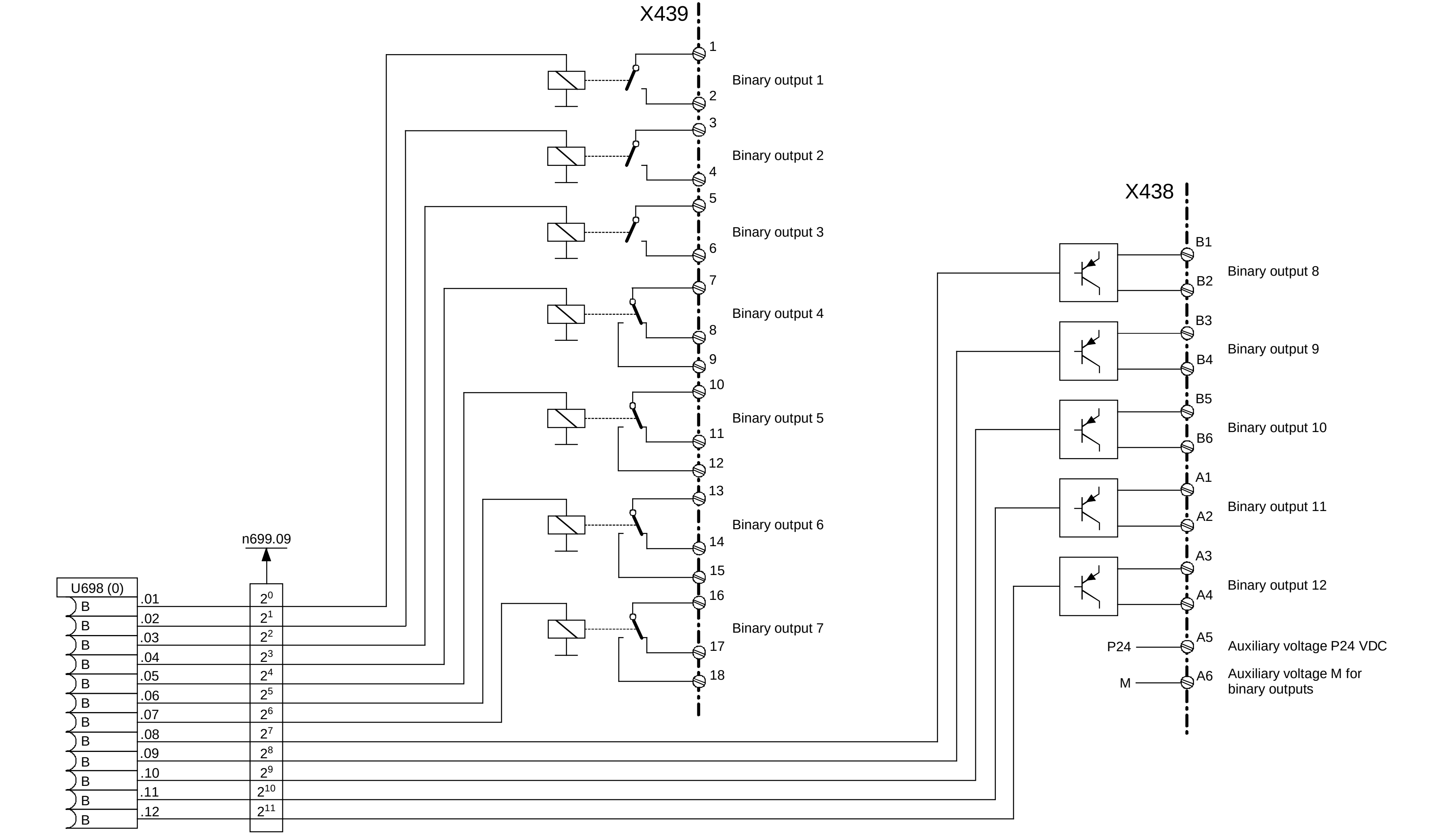
1	2	3	4	5	6	7	8

SCB1 with SCI2: SCI2 - binary inputs slave 2



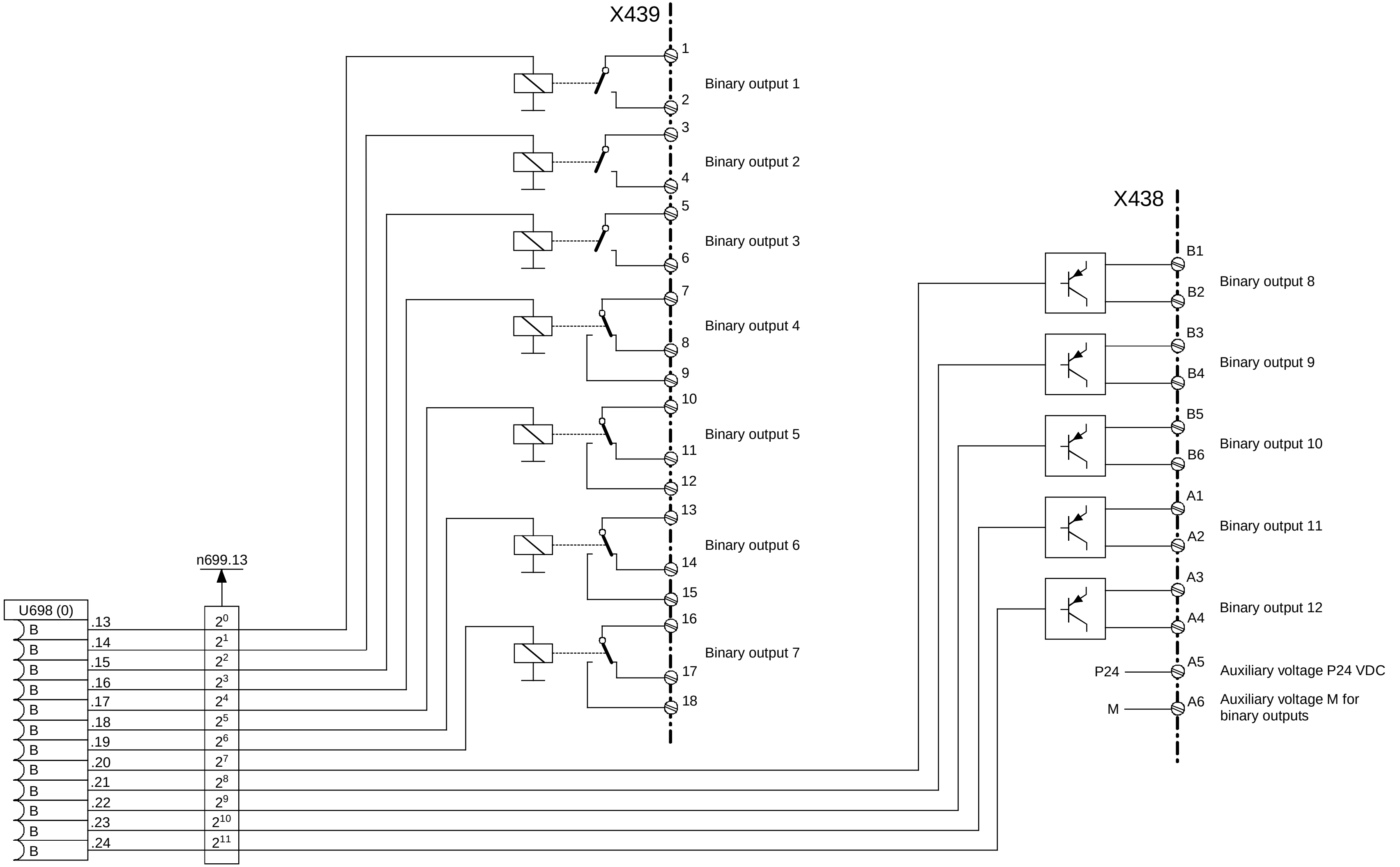
1 2 3 4 5 6 7 8

SCB1 with SCI2: SCI2 - binary outputs slave 1



1	2	3	4	5	6	7	8

SCB1 with SCI2: SCI2 - binary outputs slave 2



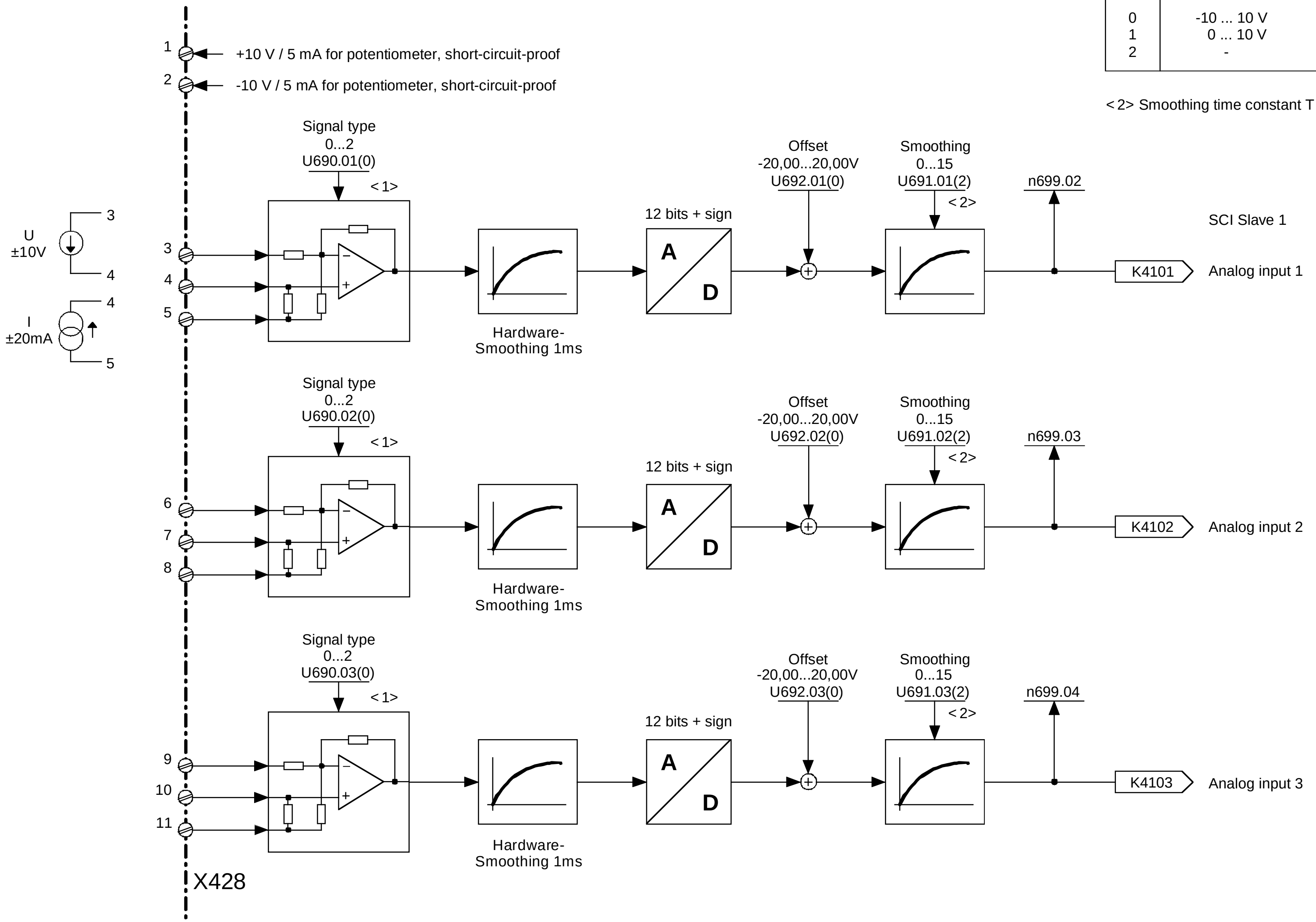
- Z146 -

SCB1 with SCI1: SCI1 analog inputs slave 1

< 1> Signal type

U690	Voltage input Kl. X428.3, .6, .9	Current input Kl. X428.5, .8, .11
0	-10 ... 10 V	-20 ... 20 mA
1	0 ... 10 V	0 ... 20 mA
2	-	4 ... 20 mA

< 2> Smoothing time constant T = 2 ms * 2^{U691}

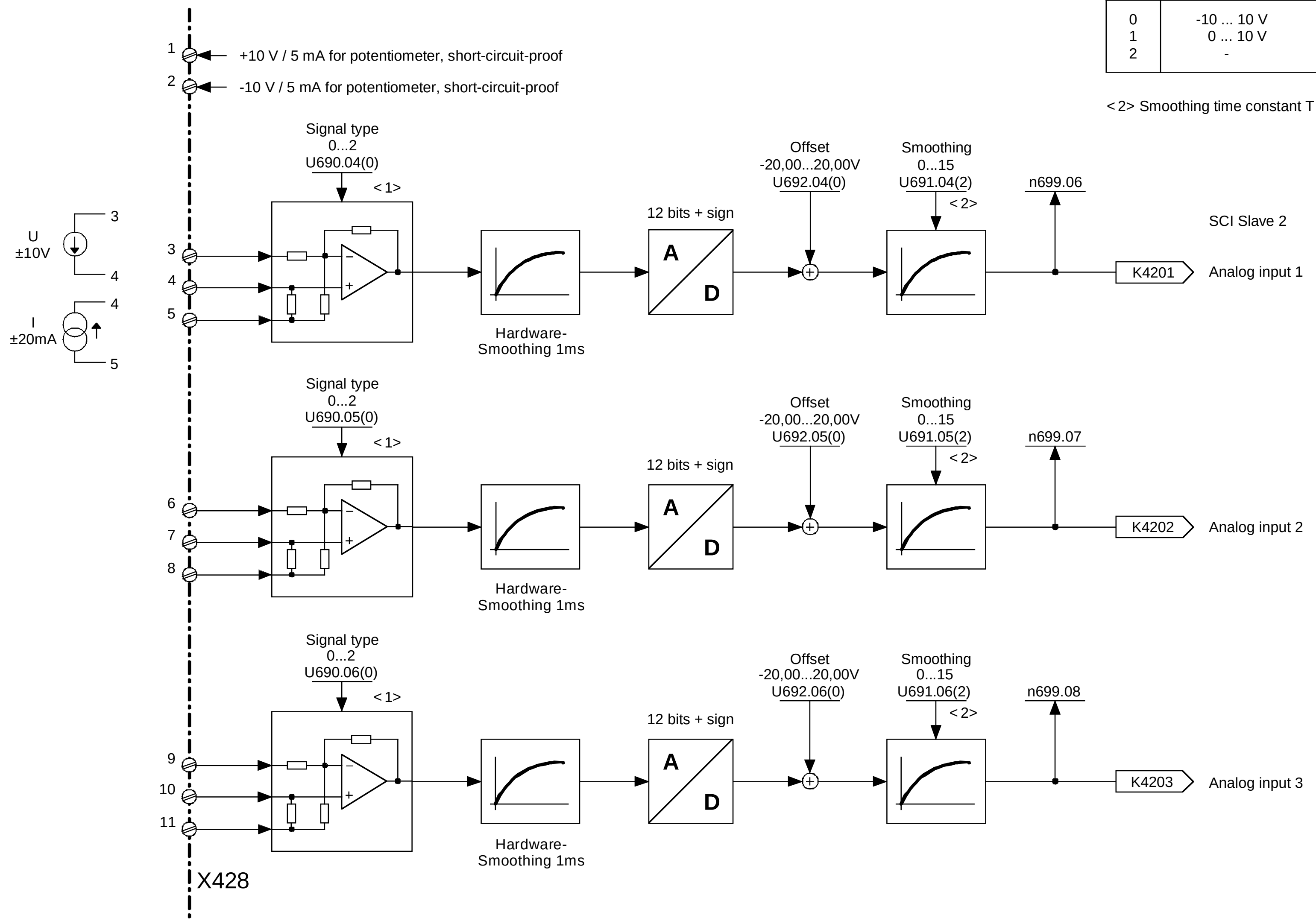


SCB1 with SCI1: SCI1 analog inputs slave 2

<1> Signal type

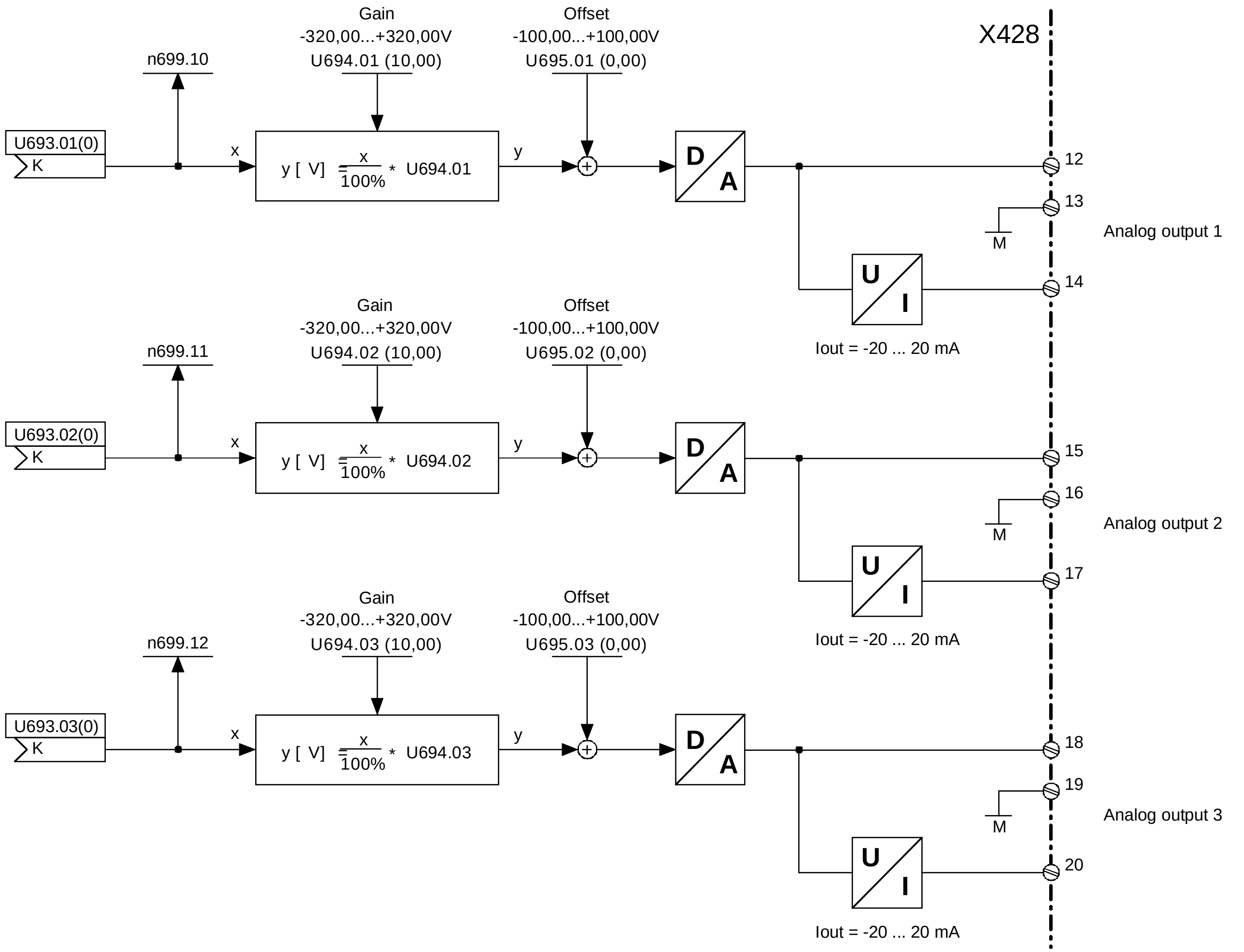
U690	Voltage input Kl. X428.3, .6, .9	Current input Kl. X428.5, .8, .11
0	-10 ... 10 V	-20 ... 20 mA
1	0 ... 10 V	0 ... 20 mA
2	-	4 ... 20 mA

<2> Smoothing time constant T = 2 ms * 2^{U691}



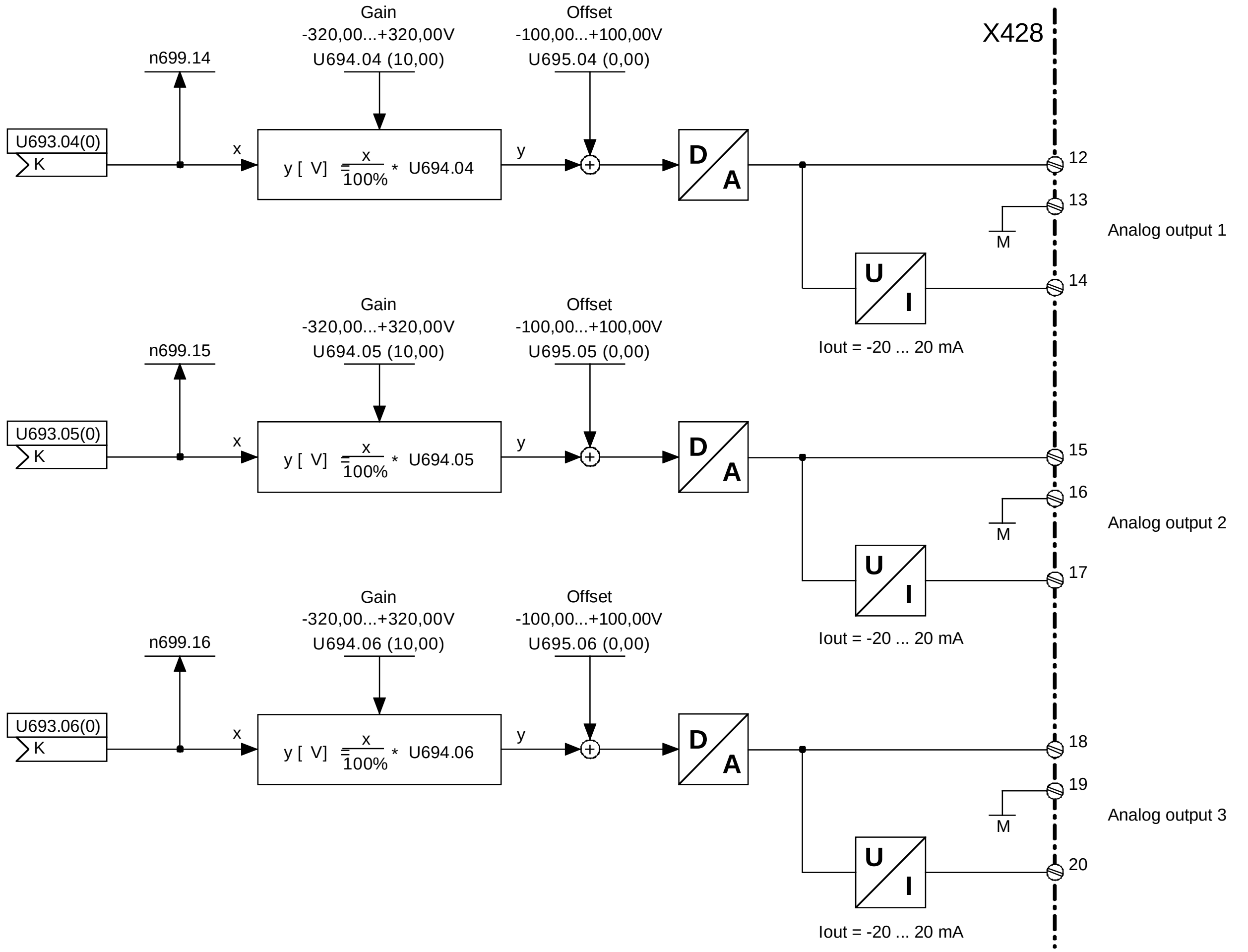
1 2 3 4 5 6 7 8

SCB1 with SCI1: SCI1 analog outputs slave 1



1	2	3	4	5	6	7	8

SCB1 with SCI1: SCI1 analog outputs slave 2



- 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

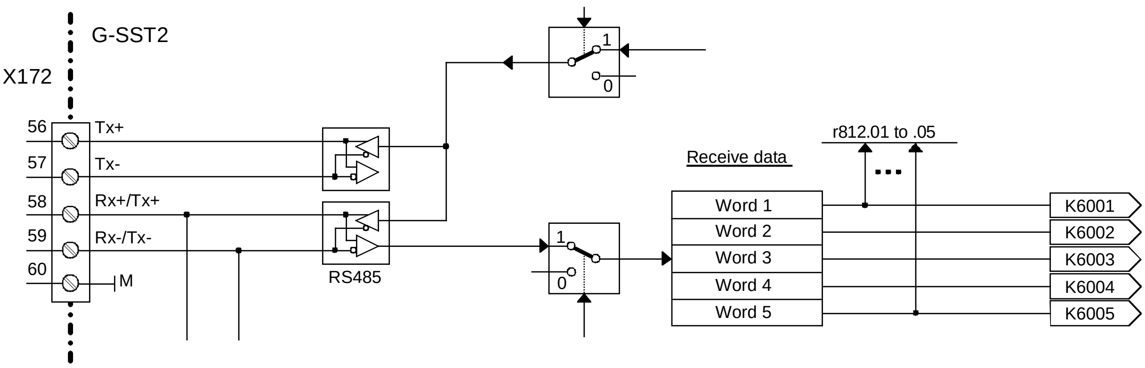
All output variables and important computation quantities within the function blocks are available in the form of "connectors" (e.g. for further processing as input signals to other function blocks). The quantities accessed via connectors correspond to output signals or measuring points in an analog 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:

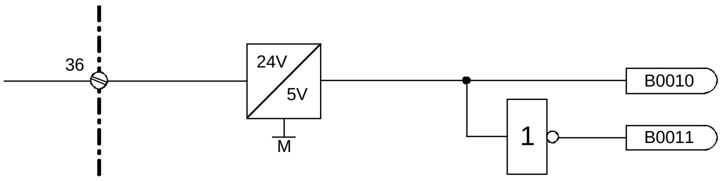
Binectors

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.

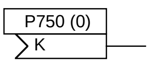
Example: The status of terminal 36 is available at B0010 and, in inverted form, at binector B0011 (Section 8, Sheet G110)



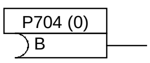
Selection switches, connections
(see also Section "Data sets")

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.

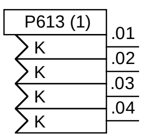
Representation in function diagrams (examples):



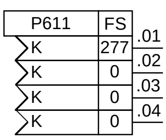
Selection of a connector
Parameter number = P750, factory setting = 0 (i. e. fixed value 0%)



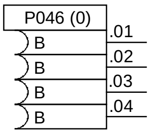
Selection of a binector
Parameter number = P704, factory setting = 0 (i. e. fixed value 0)



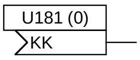
Selection of connectors ("indexed" parameter with 4 indices)
Parameter number = P613, factory setting = 1 (i. e. fixed value 100%; this factory setting applies to all the indices of P613)



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%)



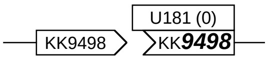
Selection of binectors ("indexed" parameter with 4 indices)
Parameter number = P046, factory setting = 0 (i. e. fixed value 0, this factory setting applies to all the indices of P046)



Selection of a double-word connector (SW 1.9 and later)
Parameter number = U181, factory setting = 0 (i.e. fixed value 0%)

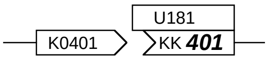
The selected setting can be entered in the empty field (fields). The value in brackets next to the parameter number is the factory setting of the selection parameter.

<u>The following rules apply to the selection of double-word connectors (SW 1.9 and later):</u>



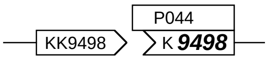
Double-word connector to double-word connector selection:

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)



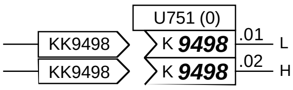
Connector to double-word connector selection:

The double word for subsequent processing comprises:
LOW word = 0
HIGH word = selected connector (K0401)

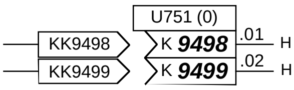


Double-word connector to connector selection:

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.

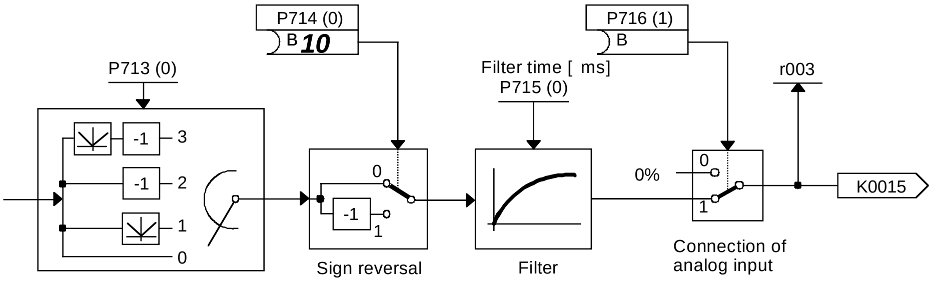
<u>Examples:</u> Some examples of how to handle connectors and binectors are given below.

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:

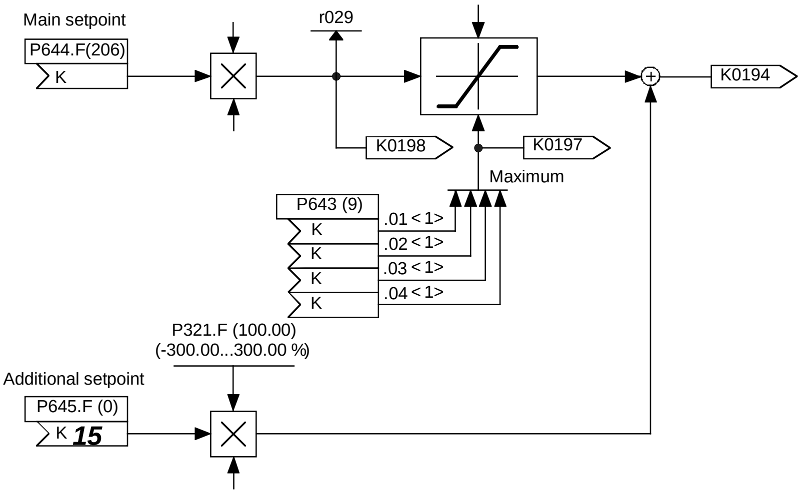
1. P714 = 10: Selects binector B0010 (status of terminal 36) as the control signal for sign reversal. Parameter P716 remains set at 1 (= fixed value 1, delivery state), thereby ensuring that the analog input is switched in continuously.

<u>Section 8, Sheet G113:</u>



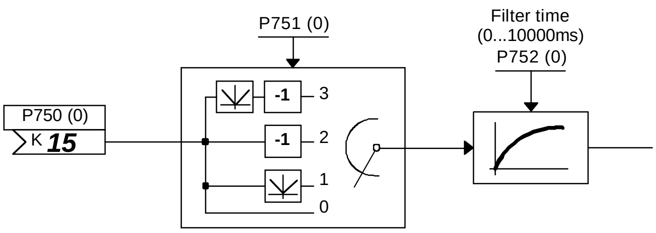
2. P645 = 15: Applies connector K0015 to the additional setpoint input when the setpoint is processed

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.

<u>Section 8, Sheet G115:</u>

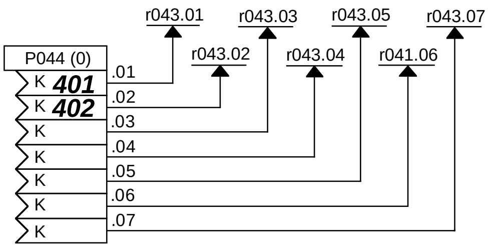


Example 2: The contents of connectors K0401 and K0402 must be output on the connector displays (parameter r043)

The following settings need to be made to create the correct links:

P044.index01 = 401: Links connector K0401 to the 1st connector display
P044.index02 = 402: Links connector K0402 to the 2nd 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

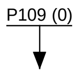
to

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.

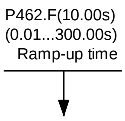
Setting parameters
(see also Section "Data sets")

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.



Setting parameter
Parameter number = P109, factory setting = 0



Setting parameter in function parameter set (".F" after parameter number)
Parameter number = P462, factory setting = 10.00s
Value range = 0.01...300.00s
Parameter for setting ramp-up time

Examples: P700 in Section 8, Sheet G113 defines the signal type of the analog input (voltage input ±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 determine 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.

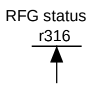
Switch over binector and connector parameters (Bico data sets):

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 technology controller, 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 ≤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).

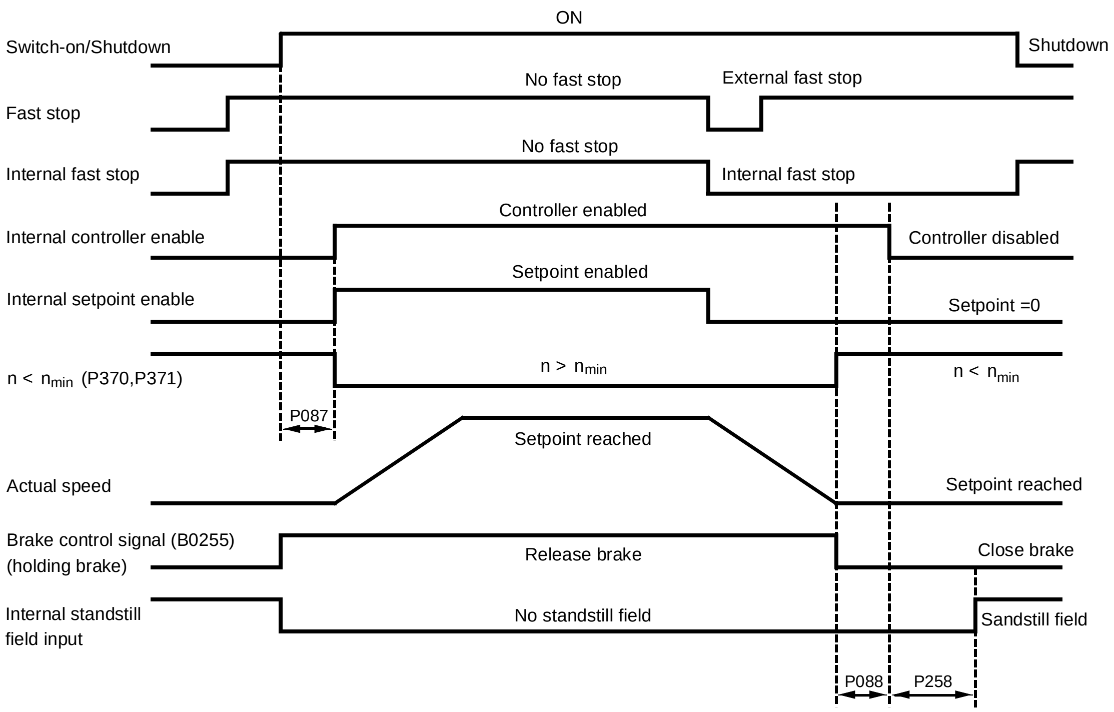
P648 ≠ 9: The connector selected via P648 is used as control word 1. Bit 2 of this word then controls the OFF3 function.

Sequence of operations for "Fast stop":

1. Input "Fast stop" command (e.g. binary input wired up to "Fast stop")
2. Technology controller and ramp-function generator are 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 converter, 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 ≠ 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 → 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 3003 (= word 3 of DPRAM interface on board in slot 2) is used as control word 1.

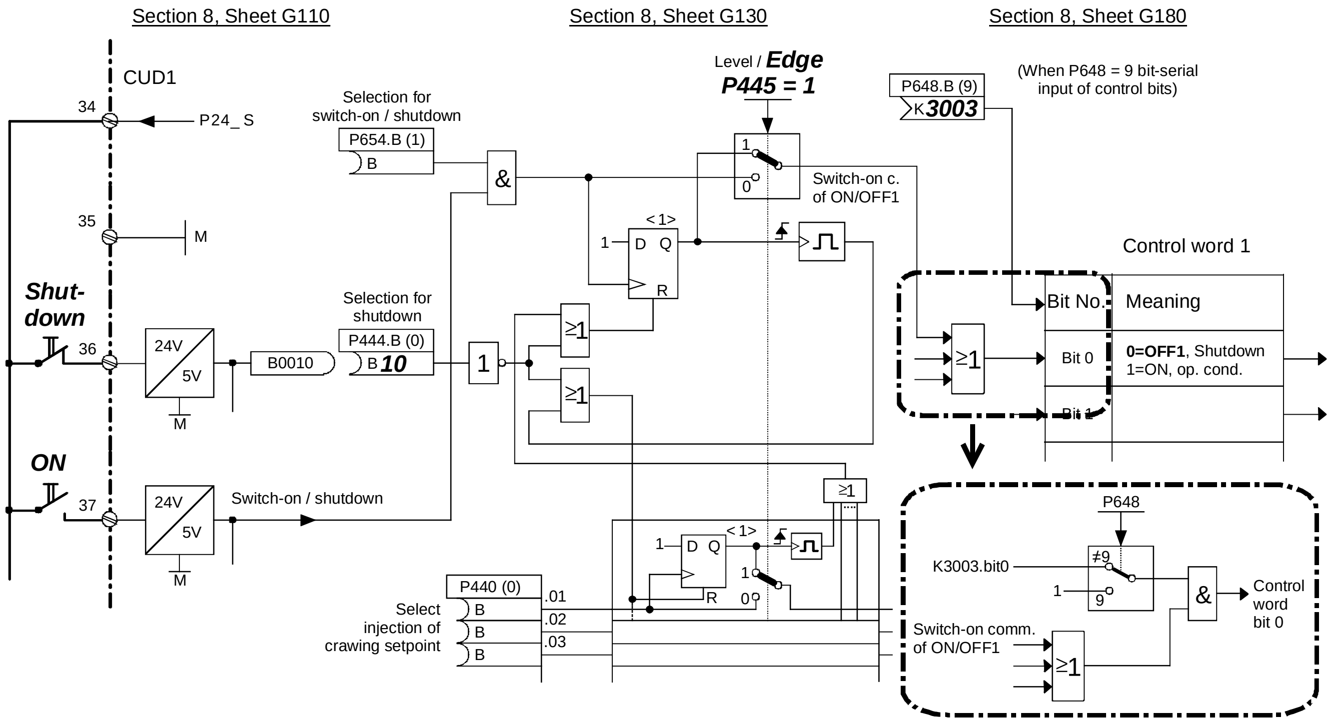
The following parameter values must be set:

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:

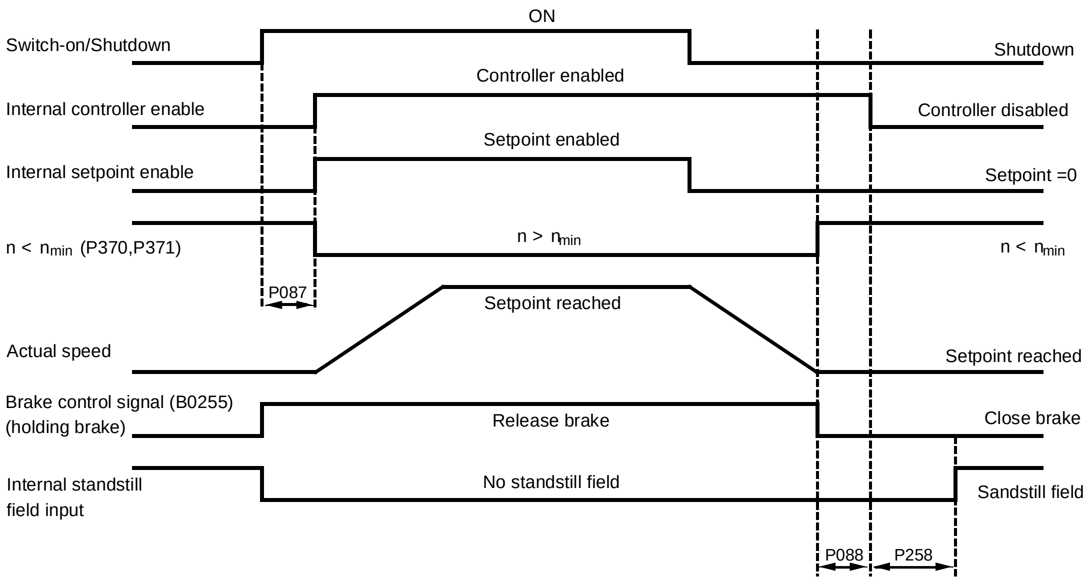
1. Enter the "Switch-on" command (e.g. via terminal "Switch-on/shutdown")
2. The converter exits operating state 07
3. The "Line contactor closed" relay picks up
4. The field current reduction command is cancelled

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 (PO87 negative), go to step 6 immediately, brake remains closed (binector B0250 = 0)
6. Technology controller, 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 $i_{set} = 0$
7. Technology controller, 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), the speed-dependent current limit and the limit derived from I^2t monitoring of the power section remain operative.

9.3.4 Operating enable (enable) terminal 38 - control word 1, bit 3

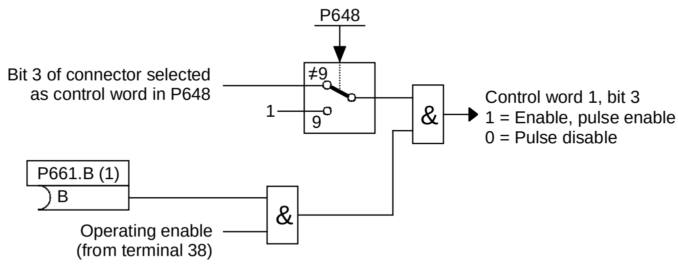
The Enable signal is HIGH active (log."1" state = Enable).

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 o1.0, with a negative brake release time (P087 negative), go to step 3 immediately, brake remains closed (binector B0250 = 0)
3. Technology controller, 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 technology controller, ramp-function generator, n and I controllers
3. Enter I_{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_{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%)

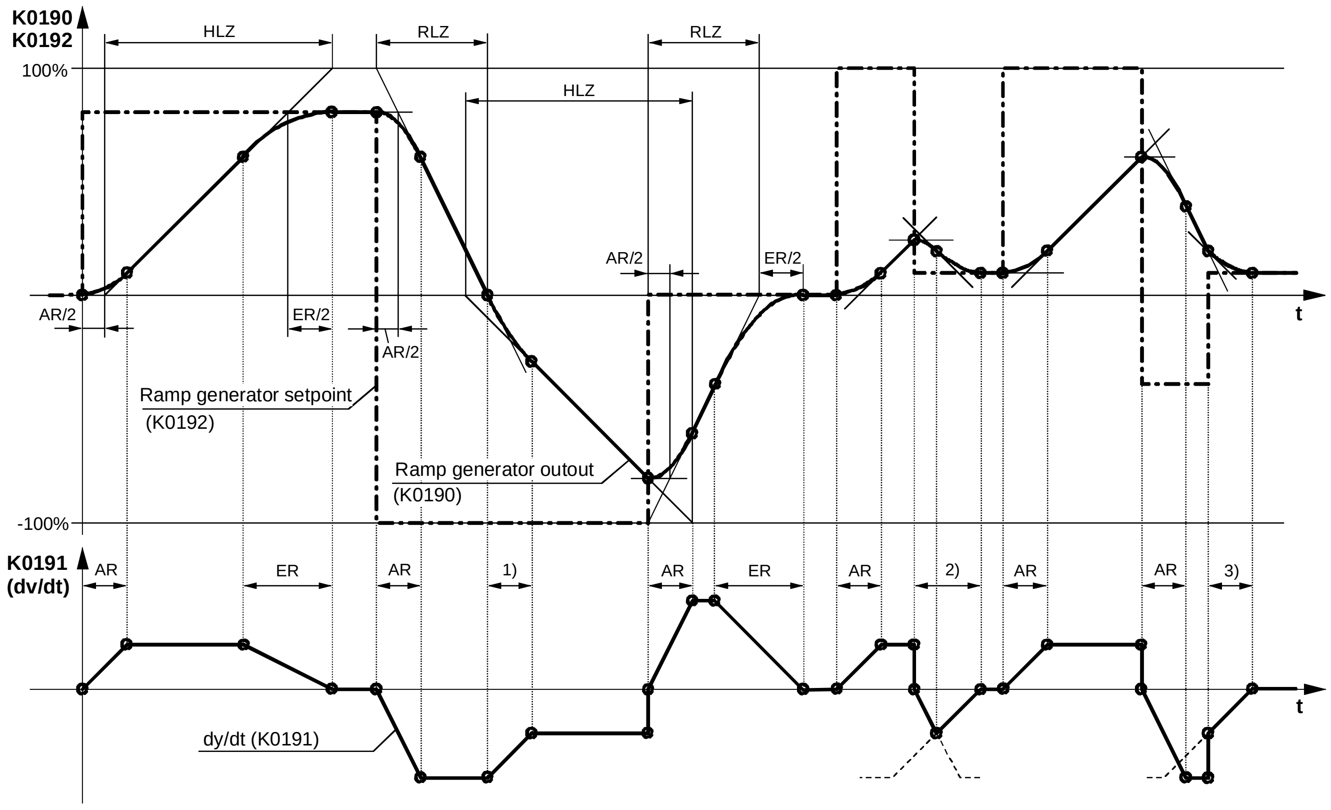
Ramp-down = Deceleration from high, positive to low, positive speeds (e.g. from 90% to 10%) or from high, negative to low, negative speeds (e.g. from -90% to -10%)

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 Selected via parameter		R-F generator setting	Effective ramp-up time	Effective ramp-down time	Effective lower rounding	Effective upper 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 (→ 0), ramp-function generator setting 1 is activated again and, with a new enable command (→ 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:

$$\frac{-M_{limit} * 1.25}{K_p} + n_{act} \quad < \quad \text{RFG output} \quad < \quad \frac{+M_{limit} * 1.25}{K_p} + n_{act}$$

When P170 = 1 (torque control), the following equation applies:

$$\frac{-I_{A,limit} * \Phi_{motor} * 1.25}{K_p} + n_{act} \quad < \quad \text{RFG output} \quad < \quad \frac{+I_{A,limit} * \Phi_{motor} * 1.25}{K_p} + n_{act}$$

When P170 = 0 (current control), the following equation applies:

$$\frac{-I_{A,limit} * 1.25}{K_p} + n_{act} \quad < \quad \text{RFG output} \quad < \quad \frac{+I_{A,limit} * 1.25}{K_p} + n_{ist}$$

Φ_{motor}	Normalized motor flux (1 at rated field current)
n_{act}	Actual speed value (K0167)
$+ M_{limit}$	Lowest positive torque limit (K0143)
$- M_{limit}$	Lower negative torque limit (K0144)
$+ I_{A, limit}$	Lowest positive current limit (K0131)
$- I_{A, limit}$	Lowest negative current limit (K0132)
K_p	Effective speed controller gain

However, if the value added to n_{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 ±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 ±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)

- **Switch operation**
  (switch between terminals XS-105 and XS-106; XS-107 open; XS-108 open)
  Opening this switch activates the safety shutdown operation.
- **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)

  Stop pushbutton pressed: Safety shutdown is executed and stored
  Reset pushbutton pressed: Storage of safety shutdown is cancelled

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) U616 = 0: E-Stop has same effect as OFF2 (as soon as I = 0, the firing pulses are disabled)
   b) U616 = 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 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 ≤o5)
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

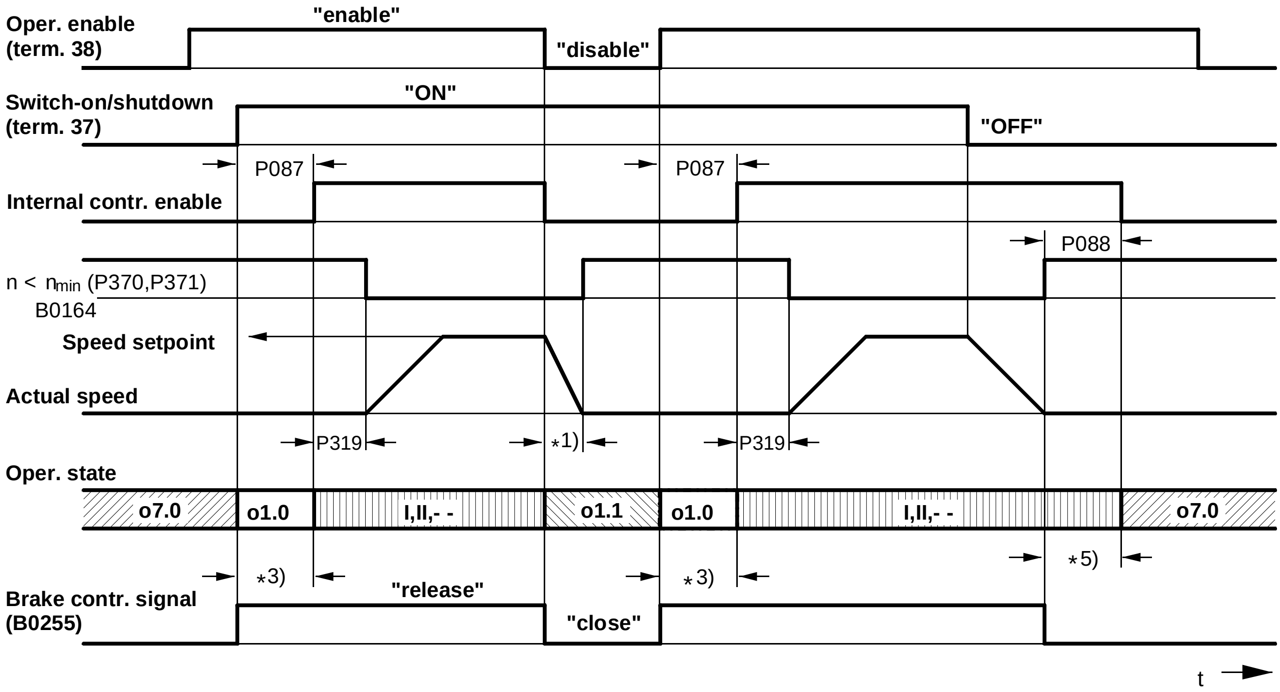
In order to drive a brake, this binector must be "wired up" to a binary output, e.g. by setting P771 to 250 for connection to output terminals 46 /47 (see Section 8, Sheet G112, for other possible settings).

The following parameters influence the action of the brake control signal:

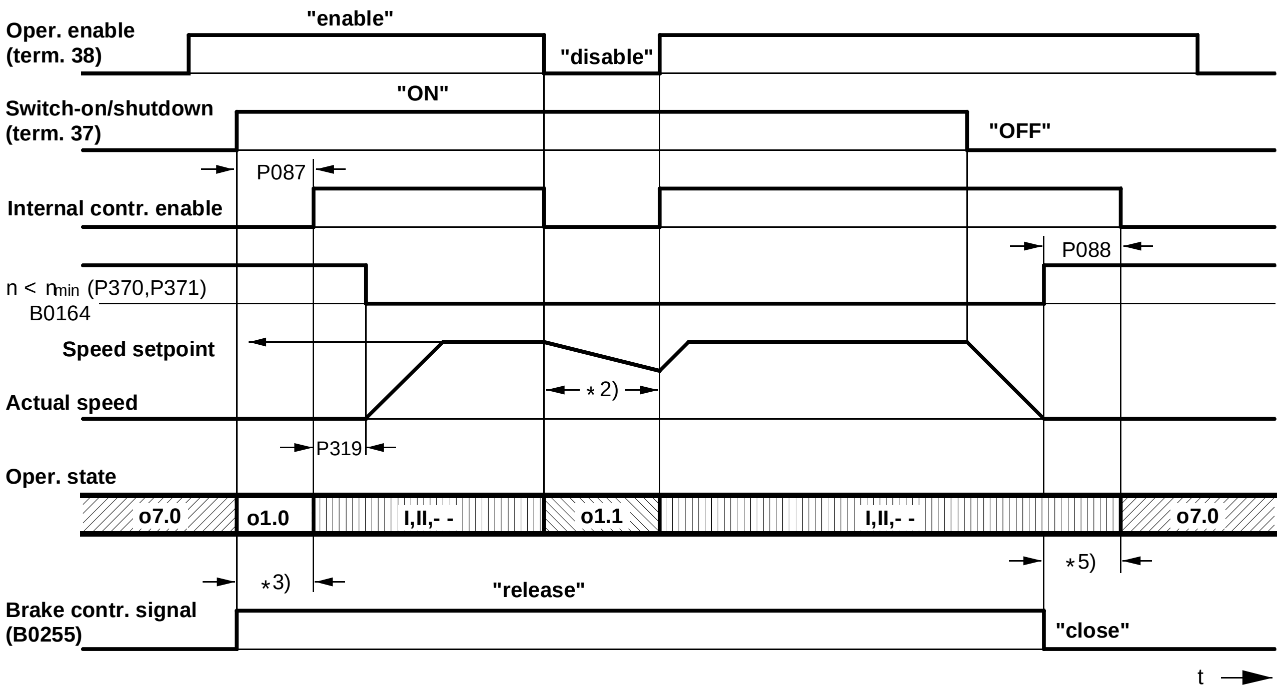
P080 = 1	The brake is a holding brake: "Close brake" command is entered only when $n < n_{min}$ (P370, P371)
P080 = 2	The brake is an operating brake: The "Close brake" command is entered even when the motor is running
P087	Brake release time: A positive value prevents the motor from acting against the 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)

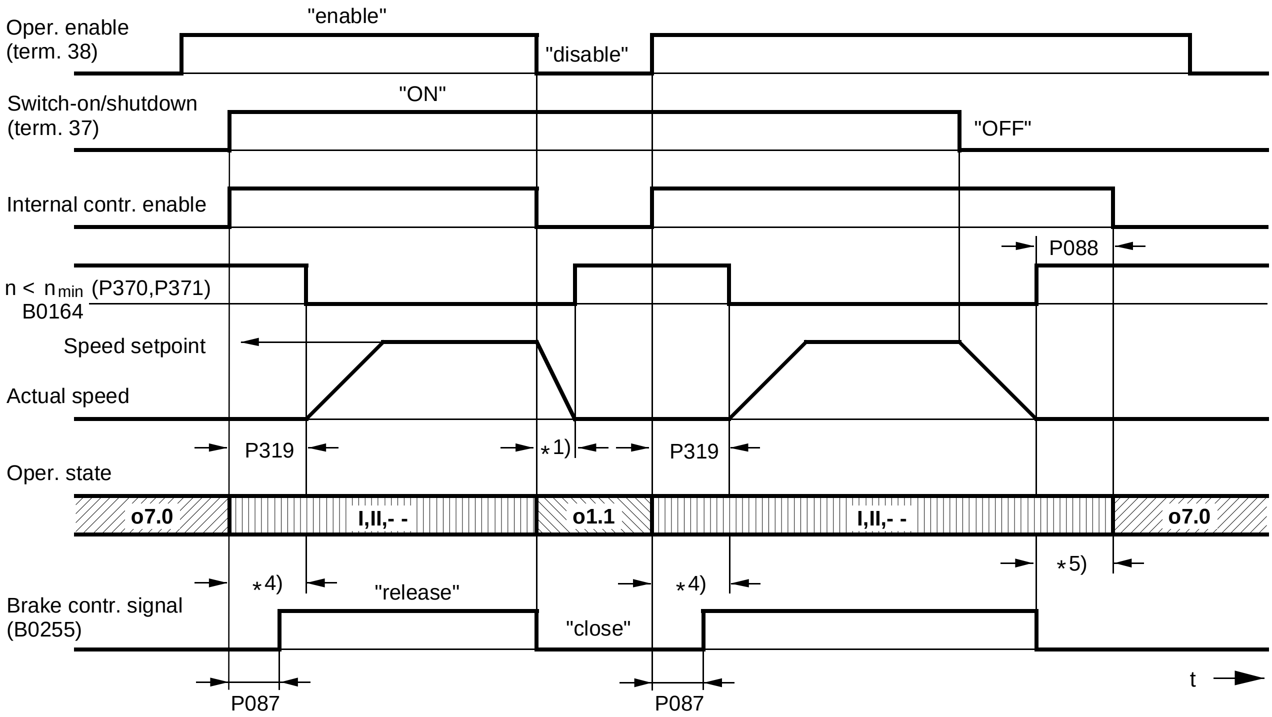


Holding brake (P080 = 1), positive brake release time (P087)

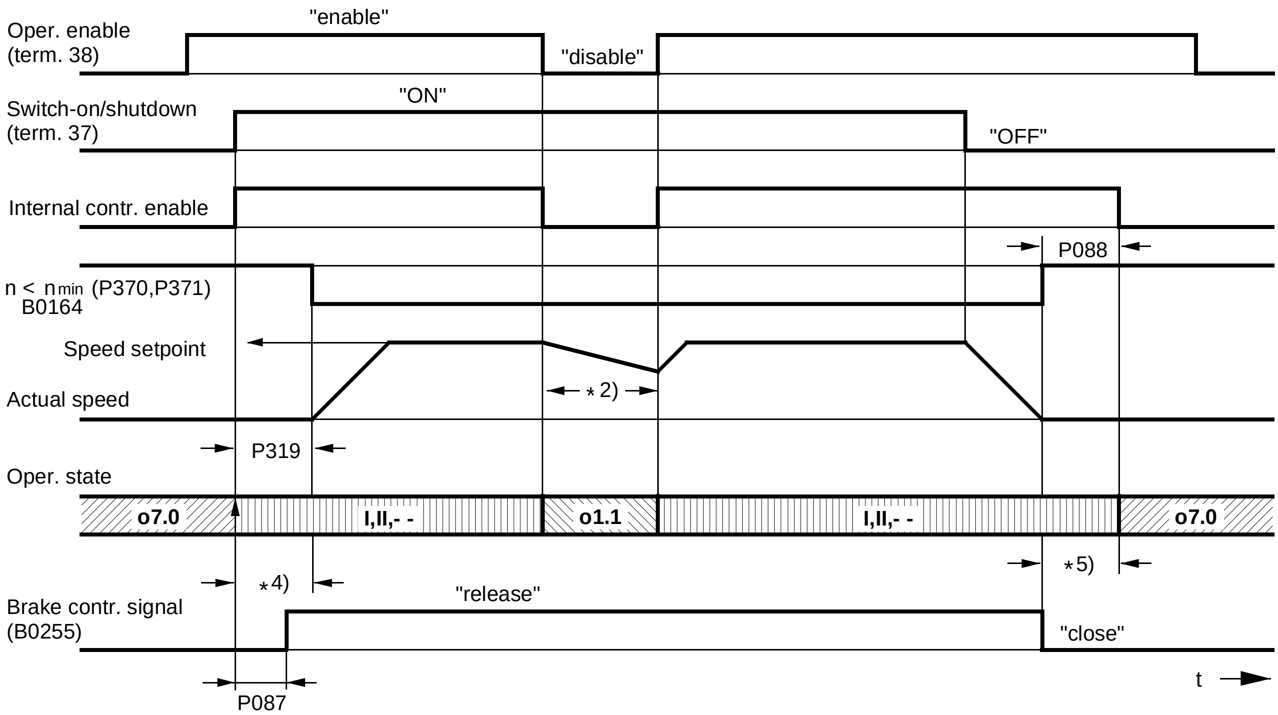


*1) Drive is braked mechanically by means of operating brake
*2) Drive coasts to standstill, "Close holding brake" not output until $n < n_{min}$
*3) Time for the brake to open before the motor produces a torque (P087 positive)
*5) Time for the brake to close while the motor is still producing a torque (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 of 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
Bit 16	Bit17	(active index)
0	0	1
1	0	2
0	1	3
1	1	4

Control word Bit30	Active Bico data set (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(set,n contr.) = M(set,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 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 α_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 6RA70 converter 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 converter.

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

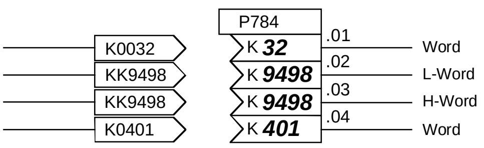
Sheets G170 to G172 in Section 8 show how useful data can be interconnected and list the parameters relevant for configuring USS interfaces.

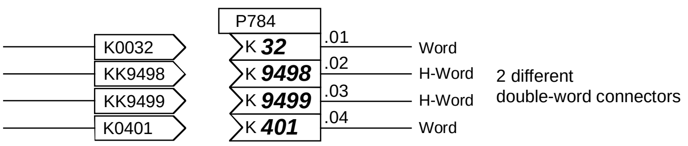
If parameters need to be read and/or written via the USS interface, then "Parameter data length" (P782, P792, P802) must be set to 3, 4 or 127 (select setting 4 only if double word parameters need to be transferred). If parameters do not need to be transferred, the "Parameter data length" must be set 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.

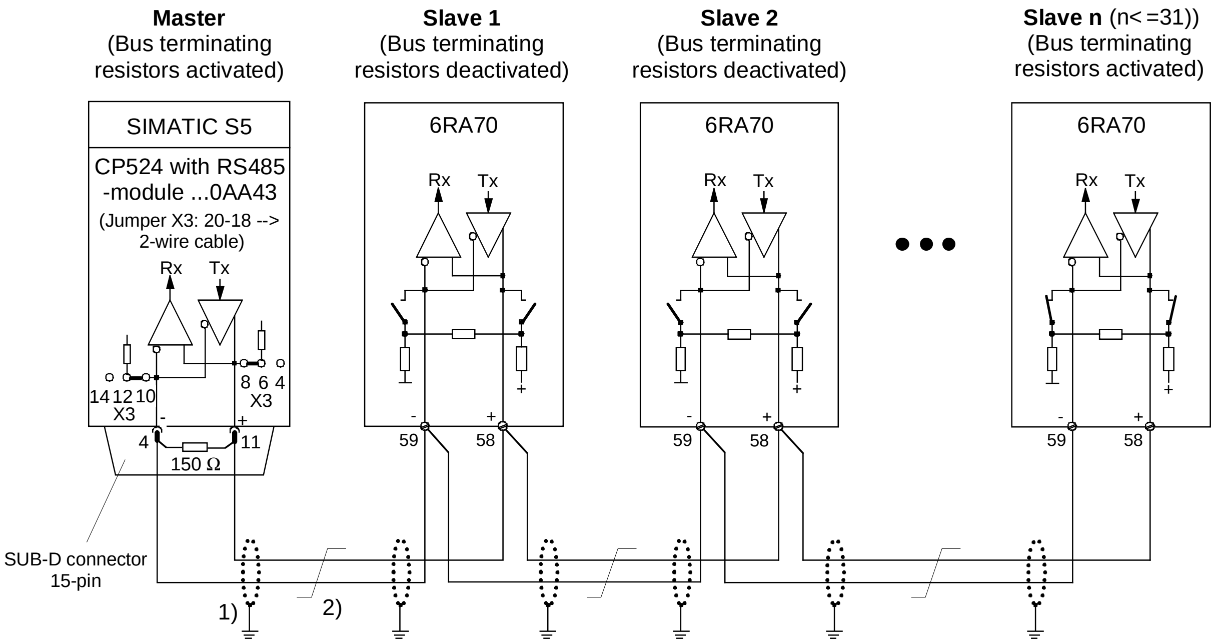
Important !

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

	G-SST1 **RS232 / RS485**	**G-SST1** **RS485** **for connection of an OP1S**	**G-SST2 / G-SST3** **RS485**
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) 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.) (applies to Receive and Send)	P781 = 0 to 16	P781 = 2	P791 / P801 = 0 to 16
PZD assignment for control word and setpoints (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: Word 1 (connector K2001): Wiring up of control bits from OP1S, see Sec. 7.2.2 Word 2 (connector K2002): Not used	All received process data are taken to connectors and must be wired up as required
No. of PKW	P782 = 0: No PKW data 3 / 4: 3 / 4 PKW data words 127: Variable data length for slave → master	P782 = 127 variable data length	P792 / P802 = 0: No PKW data 3 / 4: 3 / 4 PKW data words 127: Variable data length for slave → master
PZD assignment for actual values (transmitted process data)	Selection of transmitted values via P784	Word 1: P784.i01=32 (stat. word 1 K0032) Word 2: P784.i02=0	Selection of transmitted values via P794 / P804
Node address	P786 = 0 to 30	P786 = 0 to 30 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 1: Bus term. ON	P785 = 0: Bus term. OFF 1: Bus term. ON	P795 / P805 = 0: Bus term. OFF 1: Bus term. ON
Bus / point-to-point communication	RS232: Only point-to-point operation possible 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

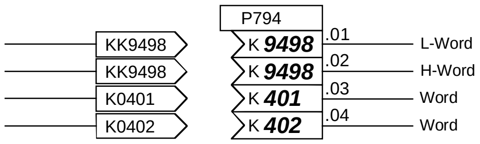
Sheets G173 and G174 in Section 8 show how useful data can be interconnected and list the parameters relevant for configuring peer-to-peer links. Any connectors can be parameterized as transmit data (numeric representation: 100% equals 4000h = 16384d).

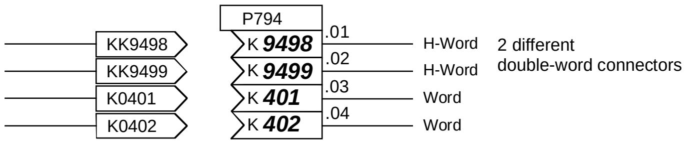
Parameters cannot be transferred via the peer-to-peer link.

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).

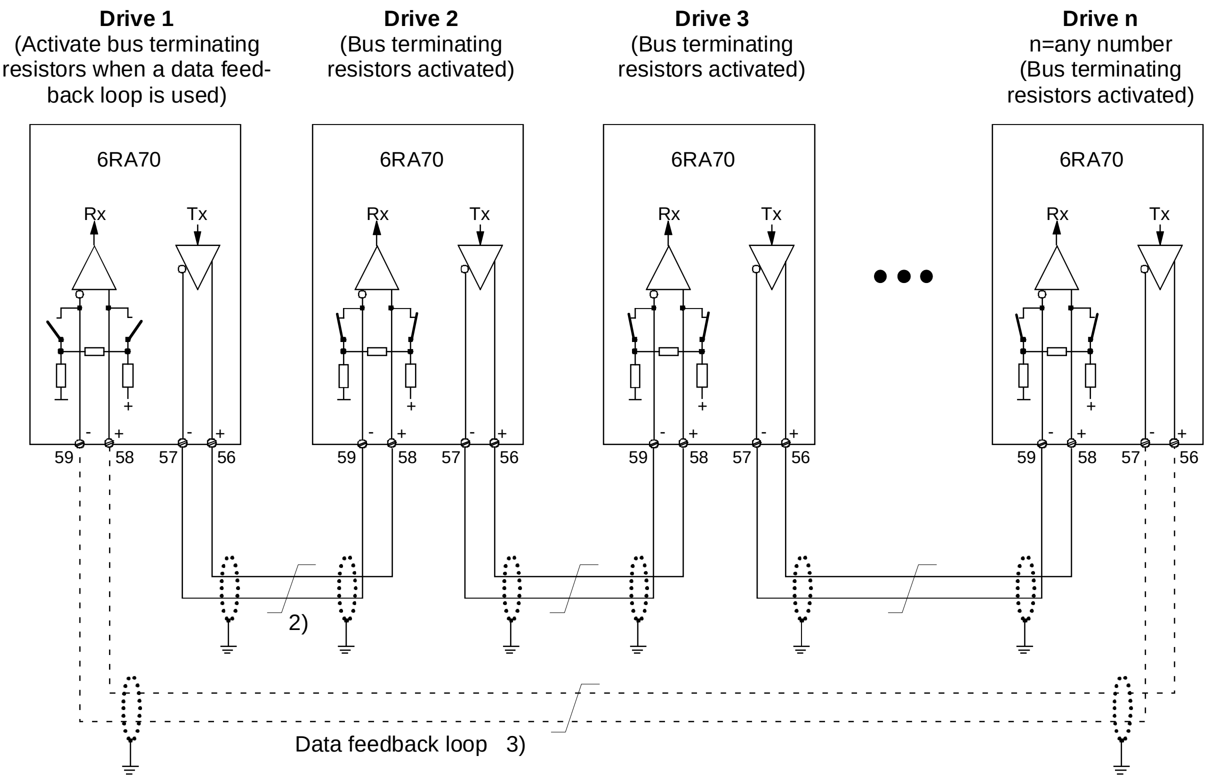
Peer-to-peer communication, 4-wire operation

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 RS485	**G-SST3 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.) (applies to Receive and Send)	P791 = 1 to 5	P801 = 1 to 5
PZD assignment for control word and setpoints (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 (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 1: Bus term. ON (depending on type of link)	P805 = 0: Bus term. OFF 1: Bus term. ON (depending on type of link)
2-wire / 4-wire transmission 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

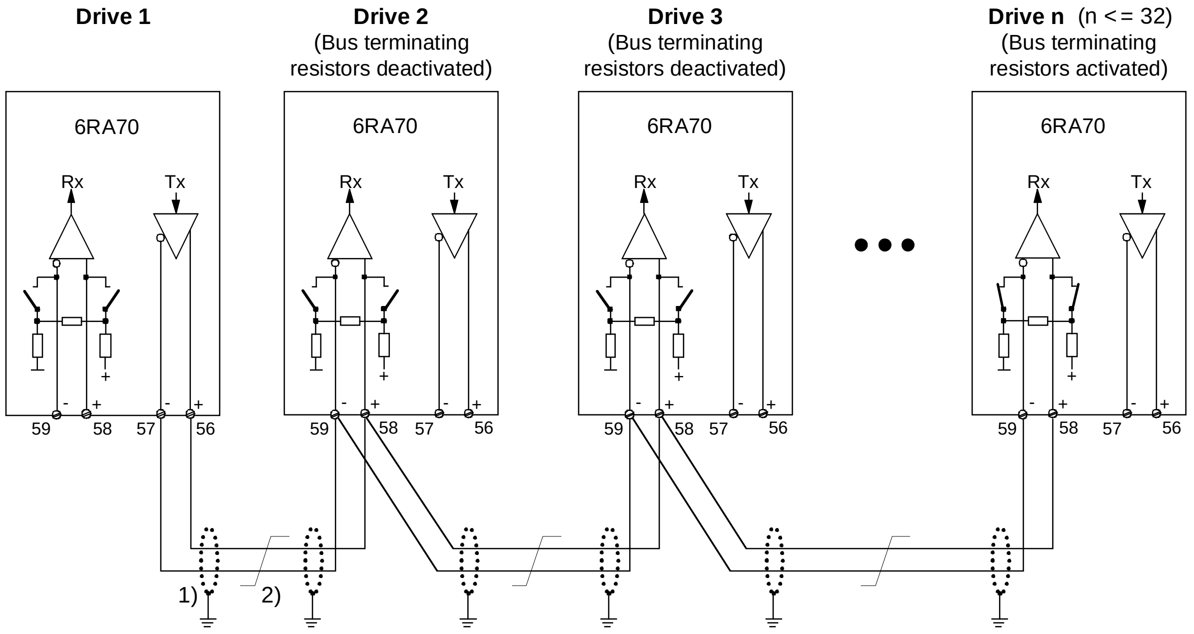
Examples of peer-to-peer links



Peer link type "Series connection"

Each drive receives its own individual setpoint from the drive connected upstream (classic setpoint cascade)

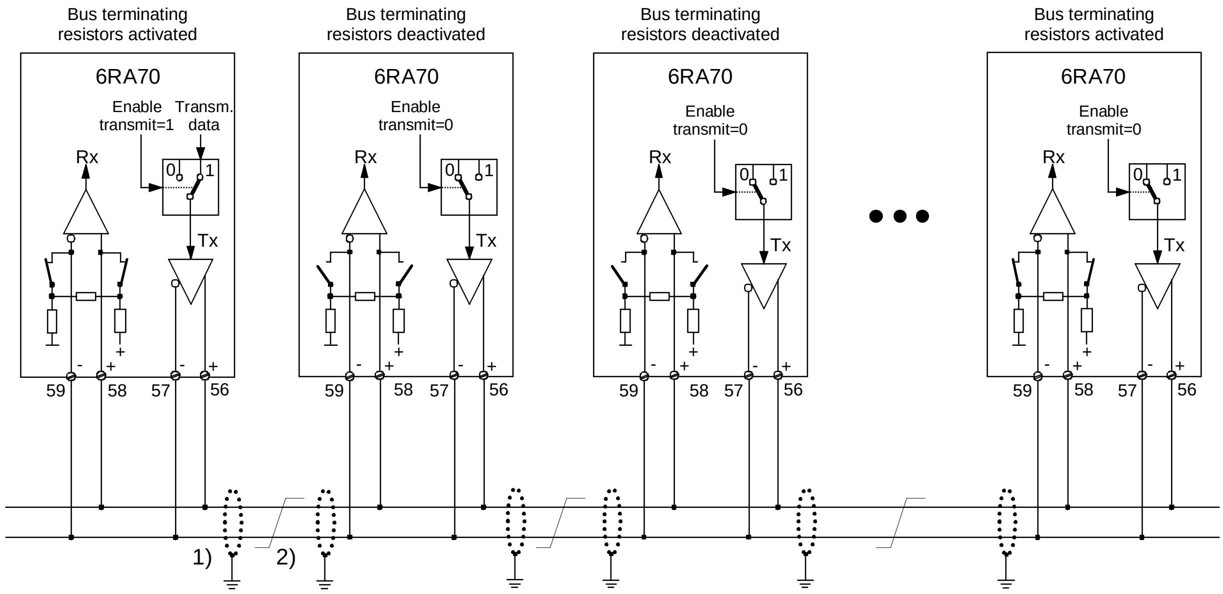
1) The interface cable shields must be connected directly on the converter with the lowest possible impedance to converter or cubicle earth (e.g. via a clamp).
2) Twisted cable, e.g. LIYCY 2x0.5 sqmm; with longer cables, an equipotential bonding conductor must be used to ensure that the difference in 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.



Peer link type "Bus connection"

Up to 31 drives receive identical setpoints from one drive. The setpoint source drive is selected with "Enable transmit" = 1. "Enable transmit" = 0 must be preset for all other drives.

1) The interface cable sheilds 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^2t monitoring of motor)

The I^2t monitoring function is parameterized in parameters P100 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_{motor} in minutes for the I^2t 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.

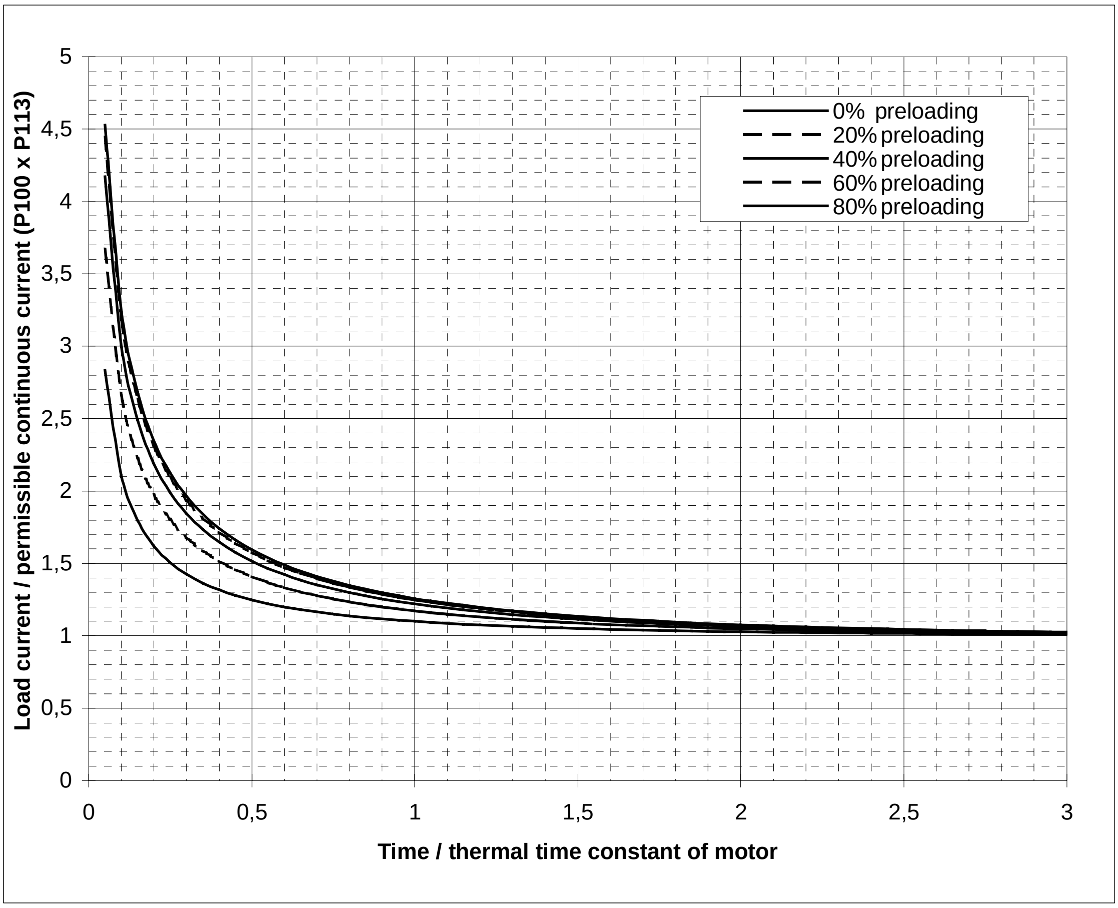
Warning characteristic / switch-off characteristic

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^2t monitoring function

This diagram shows how long it takes for an alarm message to be triggered if, after a long preloading period (> 5 * T_th), a new constant load value is injected abruptly.

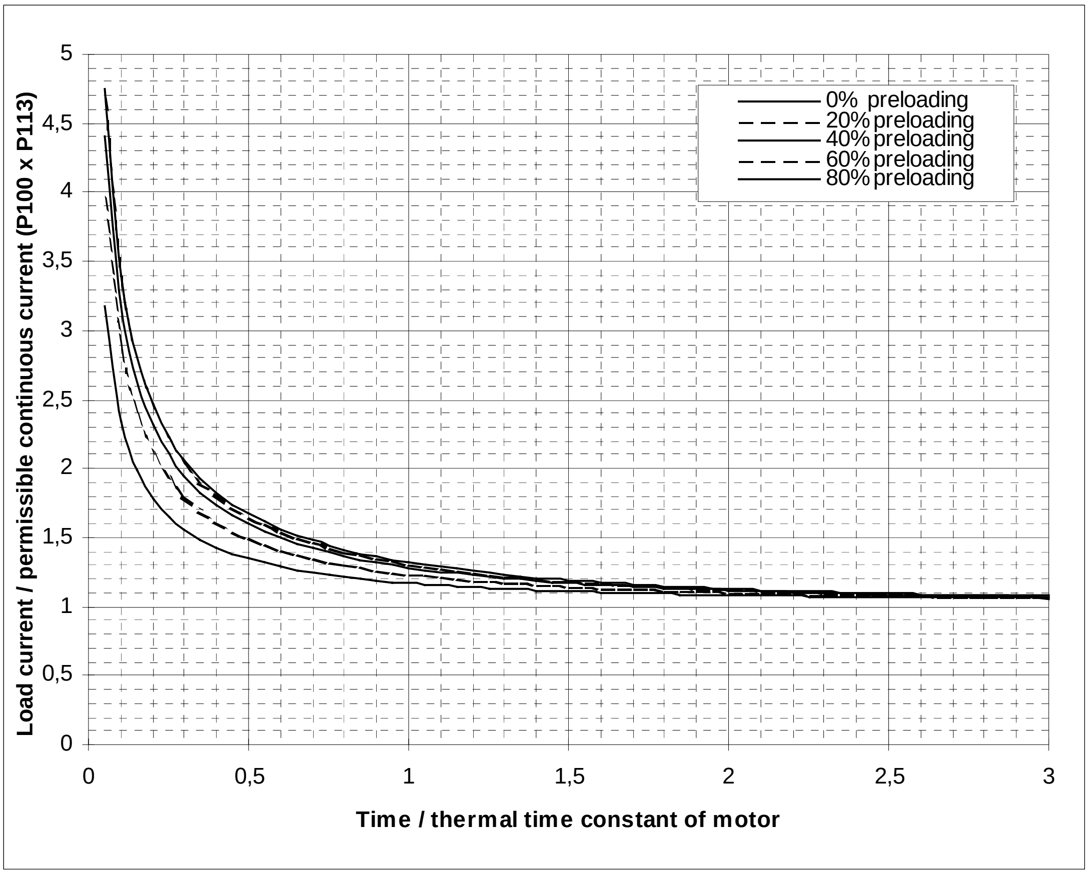
T_th = P114 .. thermal time constant of motor



Fault message triggering by motor I²t monitoring function

This diagram shows how long it takes for a fault message to be triggered if, after a long preloading period (> 5∗ T_ th), a new constant load value is injected abruptly.

T_ th = P114 .. thermal time constant of motor

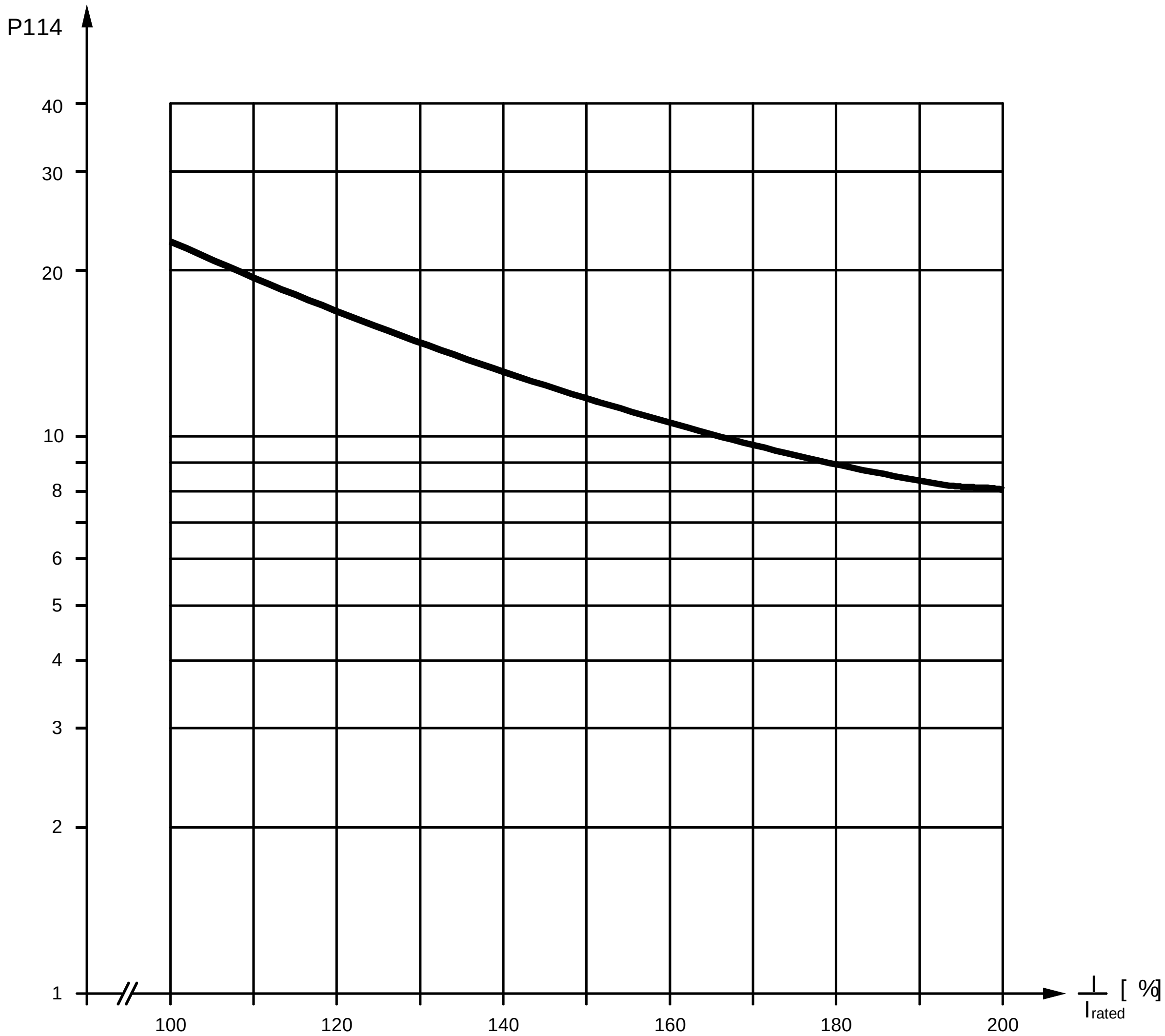


CAUTION
When the electronics power supply fails for longer than 2 s, the calculated motor preloading value is lost. When the supply is reconnected, the system assumes that the connected motor has not been loaded at all! If the electronics power supply fails and the converter is switched on again within 2 s (e.g. via the "Automatic restart" function), then the temperature calculation is based on the last calculated I²t value of the motor.. The I²t 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 I²t 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 Dynamic overload capability of power section

9.15.1 Overview of functions

The converter rated DC current specified on the rating plate (= maximum permissible continuous direct current when P077 = 1.00) may be exceeded in operation. The amount and permissible duration of the overload are subject to limits which are explained in more detail below.

The absolute upper limit for the absolute value of overload currents corresponds to 1.8 times the converter rated DC current * P077 (= r072.001 * P077). The maximum overload period depends both on the time characteristic of the overload current and on the load history of the converter and differs depending on the installed power section.

Every overload must be preceded by an "underload" (load phase at load current < P077 * rated DC current). After the maximum permissible overload period has expired, the load current must be reduced to a value of at least ≤ P077 * converter rated DC current.

The dynamic overload period is made possible by a thermal monitoring function (I^2t monitor) in the power section. This uses the time characteristic of the actual load current to calculate the time characteristic of the thyristor temperature rise over ambient temperature. When the converter is switched on, the calculation commences with the initial values that were calculated before the converter power supply was last switched off/last failed. Allowance can be made for ambient conditions (ambient temperature, installation altitude) by the setting in parameter P077.
In the delivery state, the ambient temperature is always set to the maximum permissible value (i.e. 45°C for naturally cooled converters and 35°C for converters with forced cooling).

The I^2t monitoring function responds when the calculated thyristor temperature rises exceeds the permissible limit. Two alternative responses to the monitor can be parameterized:

P075 = 1: Alarm A039 with reduction of armature current setpoint to P077 * converter rated DC current

P075 = 2: Fault F039 followed by converter shutdown

The I^2t monitoring function can be deactivated. In this case, the armature current is limited to the setting in P077 * converter rated DC current (= P077 * r072.001).

Connector K310 contains the calculated thyristor overtemperature as a % of the maximum permissible converter-specific thyristor overtemperature:

80°C on 15A to 60A converters
85°C on 90A to 140A converters
90°C on converters of > 200A converter rated armature DC current.

9.15.2 Configuring for dynamic overload capability

Section 9.15.3 provides the following information for each converter model:

– Maximum overload period t_{an} for starting with cold power section and specified constant overload with an overload factor of X (i.e. loading with X times the converter rated DC current * P077) (see small table at top right)

– Maximum current interval t_{ab} (maximum cooling time) until the power section reaches the "cold" state (see below small table at top right)

– Limit characteristics fields for calculating overload capability in thermally settled, intermittent overload operation (periodic load cycles).
(In tabulated form: Top left
As curve with logarithmic y axis: Curve at bottom left
As curve with linear y axis: Curve at bottom right)

Important:
The power section is in the "cold" state when the calculated thyristor temperature corresponds to less than 5 % of its maximum permissible value. This state can be scanned via a binary selectable output.

Note:
If load cycles are started with a cold power section at least slightly within the specified load cycle limits, then the thermally settled state can be reached without tripping the I^2t monitor.
If the I^2t monitoring function is parameterized for a shutdown response (P075 = 2), the converter should not be allowed to operate too close to the limit characteristic when periodic load cycles are configured with a load cycle time of longer or slightly shorter or equal to 300 s.
In all other cases, and especially when parameterizing reduction of the armature current setpoint (P075 = 1) as the I^2t monitoring trip response, it is possible to fully utilize the maximum overload capability defined by the limit characteristic.

Structure of limit characteristics fields for intermittent overload duty:

Each characteristics field refers to a load cycle of intermittent overload operation with a total period of 300 s.
This type of load cycle consists of two periods,
i.e. the base-load duty period (armature actual current ≤ P077 * converter rated DC current)
and the overload period (actual armature current ≥ P077 * converter rated DC current).

Each limit characteristic displays the maximum permissible overload period Tp over the maximum base-load current Ig for a specific overload factor X for each converter model.
For the remainder of the load cycle, the current may not exceed the base-load current as defined by the overload factor.
If no limit characteristic is specified for a particular overload factor, then the characteristic for the next-higher overload factor must be applied.

The limit characteristics fields apply to a load cycle time of 300s.
For load cycle times of < 300s, the overload period must be reduced proportionally (load cycle/300s).
For load cycle times of > 300s, the overload period is the same as that for a cycle time of 300s, but the base-load period is correspondingly longer.

The limit characteristics fields apply for a setting of P077 = 1.00. If P077 is set to ≤ 1.00, i.e. in the case of thermal derating, the currents which actually flow must be weighted with a factor of 1/P077:

$$\text{Overload factor X for characteristic} = \frac{\textit{Actual overload current}}{P077 * \textit{converter rated DC current}}$$

Actual maximum base-load current = P077 * max. base-load current acc. to characteristic in % of converter rated DC current

Basic tasks for configuring periodic overload operation

Terms: Base-load duty period$_{300}$ = min. base-load duty period for 300 s cycle time
Overload period$_{300}$ = max. overload period for 300 s cycle time

Basic task 1:

Known quantities: Converter type, cycle time, overload factor, overload period

Quantities to be found: Minimum base-load duty period and maximum base-load current

Solution: Selection of limit characteristic for specified converter type and overload factor

Cycle time < 300s: Overload period$_{300}$ = (300s/cycle time) * overload period
Cycle time ≥ 300s: Overload period$_{300}$ = Overload period
If: Overload period$_{300}$ > overload period$_{300}$ for base-load current = 0
Then: Required load cycle cannot be configured,
Otherwise: Determine the maximum base-load current for overload period$_{300}$ from the limit characteristic

Example 1:

Known quantities: 30A/4Q converter; cycle time 113.2s; overload factor = 1.45; overload period = 20s

Quantities to be found: Minimum base-load period and maximum base-load current

Solution: Limit characteristic for 30A/4Q converter, overload factor 1.5
Overload period$_{300}$ = (300s/113.2s) * 20s = 53s
Base-load period$_{300}$ = 300s – 53s = 247s →
Maximum base-load current = approx. 45% of I_{rated} = 13.5A

Basic task 2:

Known quantities: Converter type, cycle time, overload factor, base-load current

Quantities to be found: Minimum base-load period and maximum overload period

Solution: Selection of limit characteristic for specified converter type and overload factor
Determine overload period$_{300}$ for base-load current from limit characteristic

Cycle time < 300s:
Max. overload period = (cycle time/300s) * overload period$_{300}$
Min. base-load period = cycle time – max. overload period

Cycle time ≥ 300s:
Max. overload period = overload period$_{300}$
Min. base-load period = cycle time – max. overload period

Example 2:

Known quantities: 30A/4Q converter; cycle time 140s; current overload factor = 1.15;
base-load current = 0.6* I_{rated} = 18A

Quantities to be found: Minimum base-load period and maximum overload period

Solution: Limit characteristic for 30A/4Q converter, overload factor 1.2
Base-load current = 60% of I_{rated} → overload period$_{300}$ = 126.35s
Max. overload period = (140s/300s) * 126.35s = approx. 58s
Min. base-load period = 140s – 58s = 82s

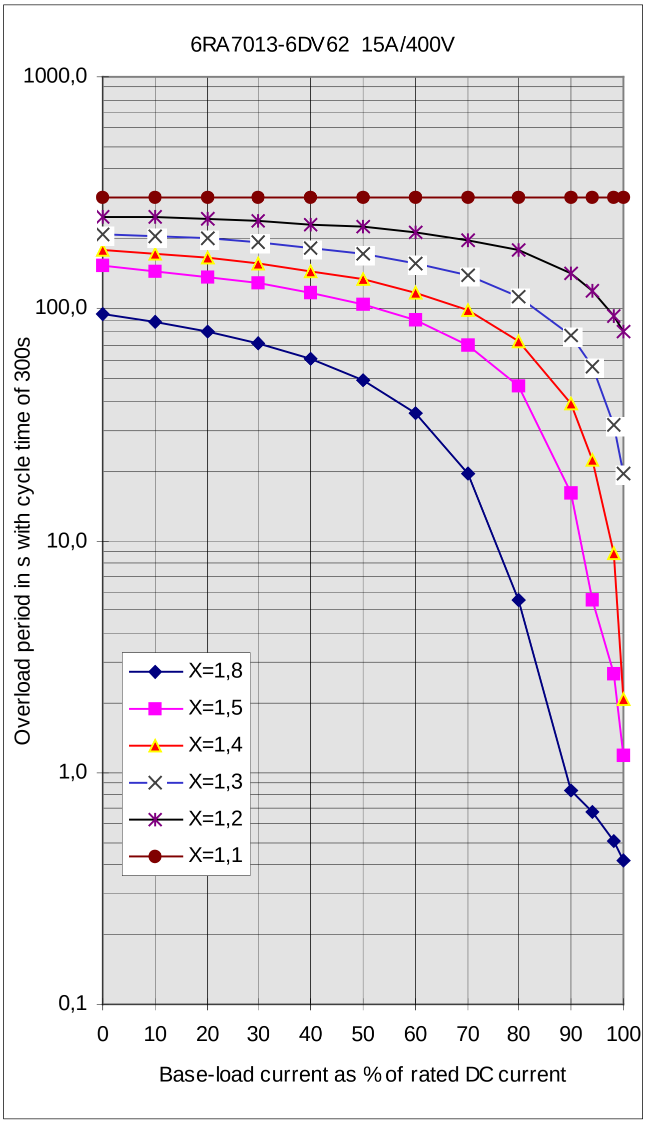
9.15.3 Characteristics for determining the dynamic overload capability for intermittent overload operation

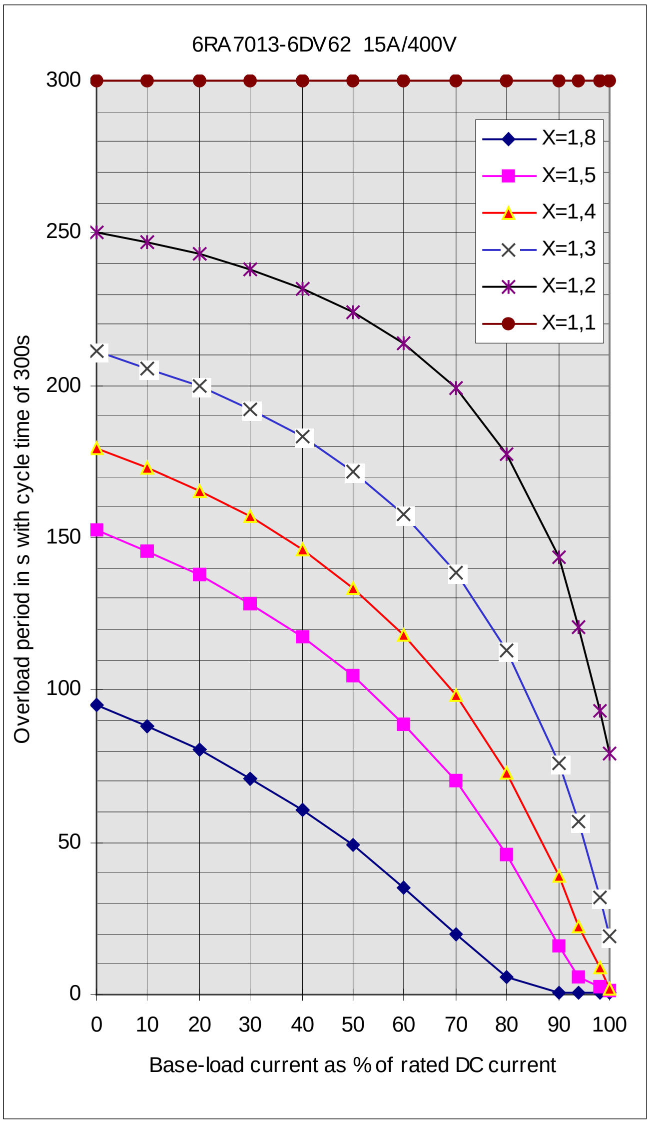
6RA7013-6DV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	95.420	152.660	179.100	211.080	250.440	300.000
10	88.298	145.785	172.818	205.833	247.077	300.000
20	80.245	137.837	165.438	199.620	243.106	300.000
30	71.148	128.570	156.707	192.183	238.150	300.000
40	60.760	117.657	146.280	183.060	231.964	300.000
50	48.911	104.704	133.676	171.763	224.061	300.000
60	35.280	89.040	118.105	157.453	213.554	300.000
70	19.600	69.916	98.440	138.528	199.098	300.000
80	5.512	46.107	72.987	112.909	177.737	300.000
90	0.838	15.990	38.903	76.140	143.360	300.000
94	0.670	5.590	22.080	56.520	120.320	300.000
98	0.503	2.651	8.750	31.800	93.013	300.000
100	0.419	1.182	2.085	19.440	79.360	300.000

X	t_{an} (s)
1.1	∞
1.2	1633
1.3	1112
1.4	833
1.5	651
1.8	382

t_{ab} (s) = 2281



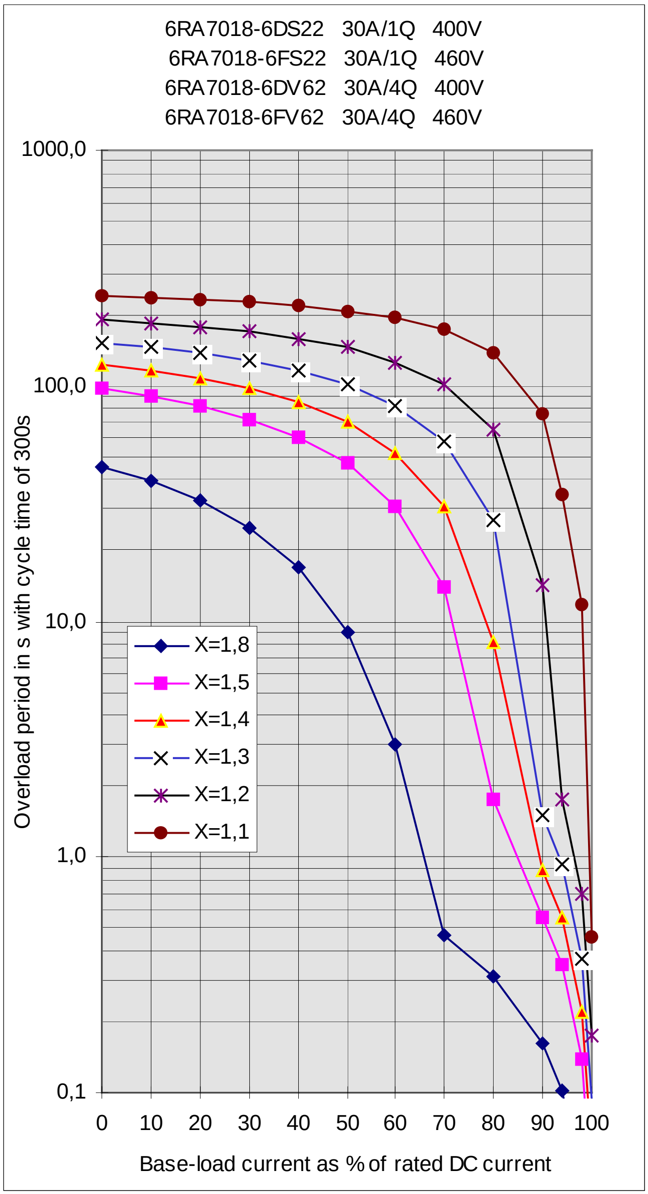


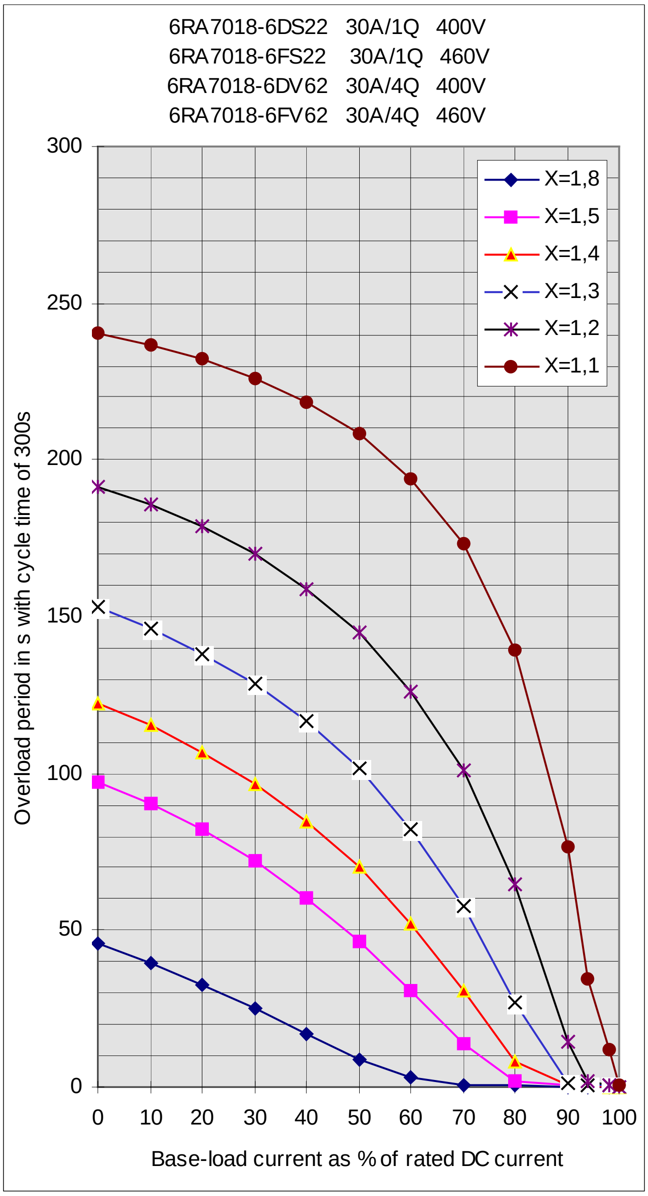
6RA7018-6DS22 and 6RA7018-6FS22.
6RA7018-6DV62 and 6RA7018-6FV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	45.520	97.480	122.400	153.020	191.300	240.300
10	39.447	90.410	115.380	146.357	185.582	236.594
20	32.616	82.061	106.977	138.295	178.589	231.970
30	25.093	72.179	96.909	128.483	169.899	226.113
40	17.093	60.500	84.768	116.423	158.923	218.466
50	9.069	46.750	70.012	101.402	144.877	208.253
60	2.993	30.889	51.992	82.375	126.350	194.047
70	0.466	13.944	30.536	57.809	101.038	173.048
80	0.314	1.750	8.127	26.755	64.820	139.207
90	0.162	0.554	0.880	1.491	14.255	76.260
94	0.101	0.346	0.550	0.932	1.758	34.440
98	0.041	0.138	0.220	0.373	0.703	11.787
100	0.010	0.035	0.055	0.093	0.176	0.460

X	t_{an} (s)
1.1	1439
1.2	906
1.3	631
1.4	456
1.5	333
1.8	123

t_{ab} (s) = 2169



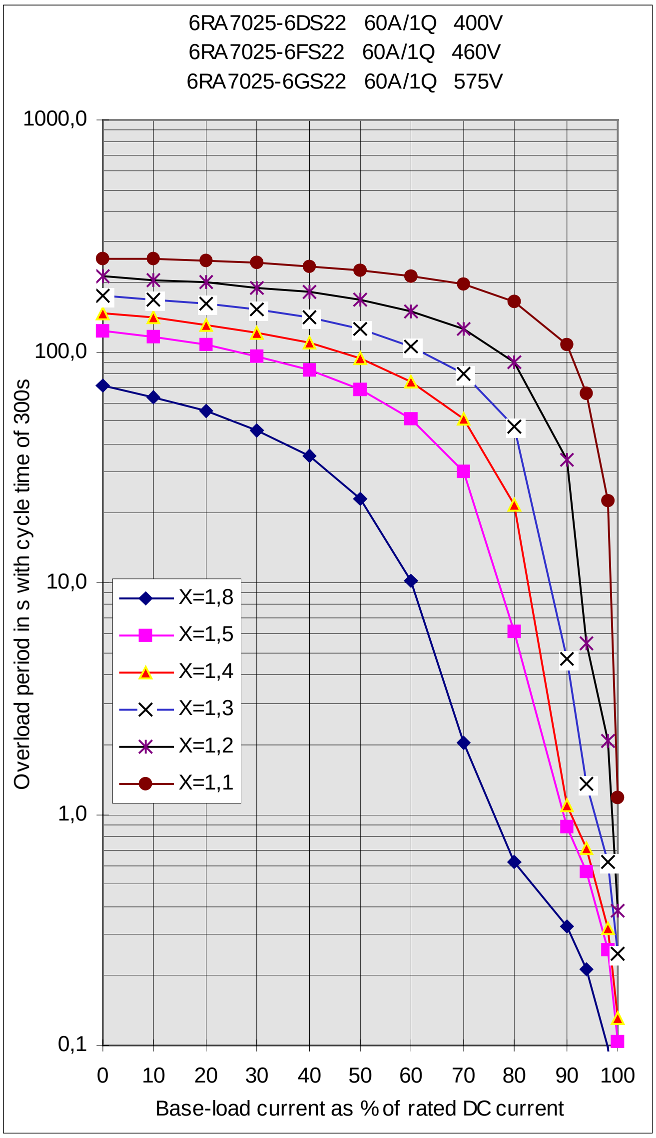


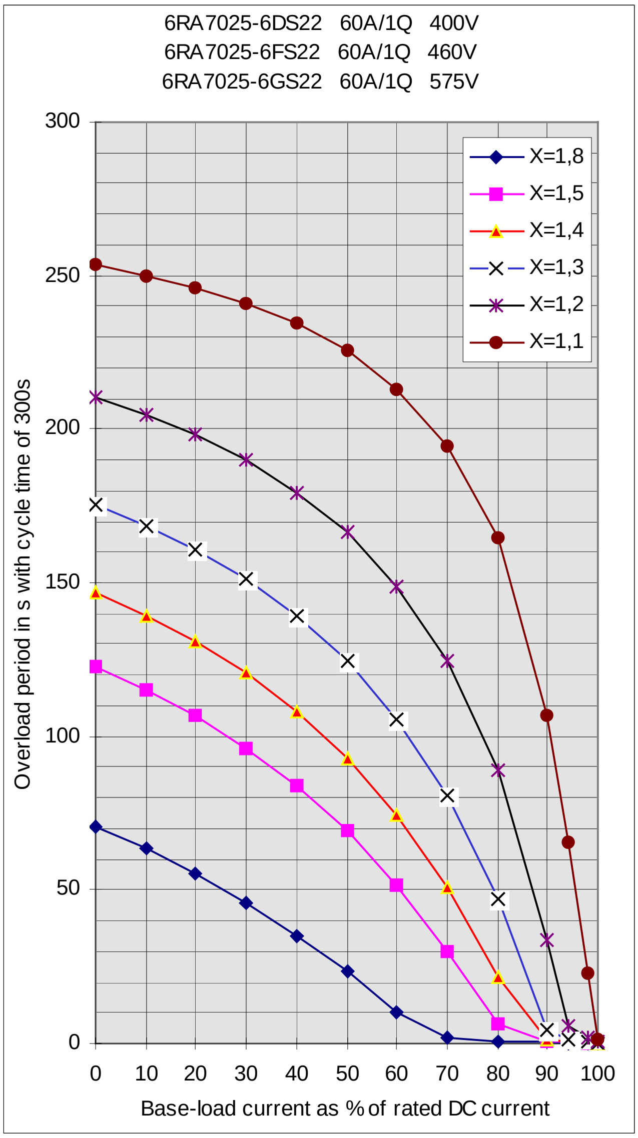
6RA7025-6DS22. 6RA7025-6FS22 and 6RA7025-6GS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	70.600	122.800	146.660	175.280	210.100	253.320
10	63.372	115.270	139.406	168.624	204.640	250.030
20	55.152	106.462	131.198	160.650	198.004	245.968
30	45.796	96.080	120.544	151.002	189.831	240.862
40	35.187	83.785	108.182	139.149	179.545	234.267
50	23.257	69.086	93.111	124.364	166.345	225.415
60	10.164	51.369	74.442	105.480	148.834	213.073
70	2.022	30.087	51.000	80.716	124.642	194.690
80	0.620	6.095	21.643	47.267	89.280	164.645
90	0.330	0.876	1.097	4.671	33.840	106.744
94	0.213	0.568	0.711	1.362	5.483	65.650
98	0.097	0.259	0.324	0.621	2.083	22.677
100	0.039	0.104	0.131	0.250	0.383	1.190

X	t_{an} (s)
1.1	2071
1.2	1352
1.3	988
1.4	756
1.5	592
1.8	296

t_{ab} (s) = 2169



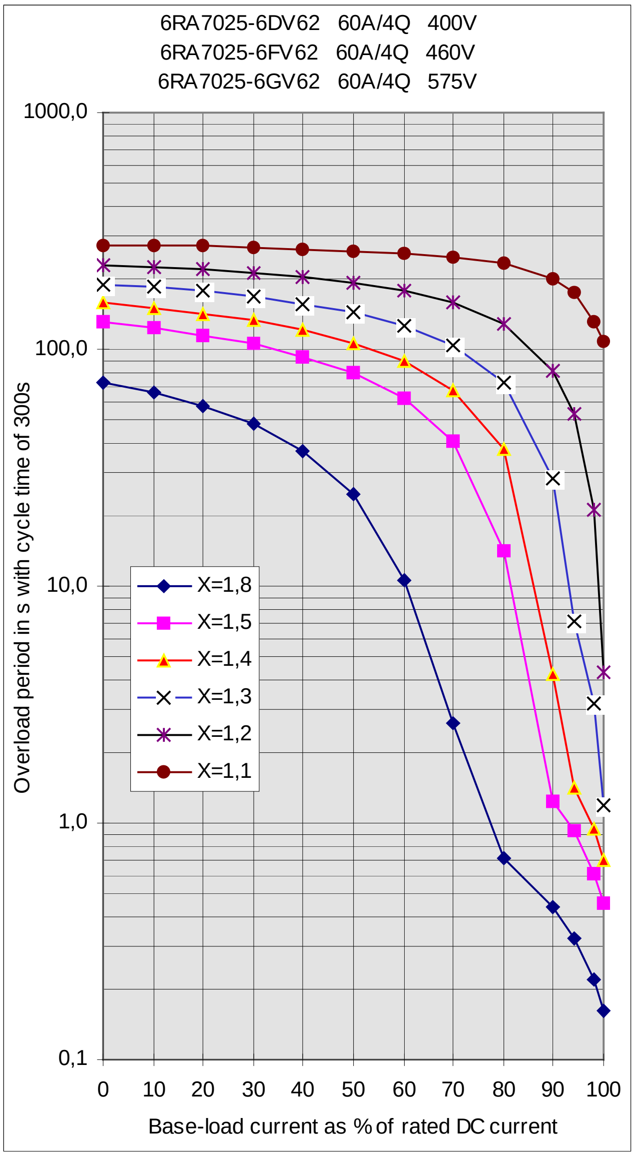


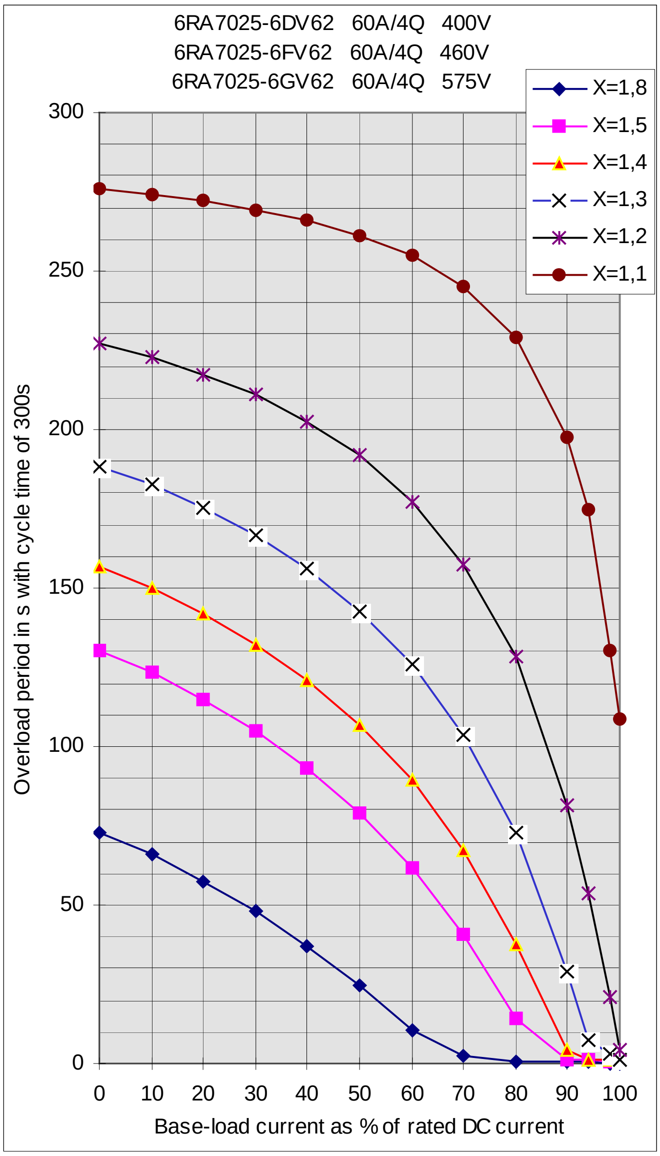
6RA7025-6DV62. 6RA7025-6FV62 and 6RA7025-6GV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	72.980	130.400	156.740	188.460	227.300	275.940
10	65.811	123.227	149.957	182.498	222.876	274.175
20	57.585	114.814	141.930	175.350	217.469	272.034
30	48.150	104.895	132.360	166.711	210.816	269.379
40	37.259	93.130	120.832	156.101	202.443	265.933
50	24.678	79.007	106.735	142.839	191.669	261.301
60	10.683	61.827	89.233	125.906	177.370	254.787
70	2.634	40.555	66.989	103.596	157.563	245.064
80	0.716	14.001	37.903	72.993	128.433	228.970
90	0.439	1.241	4.225	28.730	81.603	197.474
94	0.328	0.927	1.420	7.154	53.876	174.472
98	0.217	0.614	0.940	3.179	20.823	130.537
100	0.162	0.457	0.700	1.191	4.296	108.570

X	t_{an} (s)
1.1	2535
1.2	1446
1.3	1016
1.4	761
1.5	587
1.8	283

t_{ab} (s) = 2522



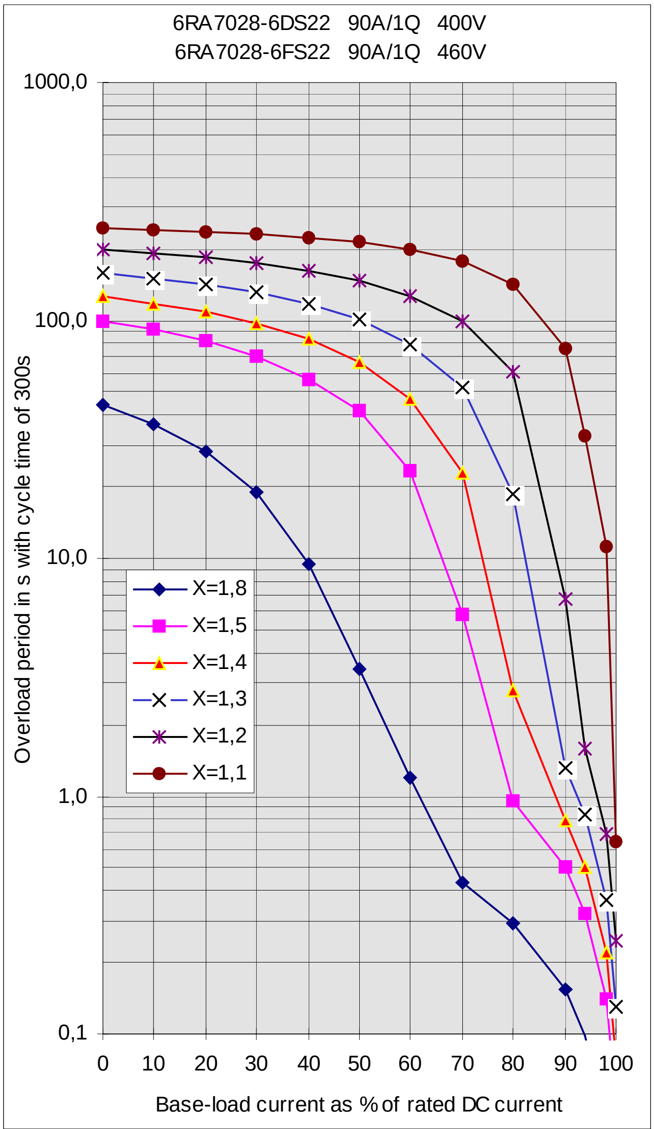


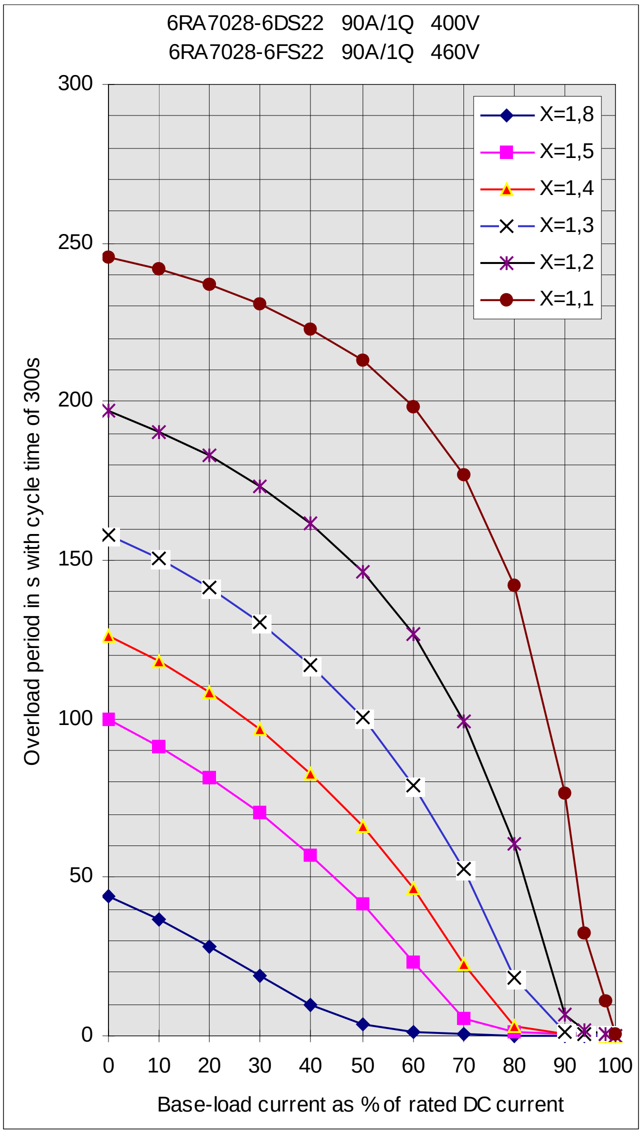
6RA7028-6DS22 and 6RA7028-6FS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	44.040	99.800	126.140	157.960	196.940	245.560
10	36.508	91.356	117.870	150.323	190.607	241.690
20	28.138	81.553	108.144	141.179	182.942	236.930
30	18.933	70.135	96.619	130.216	173.518	230.885
40	9.535	56.833	82.883	116.804	161.716	223.119
50	3.430	41.356	66.380	100.170	146.594	212.760
60	1.190	23.503	46.481	79.223	126.664	198.343
70	0.432	5.814	22.736	52.448	99.405	176.957
80	0.293	0.954	2.778	18.590	60.445	142.178
90	0.154	0.502	0.790	1.309	6.765	76.545
94	0.099	0.321	0.506	0.837	1.579	32.480
98	0.043	0.141	0.221	0.366	0.691	11.259
100	0.015	0.050	0.079	0.131	0.247	0.648

X	t_{an} (s)
1.1	1879
1.2	1186
1.3	831
1.4	604
1.5	443
1.8	151

t_{ab} (s) = 2668



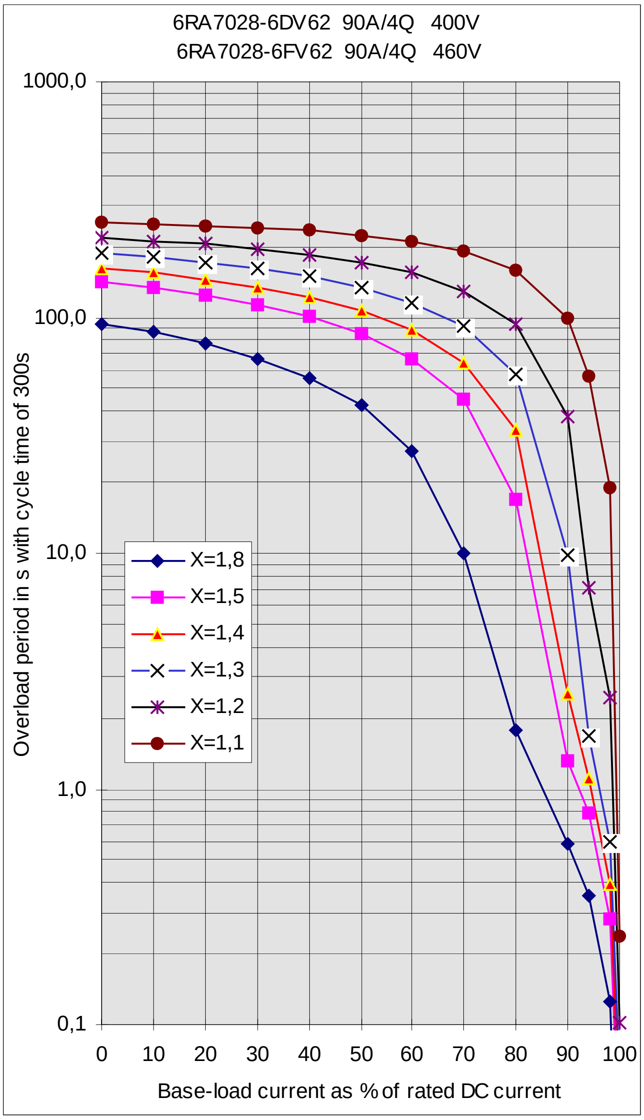


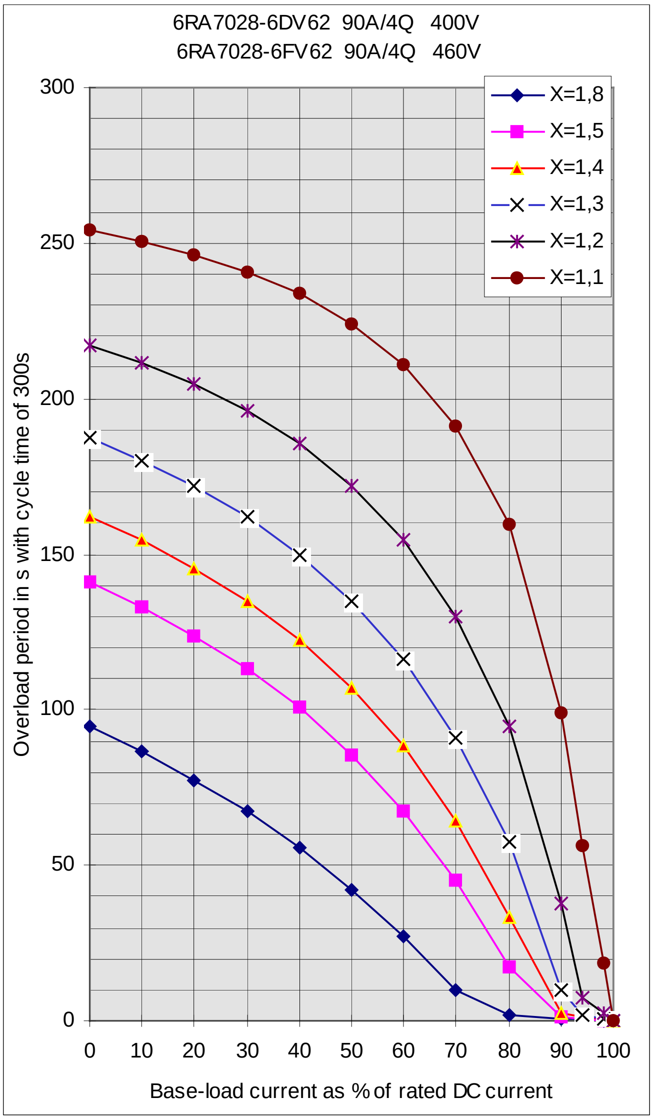
6RA7028-6DV62 and 6RA7028-6FV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	94.460	141.260	162.280	187.240	217.380	254.460
10	86.466	133.232	154.580	180.222	211.582	250.787
20	77.462	123.966	145.592	171.911	204.624	246.336
30	67.269	113.195	135.009	161.976	196.128	240.743
40	55.667	100.540	122.390	149.907	185.555	233.598
50	42.361	85.483	107.108	134.954	172.084	224.091
60	27.004	67.315	88.261	115.992	154.347	210.906
70	9.972	44.985	64.499	91.200	129.983	191.381
80	1.781	17.079	33.595	57.466	94.473	159.668
90	0.581	1.302	2.533	9.867	37.987	99.089
94	0.354	0.792	1.108	1.680	7.117	56.044
98	0.126	0.283	0.396	0.600	2.441	18.841
100	0.013	0.028	0.040	0.060	0.103	0.239

X	t_{an} (s)
1.1	1911
1.2	1320
1.3	1007
1.4	804
1.5	659
1.8	391

t_{ab} (s) = 2658



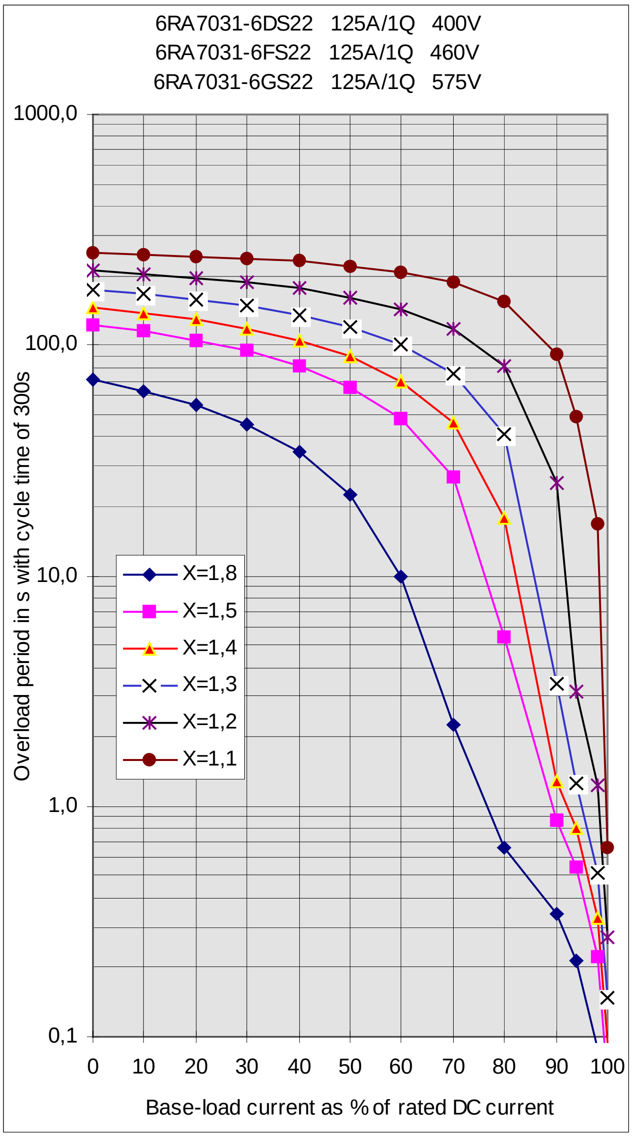


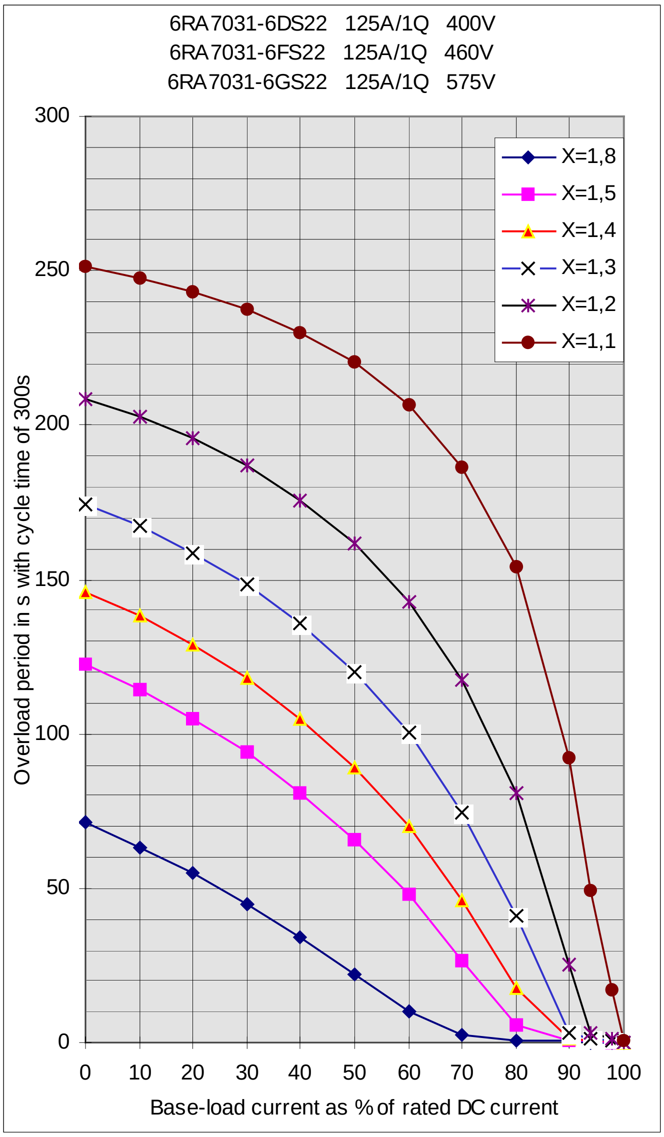
6RA7031-6DS22. 6RA7031-6FS22 and 6RA7031-6GS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	71.160	122.540	146.140	174.380	208.680	251.080
10	63.409	114.371	138.230	167.128	202.695	247.413
20	54.716	104.905	128.959	158.516	195.483	242.887
30	45.000	93.880	118.003	148.165	186.653	237.226
40	34.184	80.975	104.942	135.556	175.626	229.911
50	22.239	65.756	89.153	119.928	161.525	220.178
60	9.830	47.787	69.886	100.161	142.928	206.664
70	2.269	26.730	46.225	74.573	117.429	186.607
80	0.655	5.378	17.613	40.970	80.571	153.963
90	0.340	0.863	1.270	3.395	25.315	91.948
94	0.214	0.544	0.799	1.258	3.159	49.218
98	0.088	0.224	0.329	0.518	1.231	16.851
100	0.025	0.064	0.094	0.148	0.267	0.667

X	t_{an} (s)
1.1	1994
1.2	1318
1.3	968
1.4	743
1.5	582
1.8	289

t_{ab} (s) = 3110



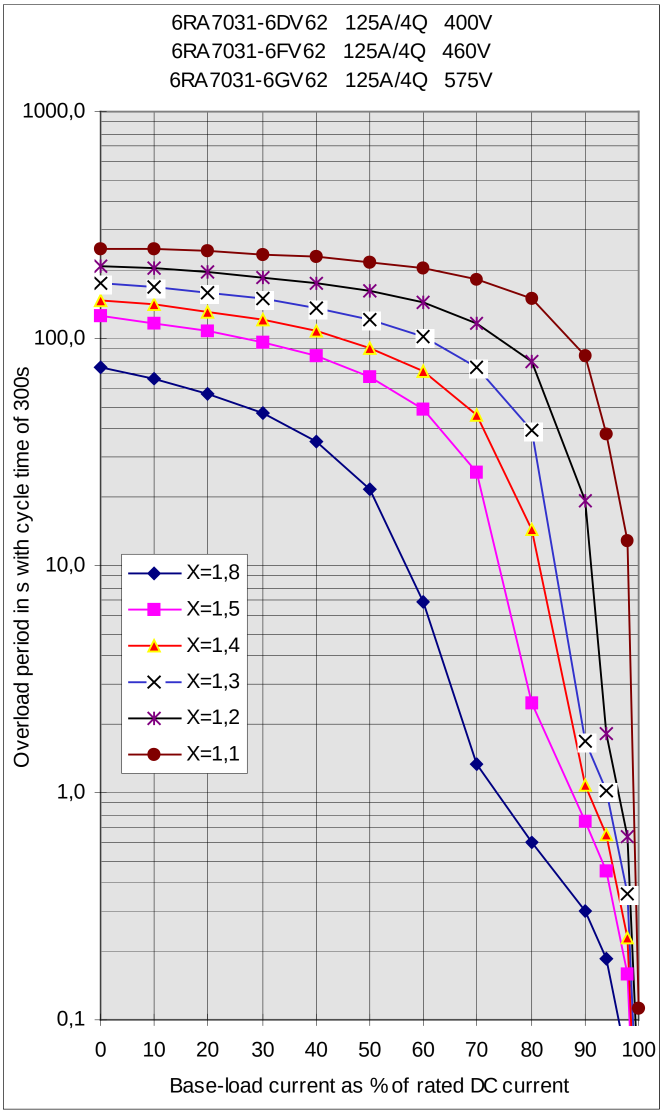


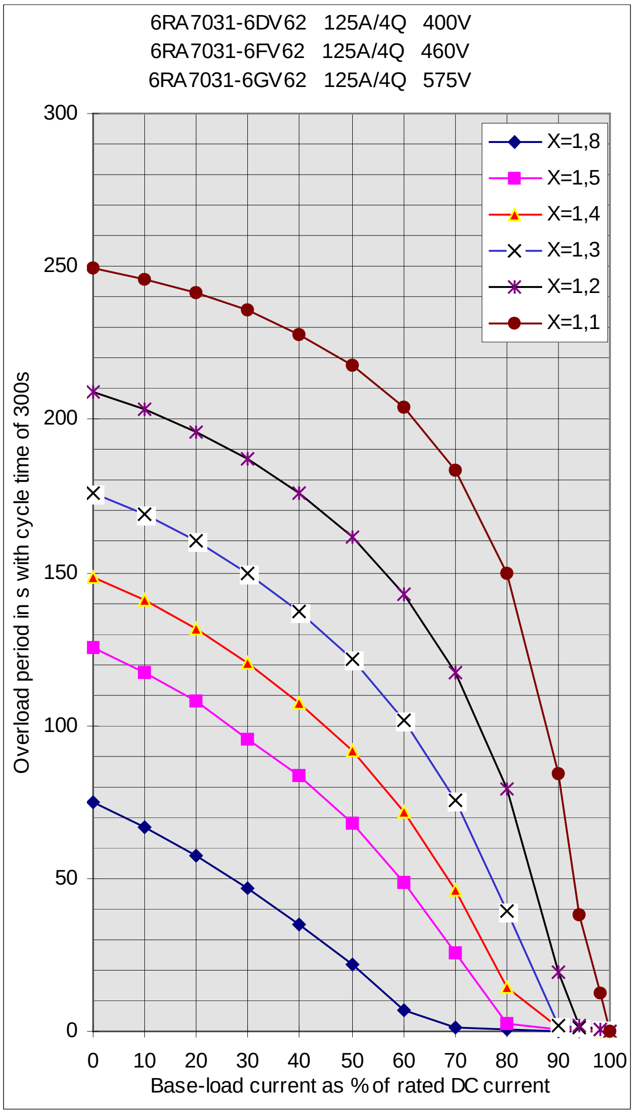
6RA7031-6DV62. 6RA7031-6FV62 and 6RA7031-6GV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	74.560	125.660	148.680	176.040	209.100	249.760
10	66.512	117.485	140.799	168.832	203.128	245.972
20	57.377	107.974	131.548	160.259	195.896	241.303
30	46.984	95.363	120.584	149.925	187.042	235.487
40	35.141	83.679	107.433	137.311	175.983	227.952
50	21.702	67.946	91.425	121.613	161.810	217.919
60	6.944	48.910	71.581	101.600	143.079	203.951
70	1.340	25.670	46.462	75.329	117.208	183.226
80	0.603	2.501	14.468	39.467	79.328	149.404
90	0.304	0.749	1.080	1.686	19.379	84.405
94	0.184	0.454	0.655	1.022	1.811	38.066
98	0.065	0.159	0.230	0.358	0.635	12.764
100	0.005	0.012	0.017	0.027	0.047	0.113

X	t_{an} (s)
1.1	2160
1.2	1453
1.3	1079
1.4	836
1.5	662
1.8	344

t_{ab} (s) = 3112



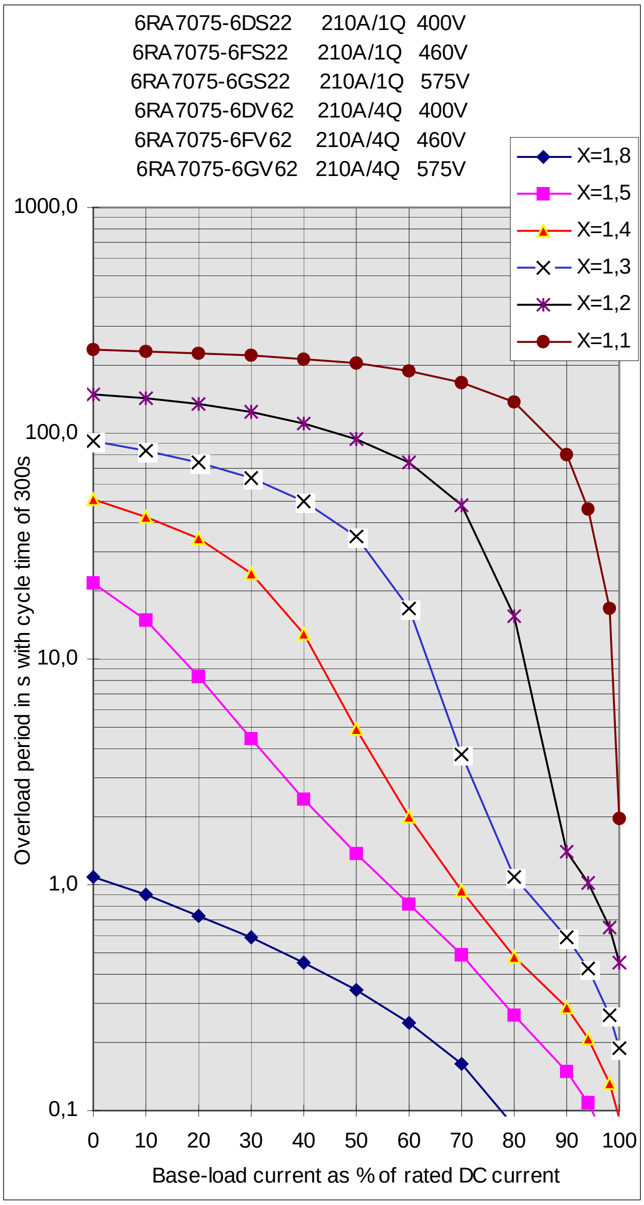


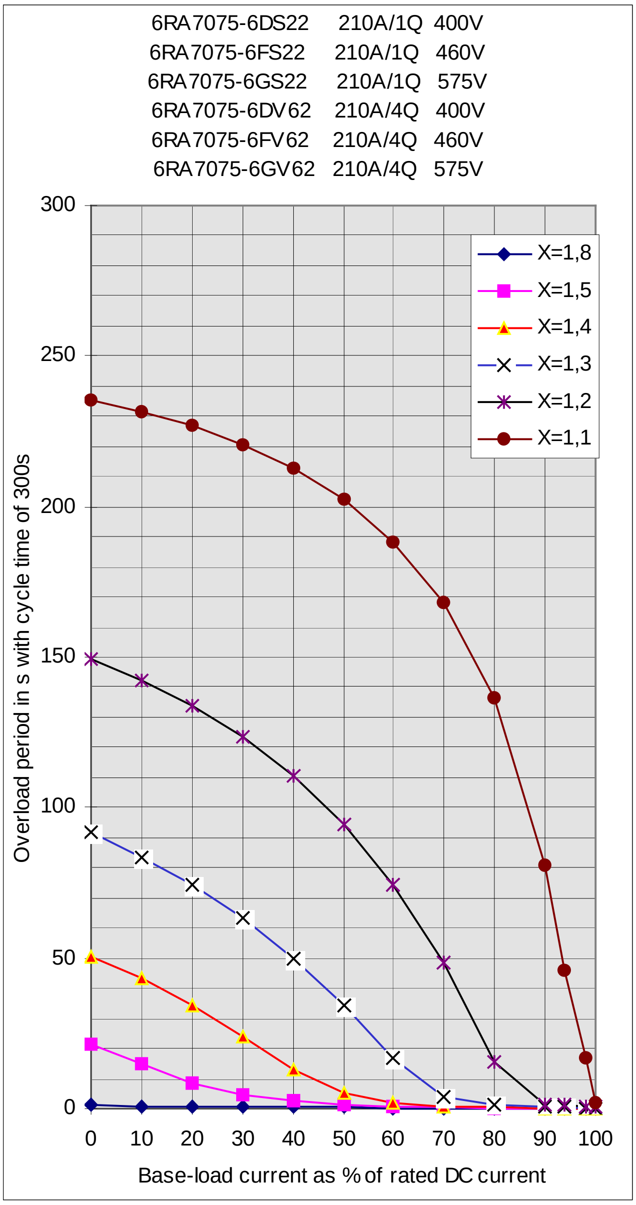
6RA7075-6DS22. 6RA7075-6FS22 and 6RA7075-6GS22
6RA7075-6DV62. 6RA7075-6FV62 and 6RA7075-6GV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	1.080	21.600	50.720	91.660	149.600	235.560
10	0.902	14.843	43.009	83.652	142.448	231.608
20	0.733	8.313	34.150	74.216	133.825	226.741
30	0.585	4.428	24.068	63.100	123.347	220.628
40	0.456	2.419	12.873	50.001	110.490	212.789
50	0.344	1.369	4.870	34.589	94.498	202.443
60	0.246	0.826	1.995	16.667	74.278	188.324
70	0.160	0.486	0.947	3.749	48.370	167.990
80	0.085	0.264	0.480	1.081	15.400	136.377
90	0.024	0.150	0.286	0.581	1.407	80.999
94	0.015	0.109	0.209	0.424	1.025	45.980
98	0.010	0.069	0.131	0.266	0.644	16.631
100	0.007	0.048	0.092	0.187	0.454	1.956

X	t_{an} (s)
1.1	680.00
1.2	318.00
1.3	167.00
1.4	78.00
1.5	25.00
1.8	0.96

t_{ab} (s) = 766



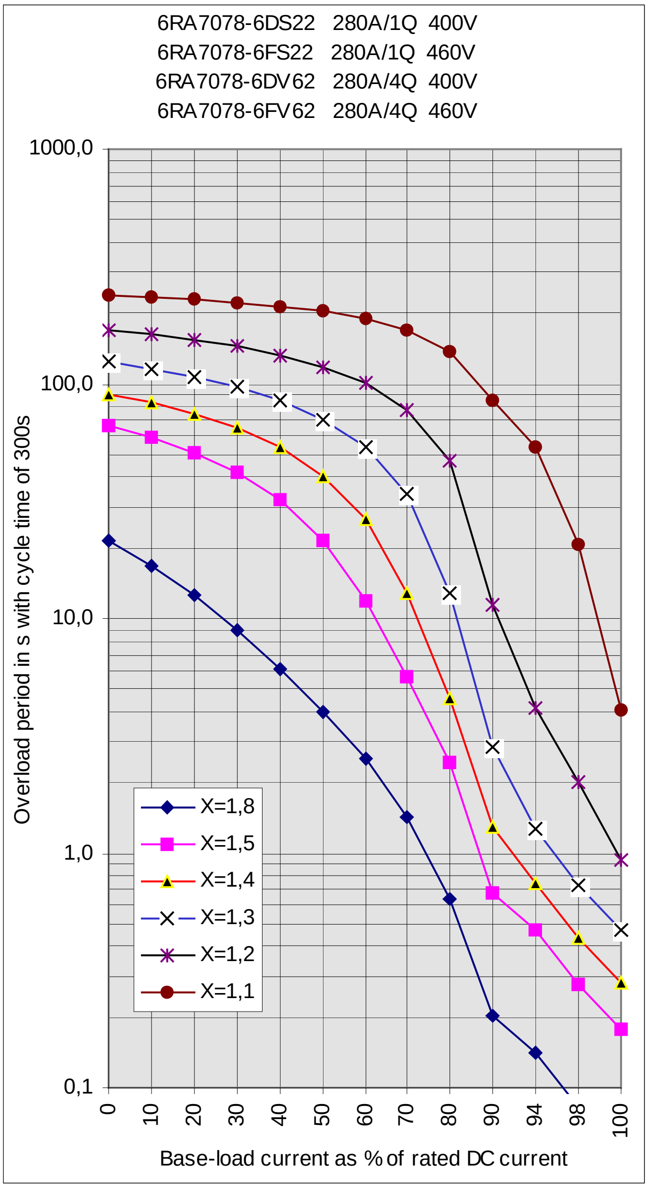


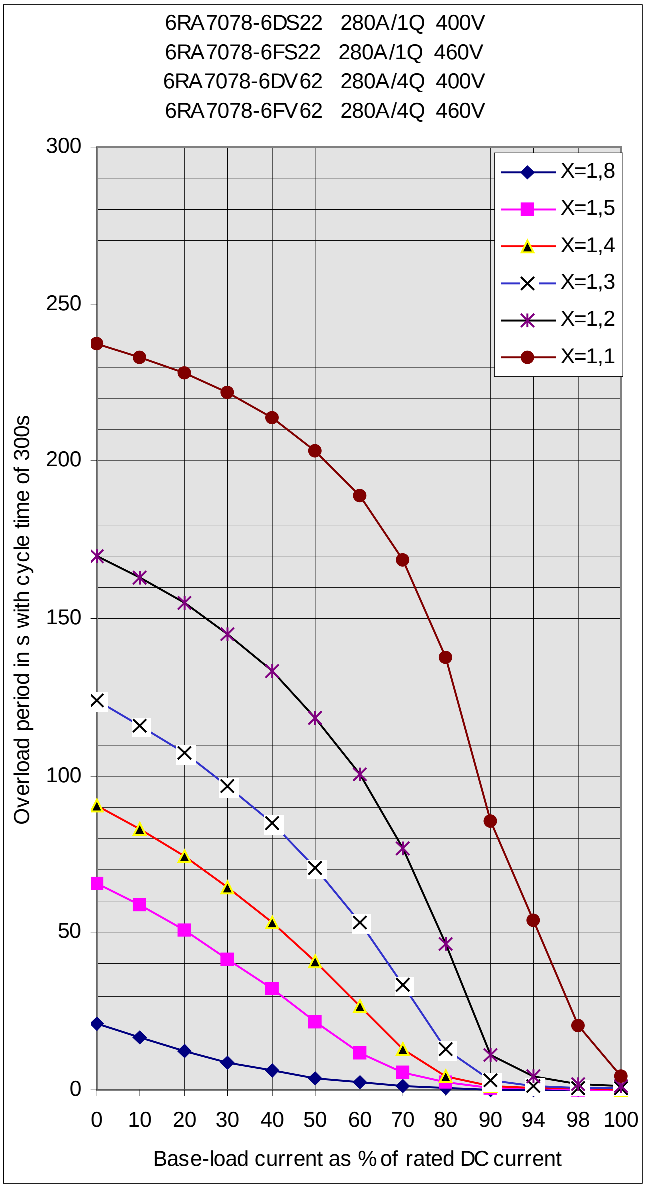
6RA7078-6DS22 and 6RA7078-6FS22
6RA7078-6DV62 and 6RA7078-6FV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	21.300	65.680	90.400	123.700	169.960	237.500
10	16.768	58.584	82.846	116.025	163.015	233.249
20	12.534	50.641	74.247	107.139	154.795	228.092
30	8.923	41.770	64.461	96.798	144.953	221.708
40	6.091	31.938	53.316	84.699	133.042	213.585
50	4.023	21.435	40.632	70.460	118.418	203.028
60	2.540	11.925	26.420	53.609	100.127	188.753
70	1.437	5.650	12.725	33.714	76.841	168.506
80	0.638	2.410	4.605	12.943	46.698	137.624
90	0.202	0.673	1.290	2.842	11.433	85.548
94	0.142	0.474	0.748	1.265	4.192	53.870
98	0.083	0.276	0.435	0.736	2.017	20.682
100	0.053	0.177	0.279	0.472	0.930	4.088

X	t_{an} (s)
1.1	729
1.2	381
1.3	237
1.4	155
1.5	103
1.8	24

t_{ab} (s) = 840



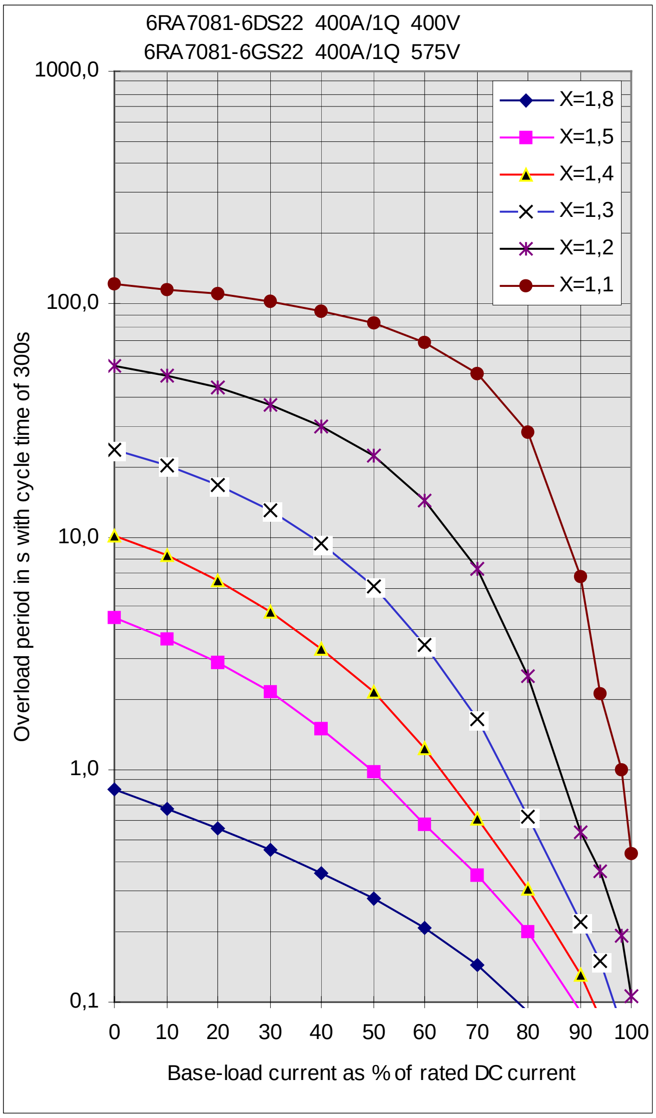


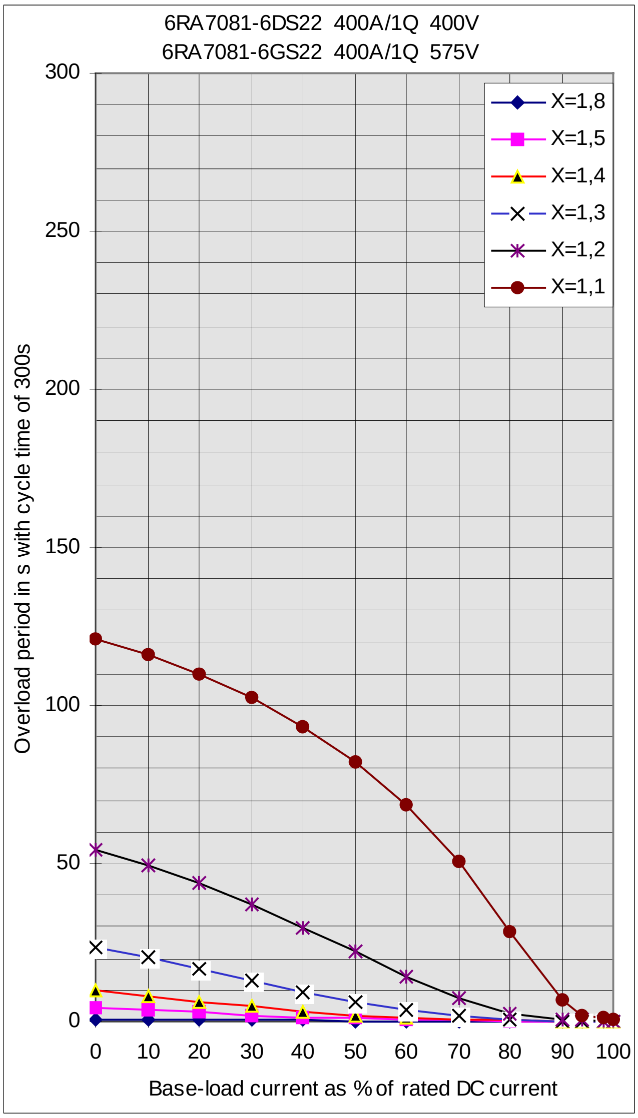
6RA7081-6DS22 and 6RA7081-6GS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	0.820	4.500	10.140	23.420	54.060	121.080
10	0.680	3.657	8.318	20.184	49.209	115.906
20	0.555	2.859	6.478	16.703	43.560	109.708
30	0.447	2.141	4.767	13.079	37.094	102.254
40	0.355	1.507	3.309	9.437	29.872	93.218
50	0.276	0.969	2.145	6.057	22.145	82.116
60	0.207	0.584	1.237	3.414	14.378	68.216
70	0.146	0.352	0.617	1.658	7.250	50.437
80	0.090	0.201	0.309	0.621	2.518	28.154
90	0.039	0.090	0.131	0.221	0.532	6.682
94	0.020	0.054	0.086	0.150	0.361	2.134
98	0.010	0.029	0.046	0.079	0.191	1.000
100	0.006	0.016	0.025	0.044	0.106	0.434

X	t_{an} (s)
1.1	130.40
1.2	53.90
1.3	21.70
1.4	8.90
1.5	3.80
1.8	0.72

t_{ab} (s) = 198



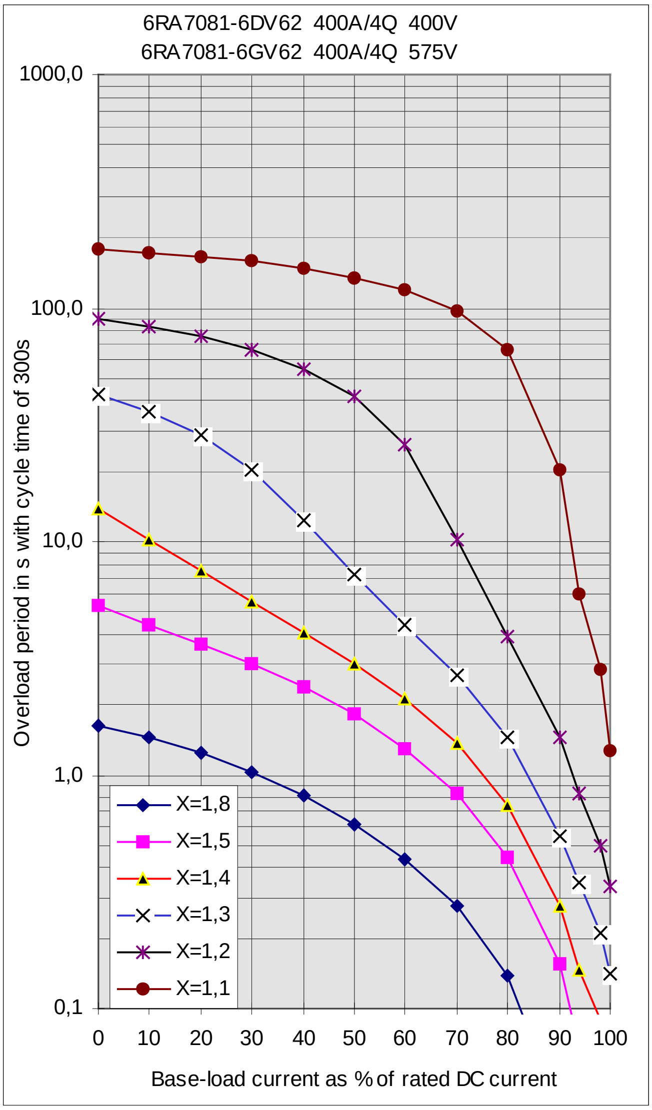


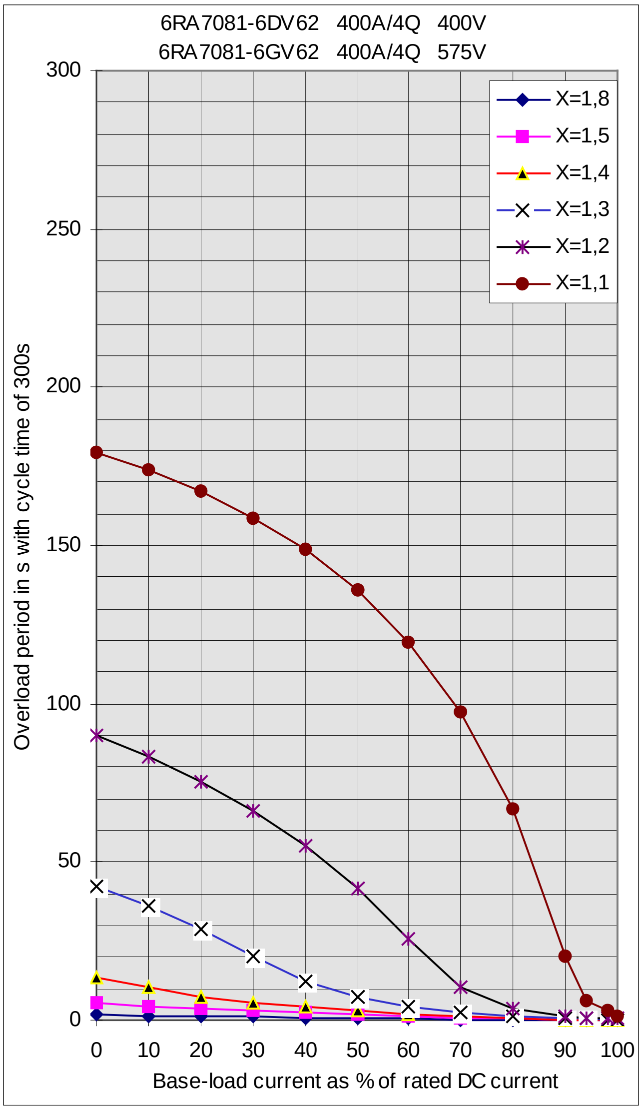
6RA7081-6DV62 and 6RA7081-6GV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	1.640	5.320	13.720	42.460	90.020	179.460
10	1.446	4.438	10.202	36.010	83.305	173.786
20	1.235	3.666	7.483	28.596	75.421	166.961
30	1.023	2.985	5.525	20.318	66.139	158.672
40	0.814	2.372	4.105	12.433	55.130	148.477
50	0.617	1.812	3.019	7.189	41.929	135.711
60	0.437	1.296	2.136	4.358	25.980	119.321
70	0.277	0.829	1.382	2.660	10.258	97.514
80	0.137	0.443	0.743	1.449	3.915	66.912
90	0.036	0.155	0.275	0.549	1.454	20.405
94	0.018	0.068	0.148	0.349	0.832	5.925
98	0.011	0.039	0.089	0.210	0.499	2.825
100	0.007	0.025	0.059	0.140	0.333	1.276

X	t_{an} (s)
1.1	282.0
1.2	112.0
1.3	47.0
1.4	13.0
1.5	4.9
1.8	1.5

t_{ab} (s) = 338



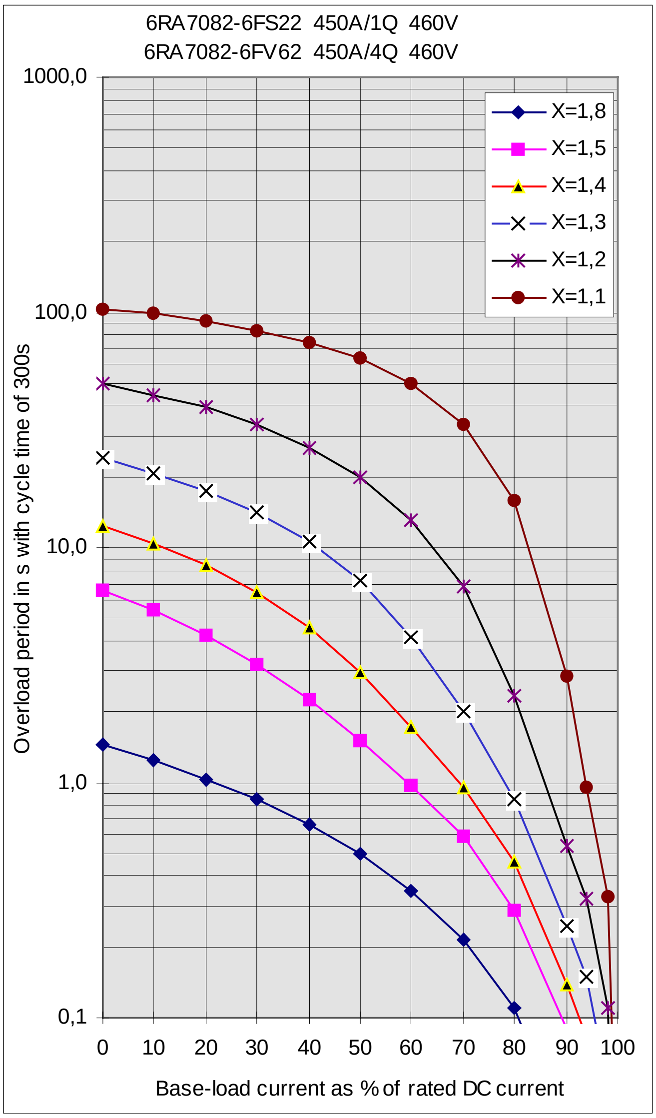


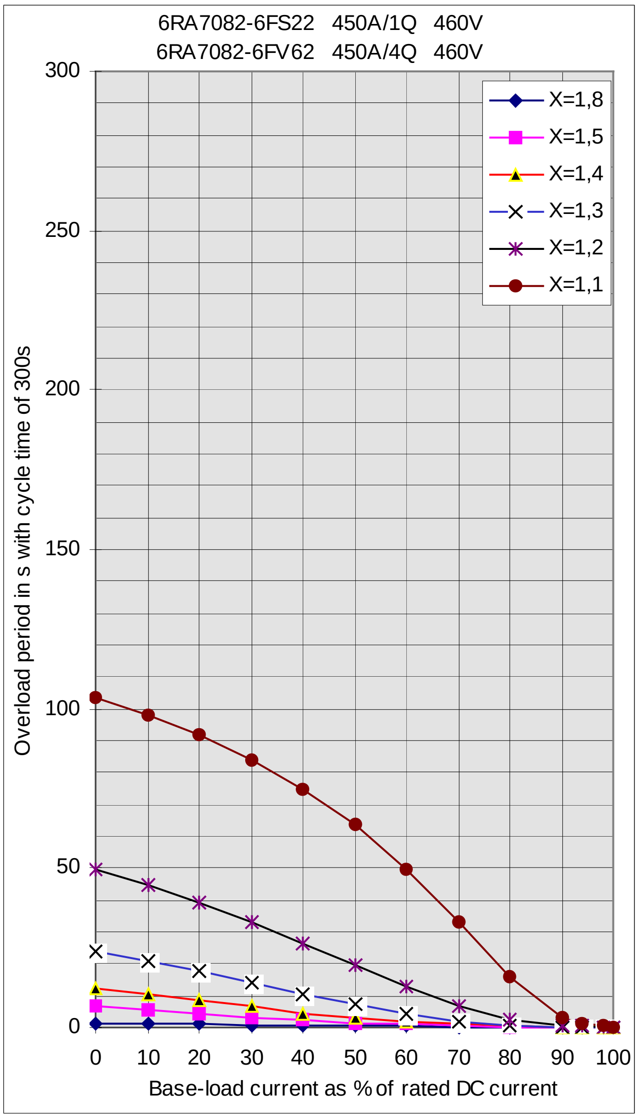
6RA7082-6FS22 and 6RA7082-6FV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	1.460	6.560	12.320	23.900	49.460	103.620
10	1.248	5.412	10.423	20.816	44.704	98.249
20	1.039	4.266	8.442	17.528	39.262	91.829
30	0.844	3.189	6.455	14.096	33.181	84.141
40	0.663	2.248	4.583	10.599	26.601	74.867
50	0.495	1.512	2.959	7.189	19.783	63.575
60	0.344	0.980	1.736	4.192	13.053	49.724
70	0.213	0.587	0.959	2.008	6.836	33.160
80	0.110	0.289	0.460	0.847	2.353	15.936
90	0.032	0.090	0.138	0.248	0.542	2.830
94	0.014	0.051	0.083	0.149	0.320	0.947
98	0.005	0.018	0.029	0.051	0.110	0.325
100	0.000	0.001	0.001	0.002	0.005	0.014

X	t_{an} (s)
1.1	109.8
1.2	49.0
1.3	22.4
1.4	11.1
1.5	5.7
1.8	1.3

t_{ab} (s) = 206



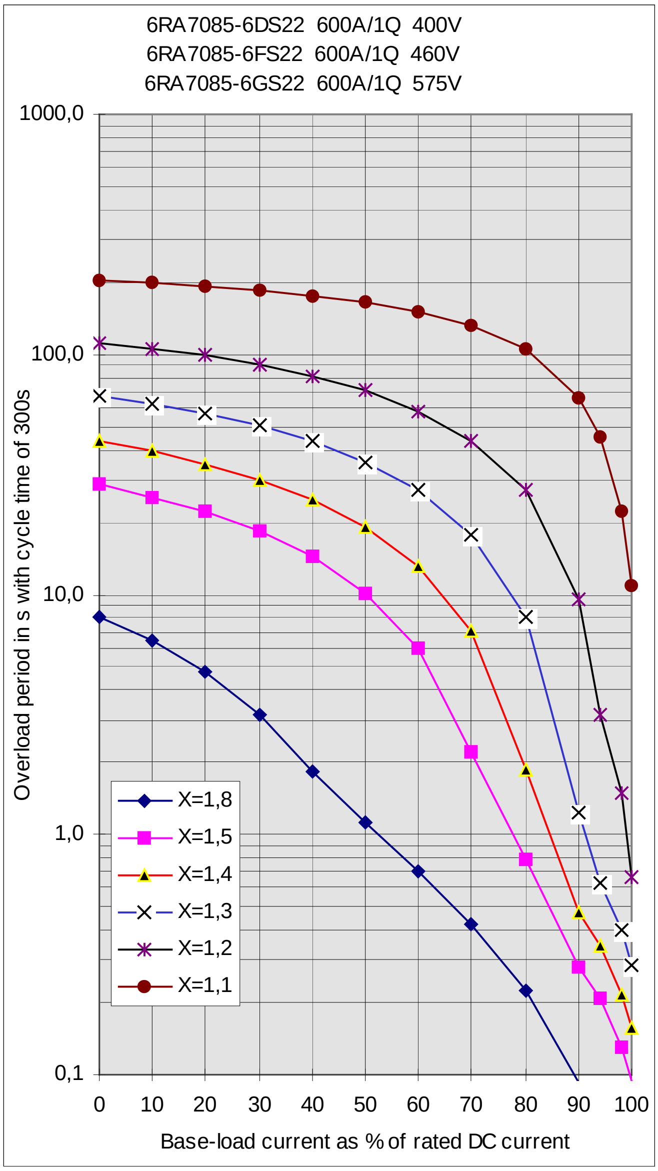


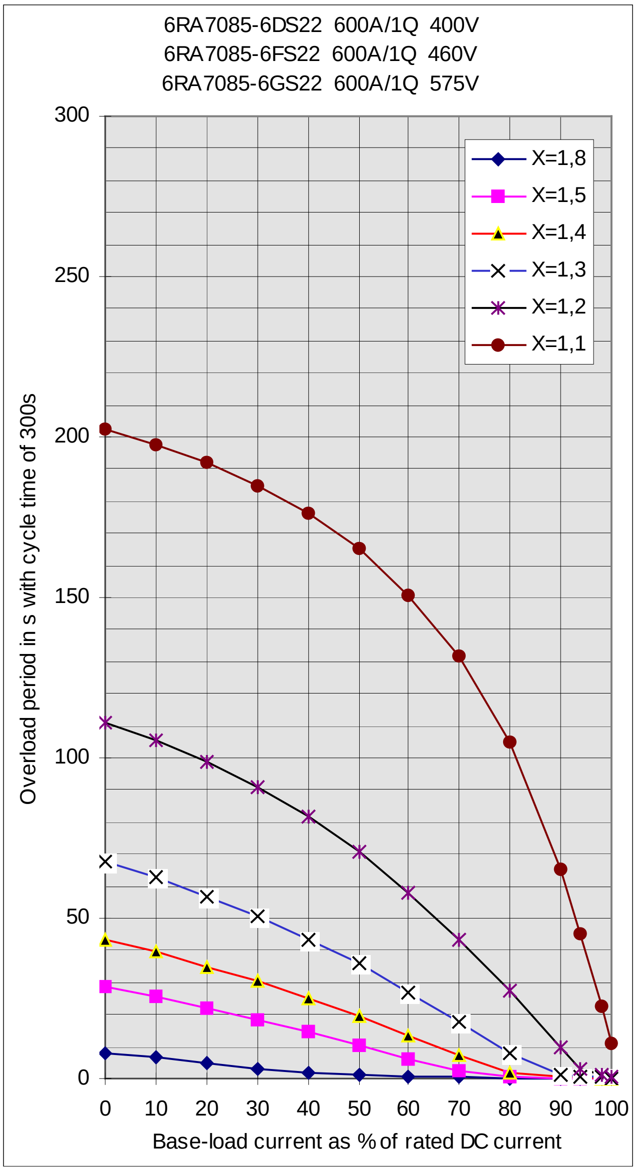
6RA7085-6DS22. 6RA7085-6FS22 and 6RA7085-6GS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	8.020	28.640	43.300	67.520	111.260	202.240
10	6.452	25.538	39.388	62.591	105.453	197.543
20	4.806	22.113	35.022	56.979	98.665	191.802
30	3.158	18.383	30.202	50.655	90.734	184.774
40	1.837	14.378	24.930	43.582	81.467	176.031
50	1.118	10.177	19.228	35.738	70.653	164.977
60	0.704	5.955	13.179	27.126	58.067	150.647
70	0.422	2.214	7.058	17.825	43.557	131.462
80	0.222	0.792	1.876	8.028	27.146	104.647
90	0.094	0.281	0.479	1.235	9.525	65.500
94	0.069	0.206	0.342	0.626	3.179	45.238
98	0.044	0.131	0.218	0.398	1.504	22.342
100	0.031	0.094	0.156	0.285	0.666	10.894

X	t_{an} (s)
1.1	331.0
1.2	137.0
1.3	74.0
1.4	44.0
1.5	28.0
1.8	6.9

t_{ab} (s) = 381



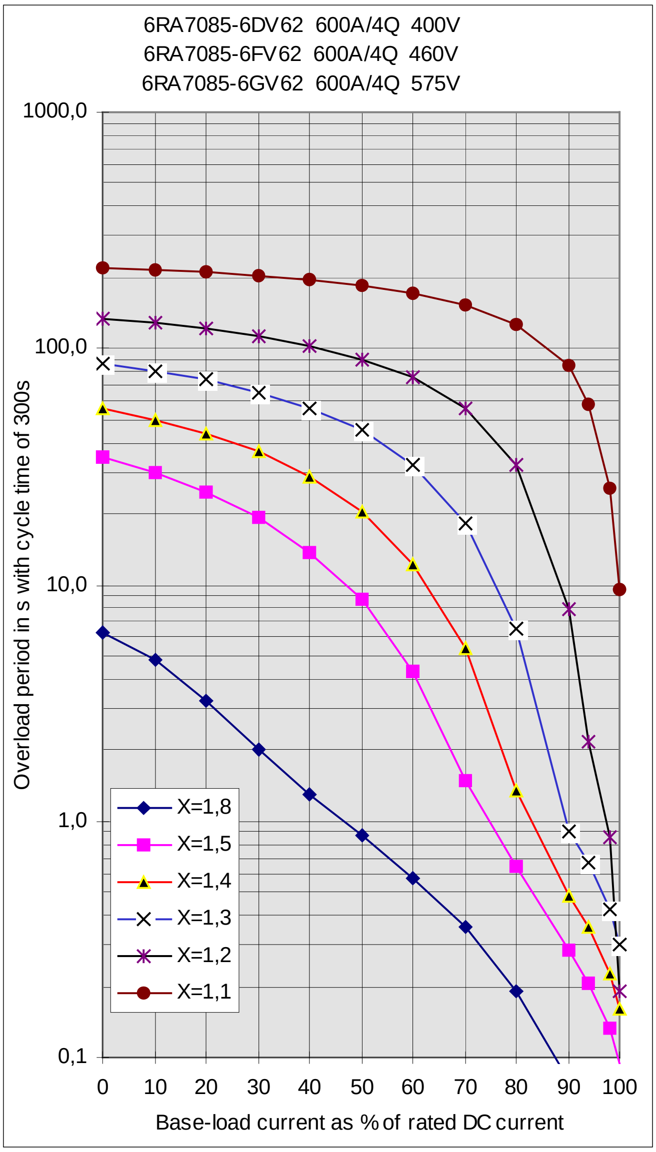


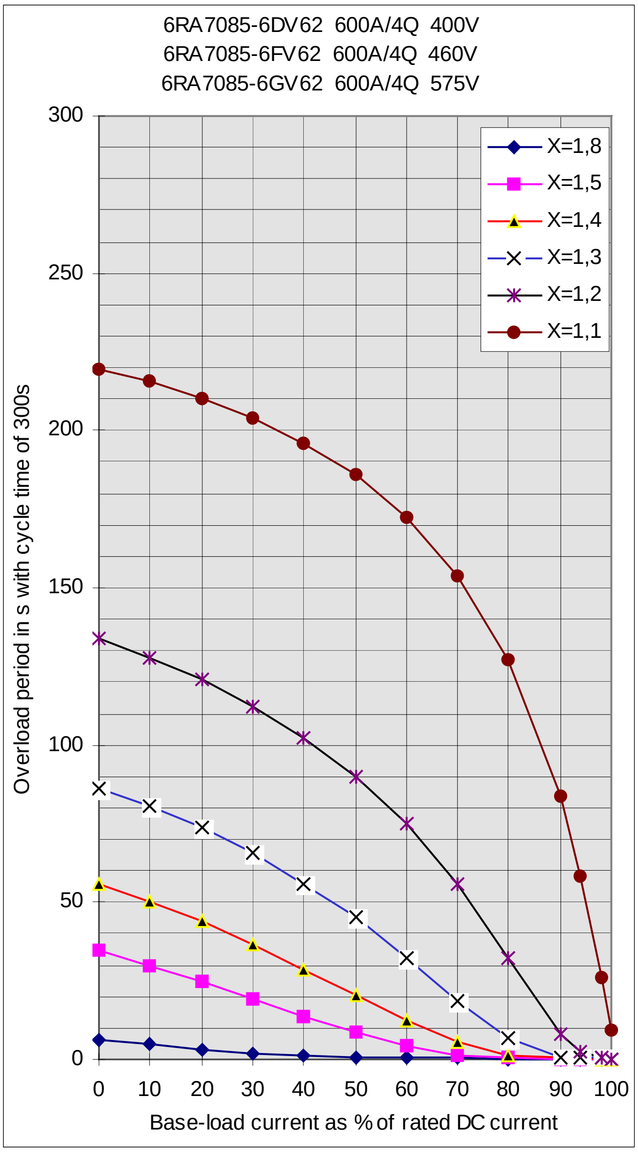
6RA7085-6DV62. 6RA7085-6FV62 and 6RA7085-6GV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	6.320	34.420	55.620	86.300	133.680	219.660
10	4.768	29.728	50.173	80.420	127.741	215.465
20	3.249	24.577	43.899	73.524	120.691	210.355
30	2.016	19.130	36.764	65.460	112.287	203.997
40	1.293	13.684	28.809	56.012	102.199	196.025
50	0.868	8.632	20.340	44.942	89.953	185.803
60	0.575	4.294	12.167	32.342	74.877	172.318
70	0.354	1.497	5.361	18.343	55.975	153.824
80	0.192	0.645	1.347	6.565	32.161	126.914
90	0.079	0.283	0.483	0.911	7.922	83.908
94	0.058	0.208	0.355	0.662	2.177	58.269
98	0.037	0.132	0.226	0.421	0.852	25.724
100	0.026	0.094	0.161	0.301	0.190	9.452

X	t_{an} (s)
1.1	423.0
1.2	183.0
1.3	105.0
1.4	63.0
1.5	36.0
1.8	5.2

t_{ab} (s) = 452



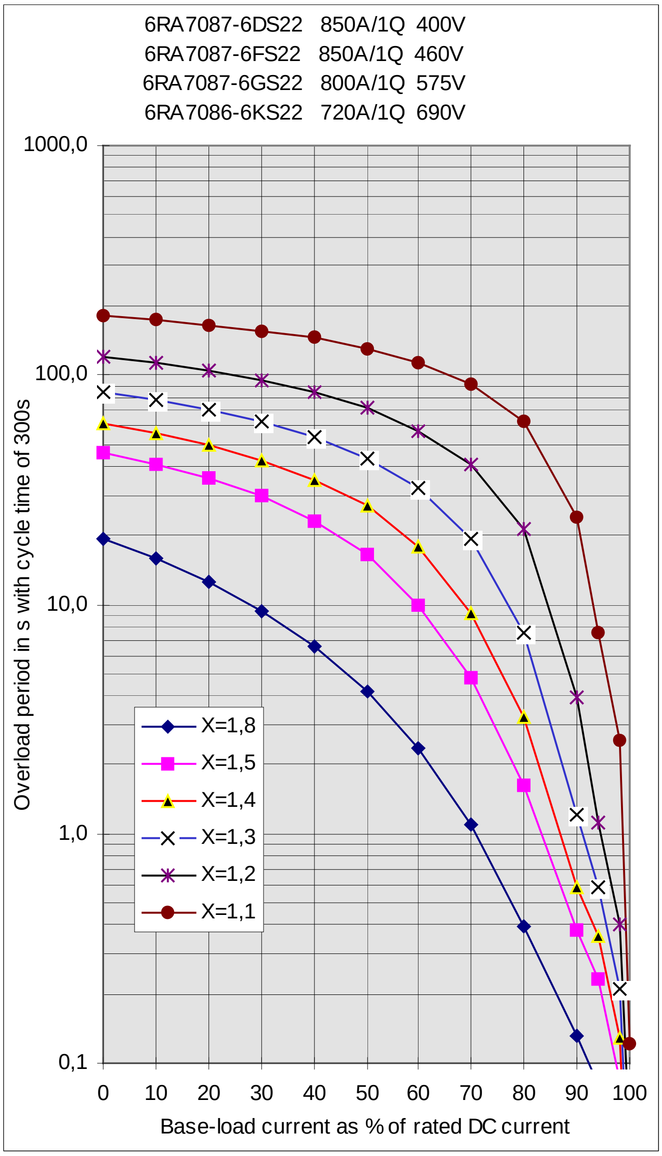


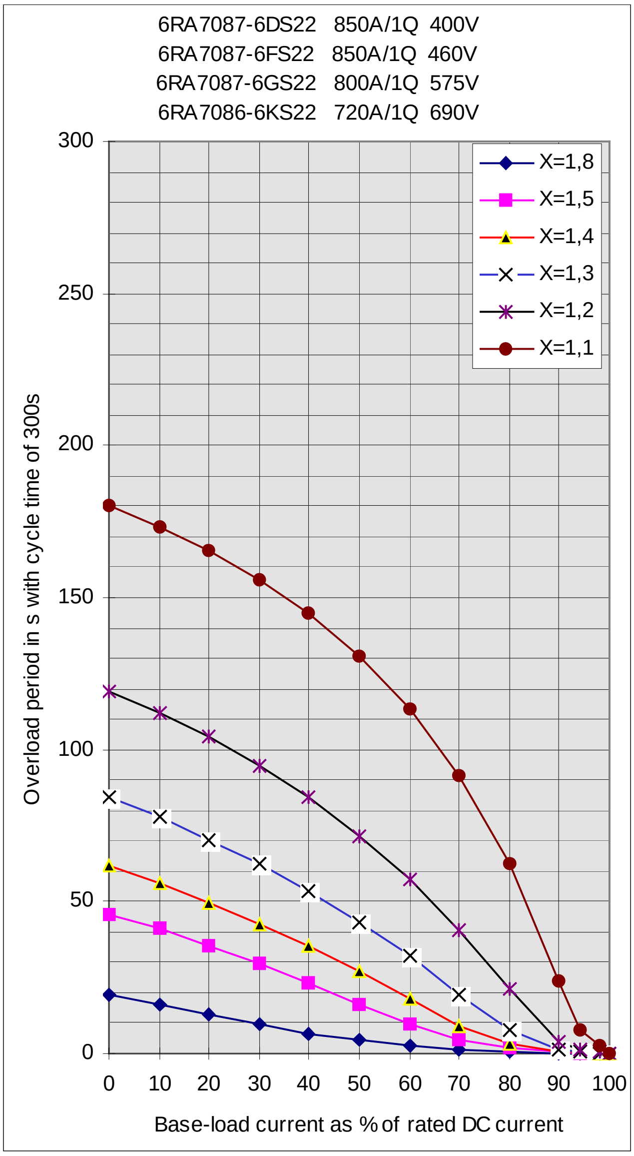
6RA7087-6DS22. 6RA7087-6FS22. 6RA7087-6GS22 and 6RA7086-6KS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	19.240	45.900	61.540	84.160	119.400	180.060
10	15.940	40.913	55.837	77.668	112.234	173.376
20	12.583	35.472	49.571	70.427	104.059	165.491
30	9.370	29.557	42.685	62.357	94.724	156.078
40	6.534	23.164	35.118	53.350	84.017	144.712
50	4.195	16.405	26.816	43.272	71.675	130.776
60	2.356	9.869	17.861	31.981	57.378	113.369
70	1.101	4.796	9.197	19.447	40.710	91.195
80	0.392	1.619	3.225	7.482	21.279	62.331
90	0.132	0.383	0.585	1.209	3.936	23.947
94	0.080	0.234	0.357	0.586	1.125	7.453
98	0.029	0.084	0.128	0.211	0.405	2.565
100	0.003	0.009	0.014	0.023	0.045	0.122

X	t_{an} (s)
1.1	296
1.2	161
1.3	102
1.4	70
1.5	50
1.8	19

t_{ab} (s) = 516



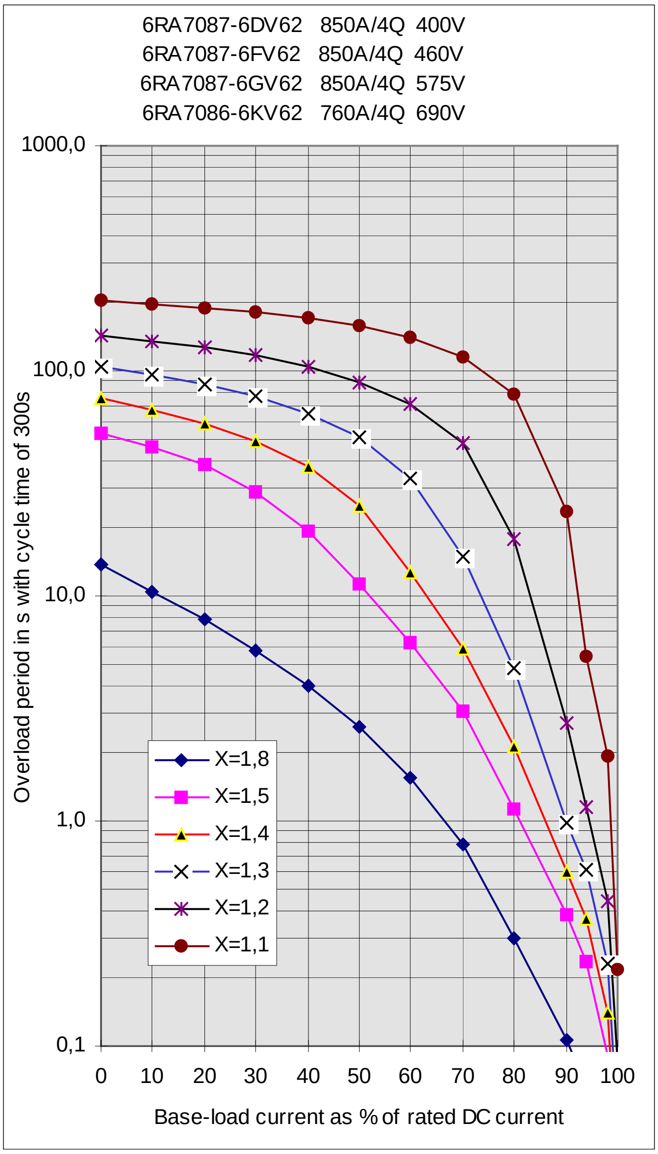


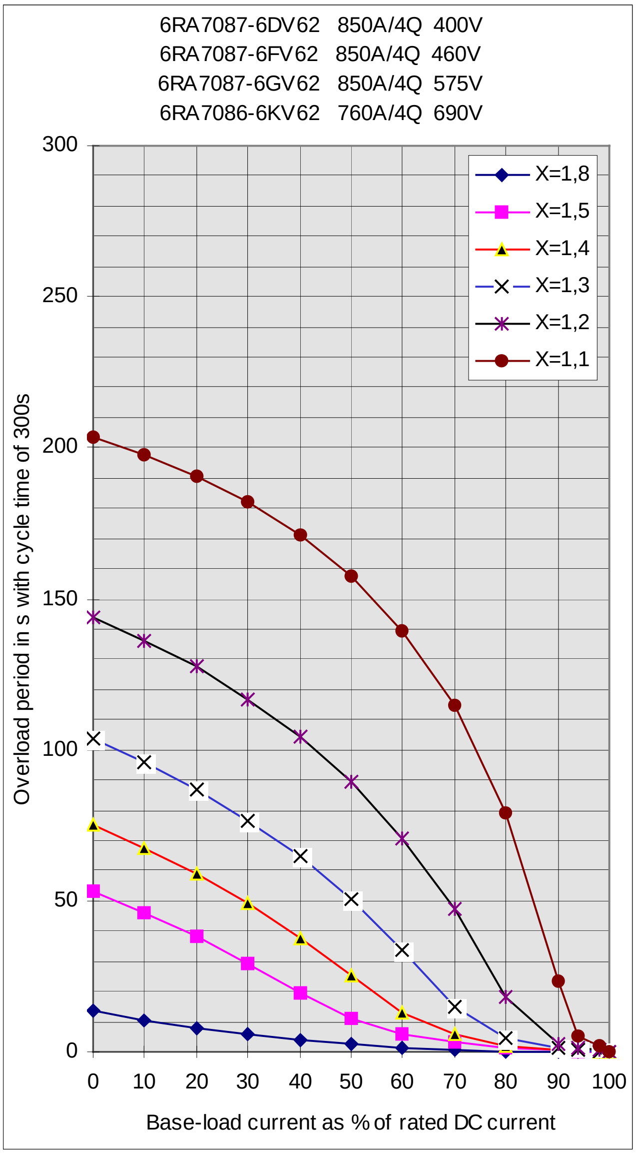
6RA7087-6DV62. 6RA7087-6FV62. 6RA7087-6GV62 and 6RA7086-6KV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	13.760	53.220	74.980	103.760	143.740	203.660
10	10.426	46.039	67.417	95.971	136.188	197.687
20	7.840	37.973	58.820	87.013	127.352	190.507
30	5.681	28.968	49.019	76.651	116.928	181.775
40	4.005	19.373	37.798	64.573	104.480	170.947
50	2.631	11.176	25.080	50.350	89.409	157.197
60	1.548	6.126	12.836	33.449	70.819	139.217
70	0.787	3.058	5.774	14.946	47.335	114.694
80	0.303	1.132	2.146	4.802	17.887	79.242
90	0.106	0.382	0.596	0.981	2.723	23.486
94	0.066	0.236	0.368	0.606	1.150	5.393
98	0.025	0.090	0.141	0.232	0.439	1.942
100	0.005	0.017	0.027	0.044	0.084	0.217

X	t_{an} (s)
1.1	382.0
1.2	228.0
1.3	150.0
1.4	102.0
1.5	68.0
1.8	13.5

t_{ab} (s) = 582



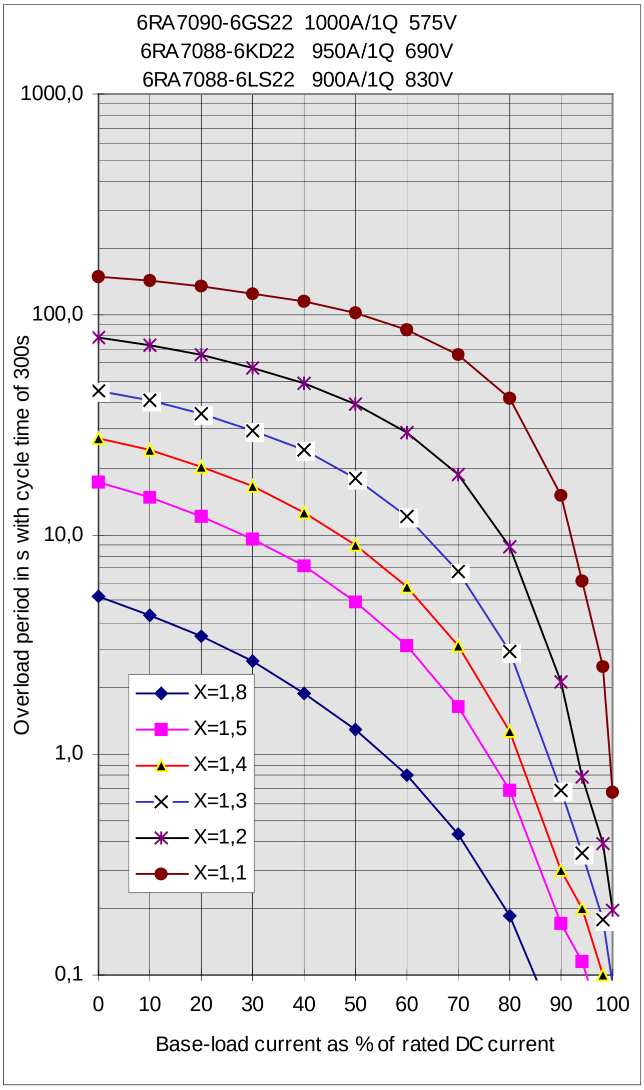


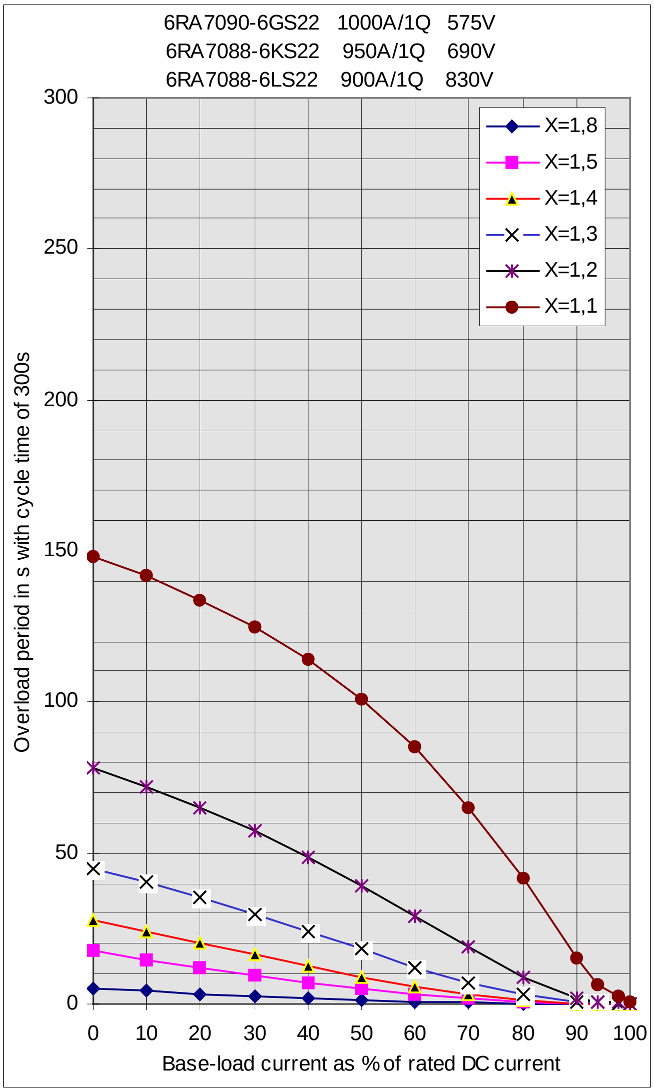
6RA7090-6GS22. 6RA7088-6KS22 and 6RA7088-6LS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	5.200	17.360	27.520	44.980	78.220	148.060
10	4.317	14.787	24.058	40.280	72.007	141.537
20	3.462	12.144	20.380	35.203	65.028	133.879
30	2.652	9.551	16.541	29.781	57.253	124.828
40	1.916	7.132	12.653	24.043	48.664	114.020
50	1.296	4.984	8.952	18.058	39.296	100.938
60	0.807	3.136	5.740	12.075	29.251	84.905
70	0.436	1.655	3.148	6.812	18.728	65.123
80	0.183	0.689	1.282	2.925	8.727	41.287
90	0.052	0.173	0.301	0.692	2.145	15.025
94	0.035	0.115	0.200	0.359	0.793	6.128
98	0.017	0.058	0.100	0.179	0.397	2.491
100	0.009	0.029	0.050	0.090	0.198	0.672

X	t_{an} (s)
1.1	185.0
1.2	86.0
1.3	46.0
1.4	26.0
1.5	16.0
1.8	4.6

t_{ab} (s) = 296



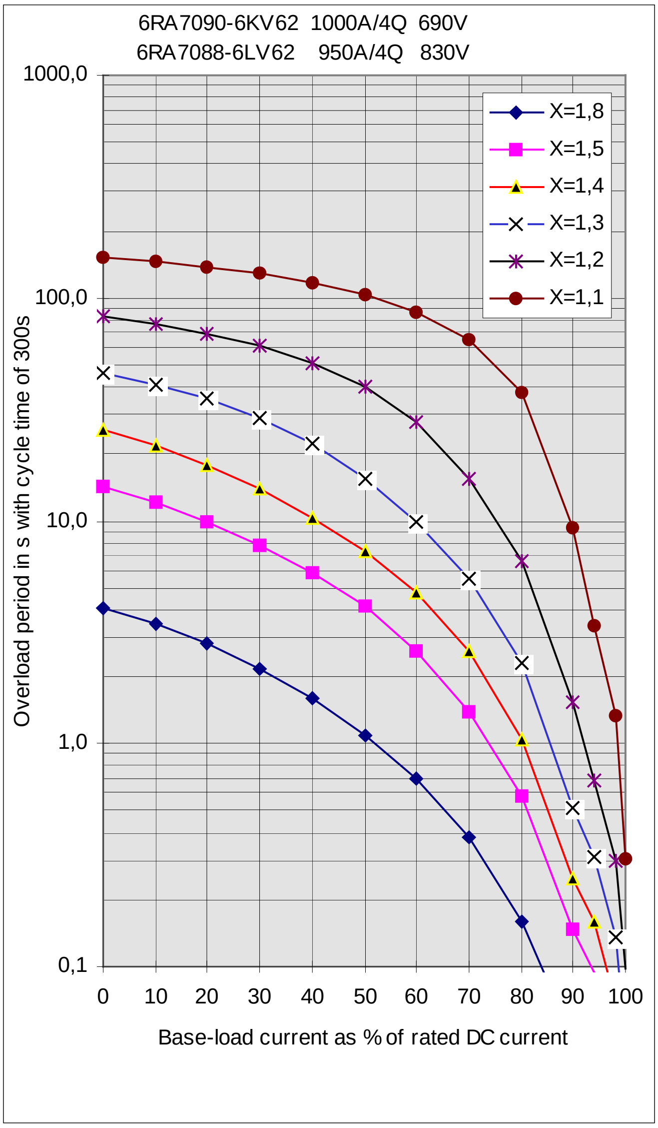


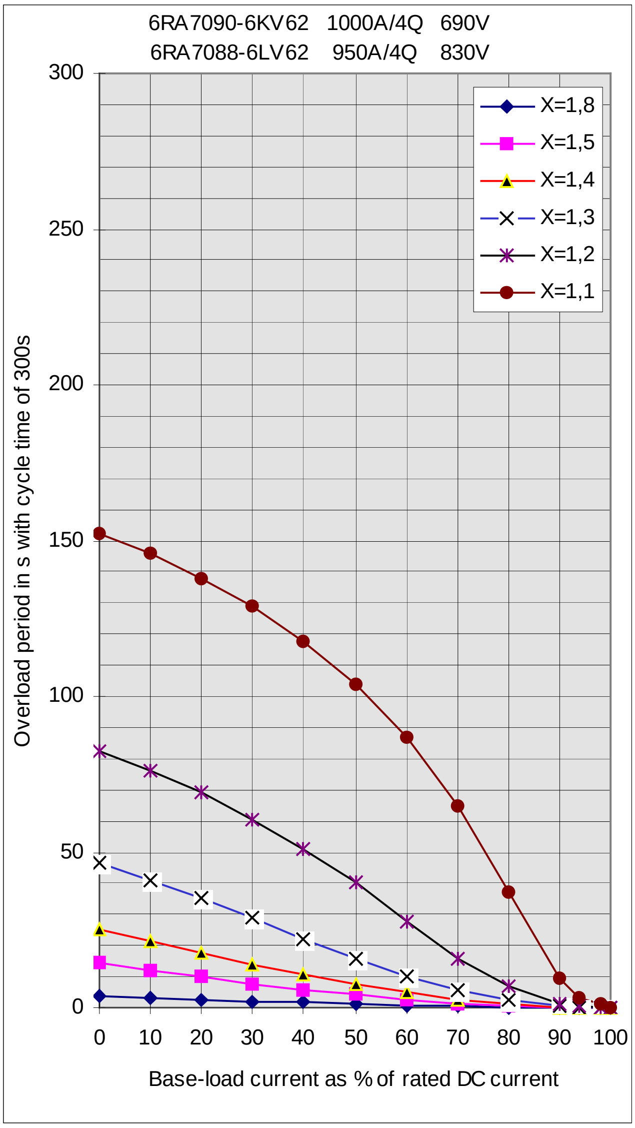
6RA7090-6KV62 and 6RA7088-6LV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	4.080	14.280	25.460	46.360	82.600	152.260
10	3.442	12.036	21.667	41.114	76.322	145.782
20	2.794	9.811	17.755	35.237	69.058	138.048
30	2.164	7.746	13.929	28.803	60.682	128.752
40	1.586	5.854	10.403	22.049	51.032	117.487
50	1.093	4.142	7.334	15.493	39.973	103.686
60	0.693	2.616	4.748	9.849	27.665	86.554
70	0.378	1.385	2.597	5.516	15.554	64.950
80	0.160	0.581	1.049	2.324	6.650	37.418
90	0.048	0.147	0.250	0.516	1.525	9.360
94	0.030	0.093	0.159	0.313	0.690	3.399
98	0.013	0.040	0.068	0.134	0.296	1.337
100	0.004	0.013	0.023	0.045	0.099	0.305

X	t_{an} (s)
1.1	218.0
1.2	99.0
1.3	50.0
1.4	25.0
1.5	13.0
1.8	3.6

t_{ab} (s) = 373



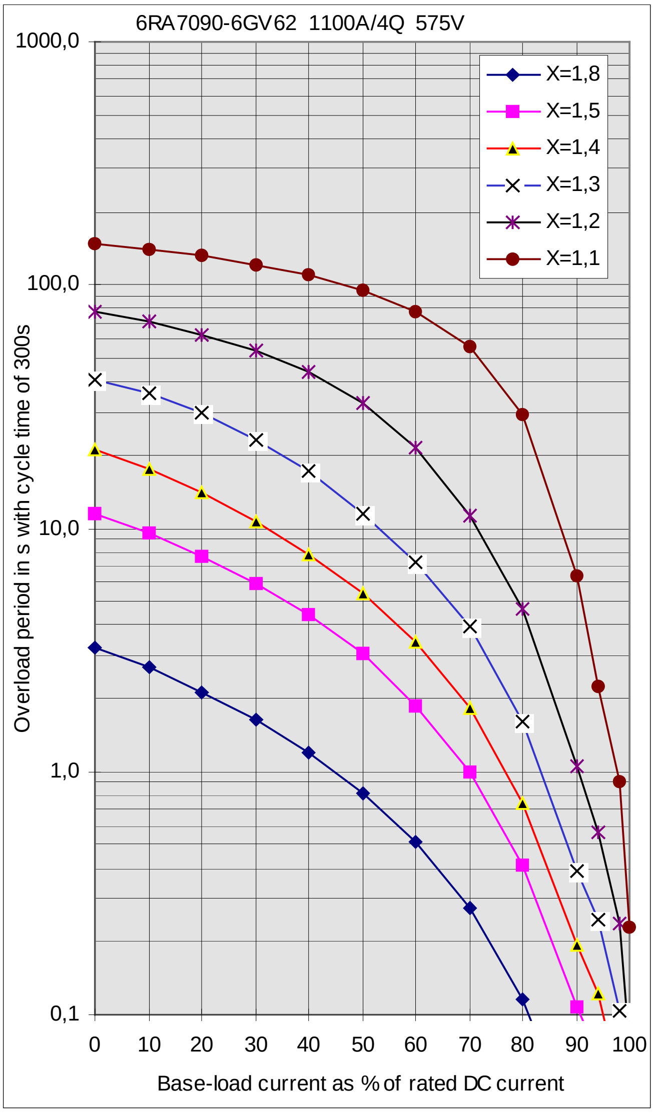


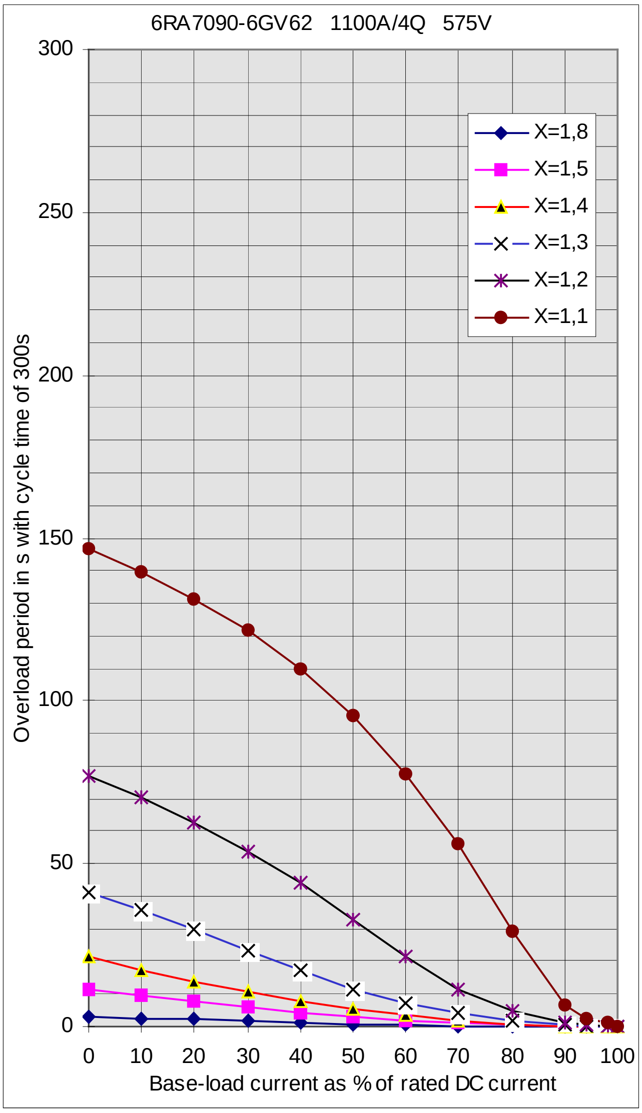
6RA7090-6GV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	3.220	11.460	21.200	41.120	77.020	146.840
10	2.667	9.464	17.531	35.592	70.260	139.763
20	2.126	7.683	13.963	29.586	62.571	131.415
30	1.627	5.916	10.688	23.294	53.843	121.518
40	1.190	4.393	7.839	17.098	43.959	109.666
50	0.820	3.030	5.441	11.577	32.922	95.330
60	0.514	1.864	3.435	7.202	21.337	77.776
70	0.276	0.992	1.817	3.943	11.248	55.976
80	0.116	0.412	0.746	1.595	4.679	29.109
90	0.032	0.107	0.194	0.388	1.042	6.405
94	0.020	0.068	0.123	0.246	0.559	2.255
98	0.008	0.029	0.052	0.104	0.235	0.905
100	0.003	0.009	0.016	0.032	0.074	0.230

X	t_{an} (s)
1.1	208.0
1.2	91.0
1.3	43.6
1.4	20.5
1.5	10.5
1.8	2.9

t_{ab} (s) = 366



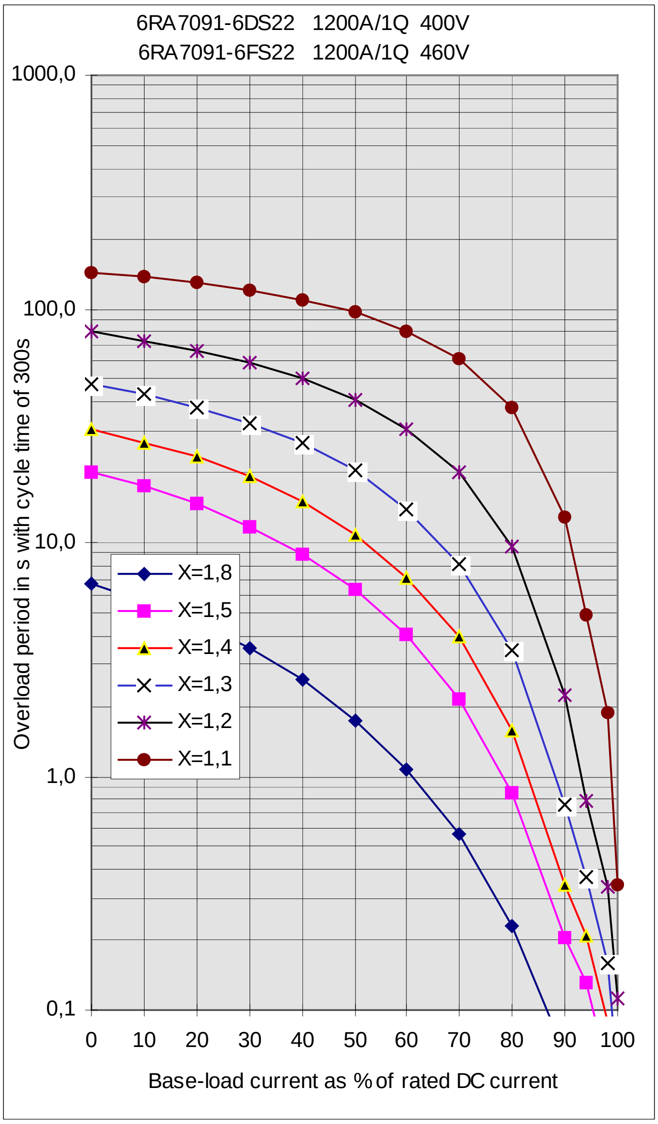


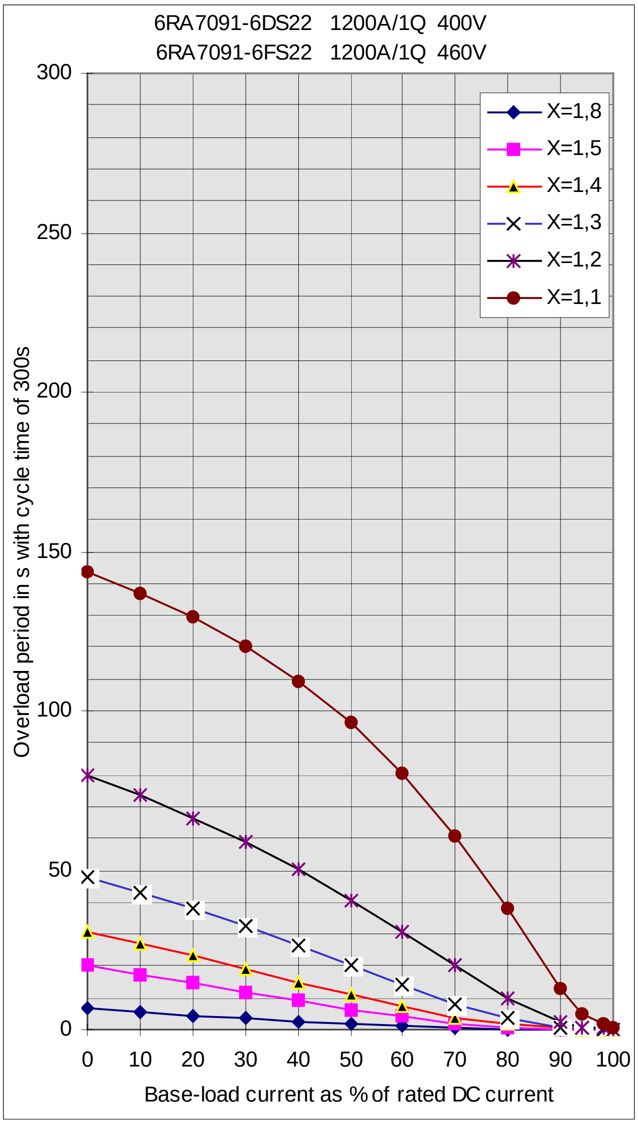
6RA7091-6DS22 and 6RA7091-6FS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	6.700	20.140	30.440	47.720	79.460	143.340
10	5.627	17.447	26.910	42.992	73.349	136.839
20	4.569	14.613	23.126	37.864	66.463	129.216
30	3.550	11.728	19.129	32.352	58.749	120.198
40	2.589	8.916	14.988	26.479	50.180	109.427
50	1.737	6.321	10.873	20.297	40.779	96.405
60	1.061	4.043	7.101	13.974	30.640	80.494
70	0.568	2.139	3.952	8.086	19.951	61.016
80	0.231	0.850	1.571	3.492	9.534	37.886
90	0.066	0.204	0.340	0.754	2.231	12.898
94	0.042	0.130	0.208	0.373	0.780	4.891
98	0.018	0.056	0.089	0.160	0.334	1.859
100	0.006	0.019	0.030	0.053	0.111	0.344

X	t_{an} (s)
1.1	180
1.2	88
1.3	49
1.4	30
1.5	19
1.8	6

t_{ab} (s) = 312



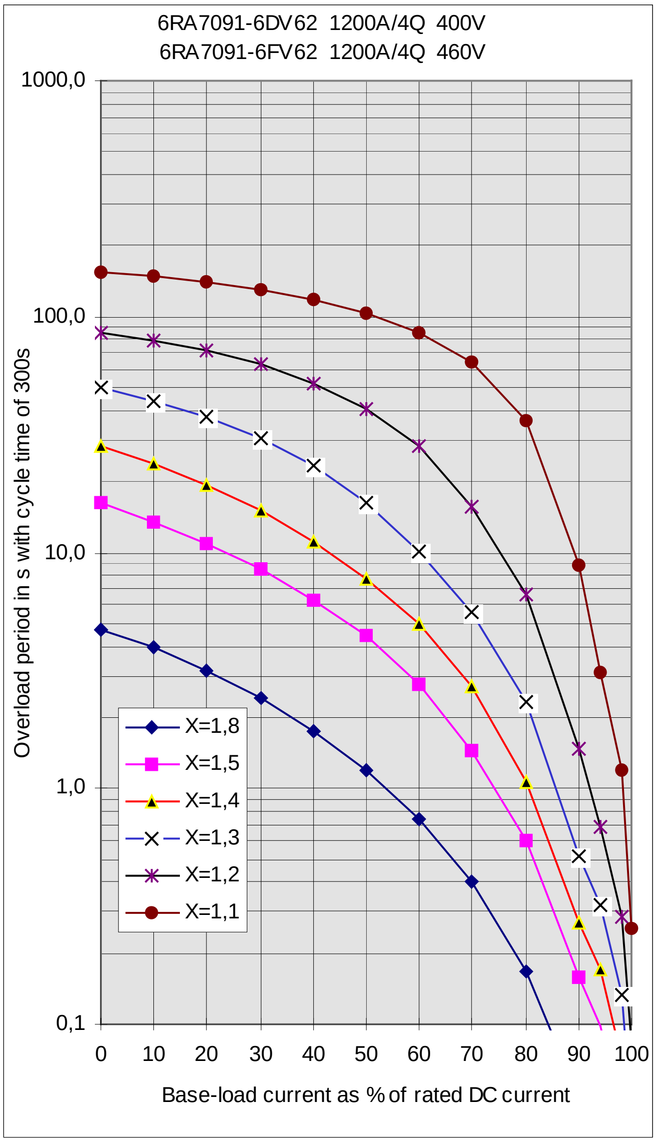


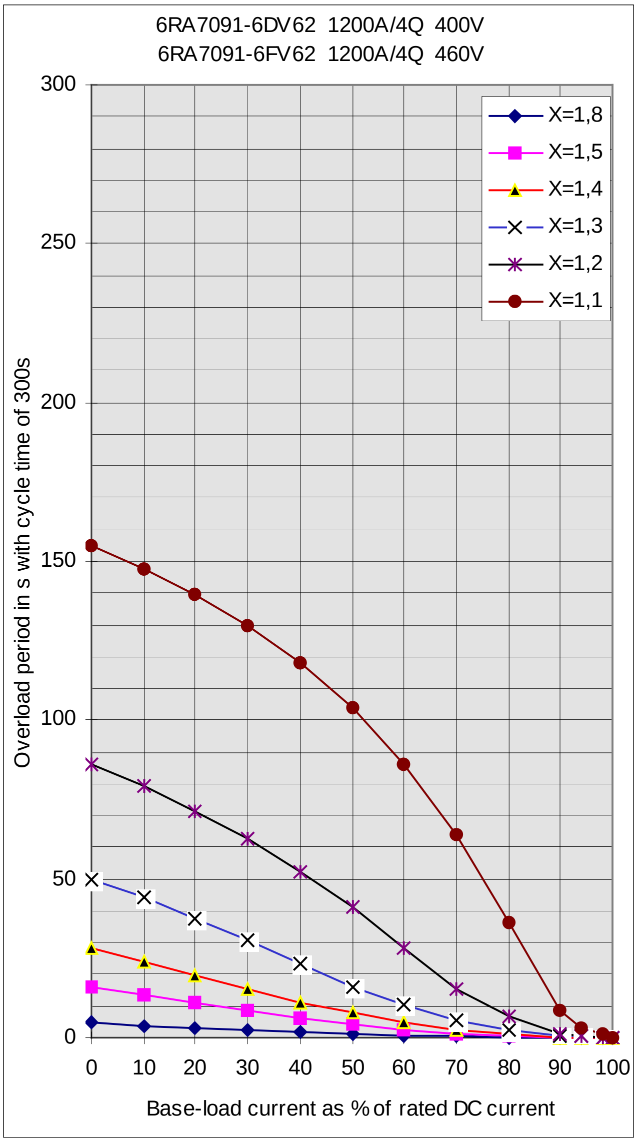
6RA7091-6DV62 and 6RA7091-6FV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	4.720	16.220	28.320	49.780	86.080	154.620
10	3.939	13.465	23.936	43.976	79.248	147.678
20	3.170	10.843	19.451	37.560	71.456	139.481
30	2.433	8.442	15.098	30.588	62.575	129.727
40	1.761	6.301	11.133	23.292	52.441	118.002
50	1.194	4.415	7.745	16.227	40.916	103.748
60	0.747	2.766	4.958	10.189	28.161	86.175
70	0.403	1.445	2.686	5.632	15.673	64.163
80	0.167	0.596	1.074	2.344	6.604	36.340
90	0.048	0.157	0.270	0.511	1.482	8.816
94	0.030	0.099	0.170	0.323	0.682	3.100
98	0.013	0.041	0.071	0.134	0.283	1.202
100	0.004	0.012	0.021	0.039	0.083	0.253

X	t_{an} (s)
1.1	223
1.2	104
1.3	54
1.4	28
1.5	15
1.8	4

t_{ab} (s) = 383



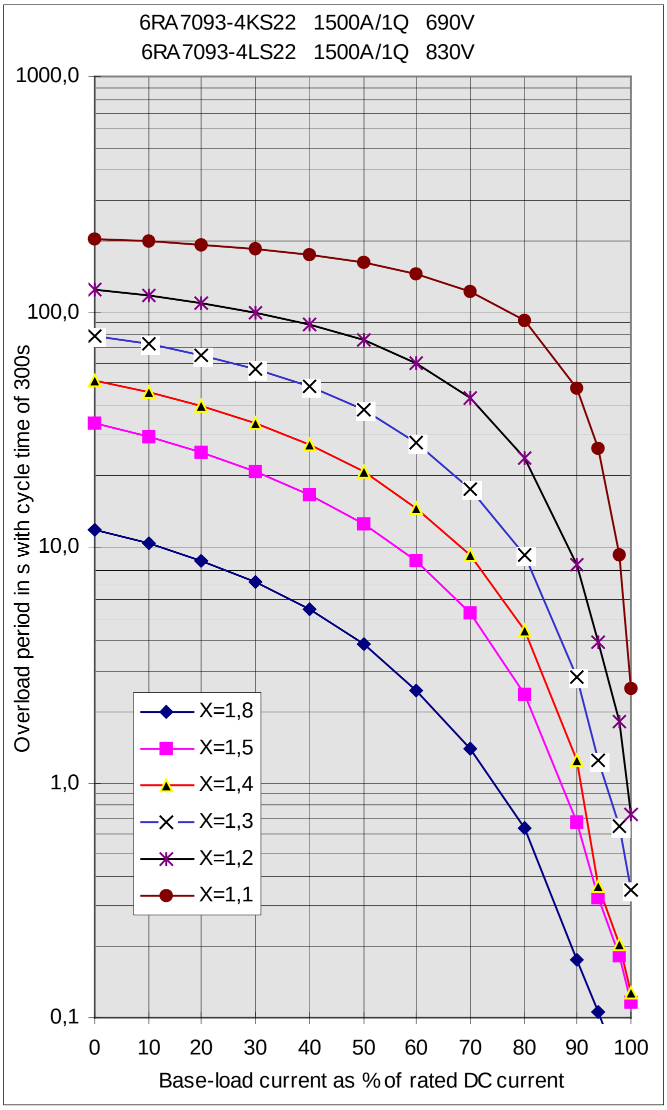


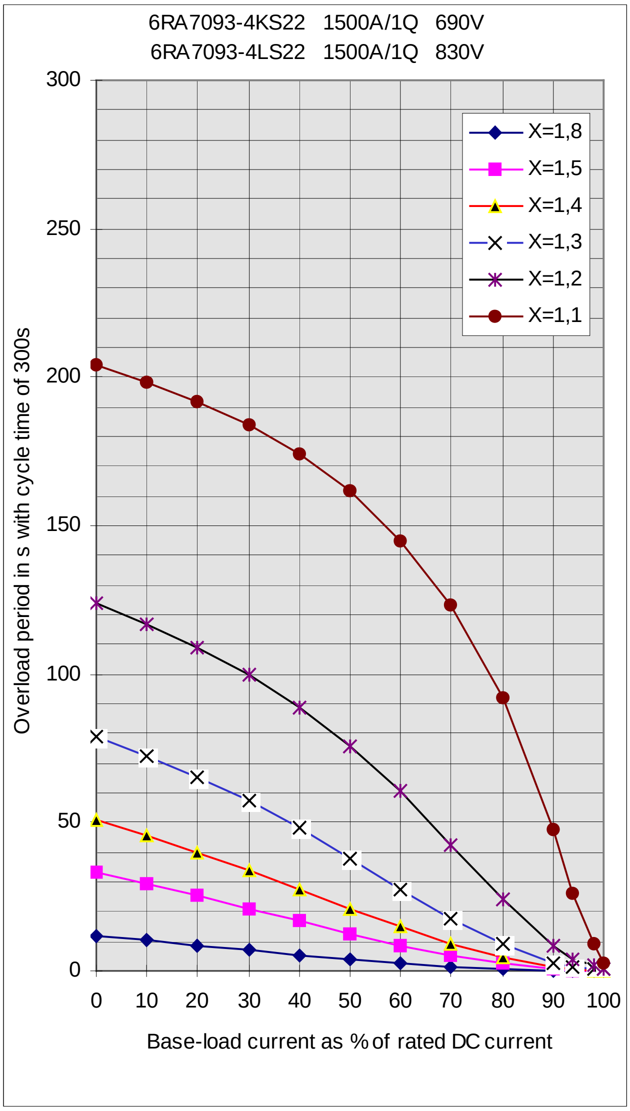
6RA7093-4KS22 and 6RA7093-4LS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	11.960	33.580	51.120	78.920	123.920	203.840
10	10.354	29.516	45.777	72.560	117.063	198.463
20	8.711	25.272	39.920	65.342	109.063	191.954
30	7.058	20.967	33.657	57.190	99.707	183.973
40	5.420	16.716	27.174	48.056	88.721	174.045
50	3.850	12.626	20.753	38.057	75.770	161.434
60	2.466	8.783	14.690	27.663	60.472	145.020
70	1.400	5.269	9.208	17.798	42.676	122.948
80	0.640	2.374	4.467	9.313	23.903	92.099
90	0.175	0.674	1.251	2.786	8.505	47.471
94	0.107	0.324	0.360	1.251	3.933	26.380
98	0.061	0.185	0.206	0.649	1.802	9.232
100	0.038	0.116	0.128	0.347	0.736	2.516

X	t_{an} (s)
1.1	407
1.2	183
1.3	100
1.4	59
1.5	35
1.8	11

t_{ab} (s) = 565



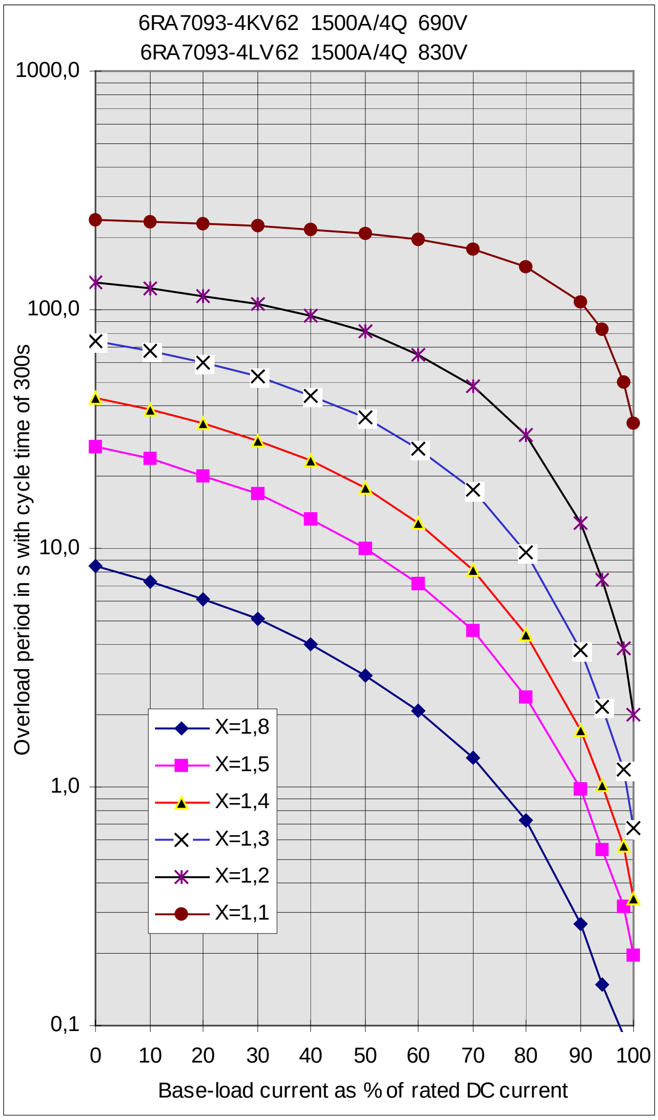


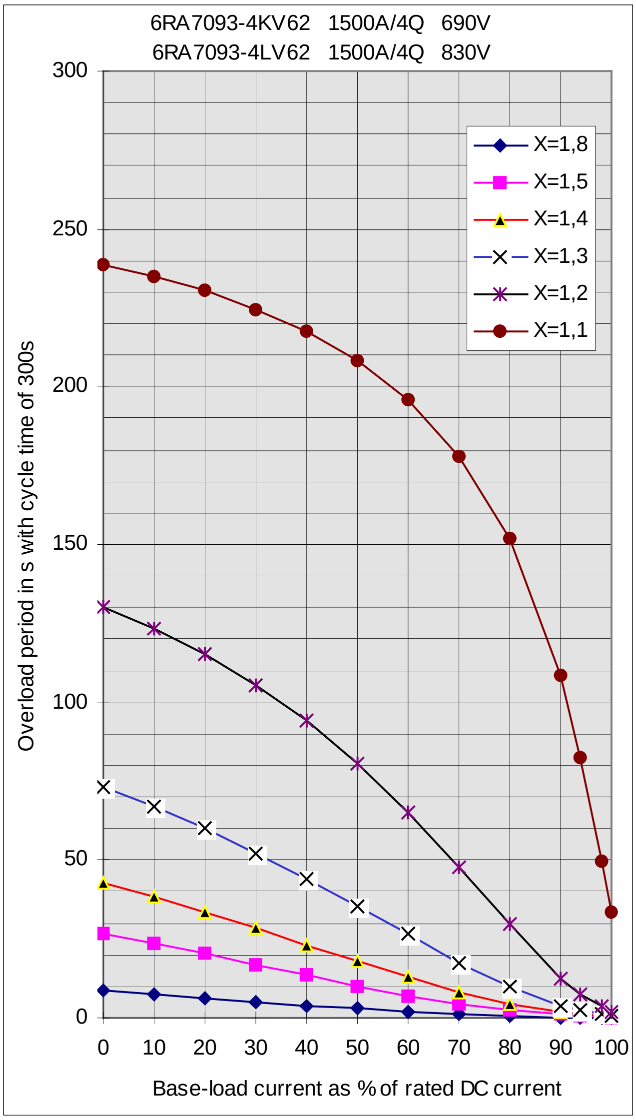
6RA7093-4KV62 and 6RA7093-4LV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	8.440	26.800	42.880	73.260	130.180	238.580
10	7.298	23.608	38.359	66.907	123.241	234.844
20	6.151	20.256	33.532	59.860	115.099	230.280
30	5.028	16.808	28.460	52.162	105.514	224.637
40	3.954	13.363	23.204	43.906	94.199	217.465
50	2.959	10.070	17.875	35.241	80.852	208.159
60	2.080	7.079	12.713	26.356	65.306	196.012
70	1.339	4.489	8.111	17.545	47.882	178.187
80	0.729	2.403	4.373	9.623	29.713	151.885
90	0.265	0.975	1.724	3.773	12.681	108.266
94	0.150	0.550	1.013	2.173	7.327	82.134
98	0.092	0.316	0.565	1.174	3.792	49.566
100	0.063	0.198	0.341	0.675	2.025	33.283

X	t_{an} (s)
1.1	546.0
1.2	195.0
1.3	92.0
1.4	47.0
1.5	27.0
1.8	7.8

t_{ab} (s) = 480



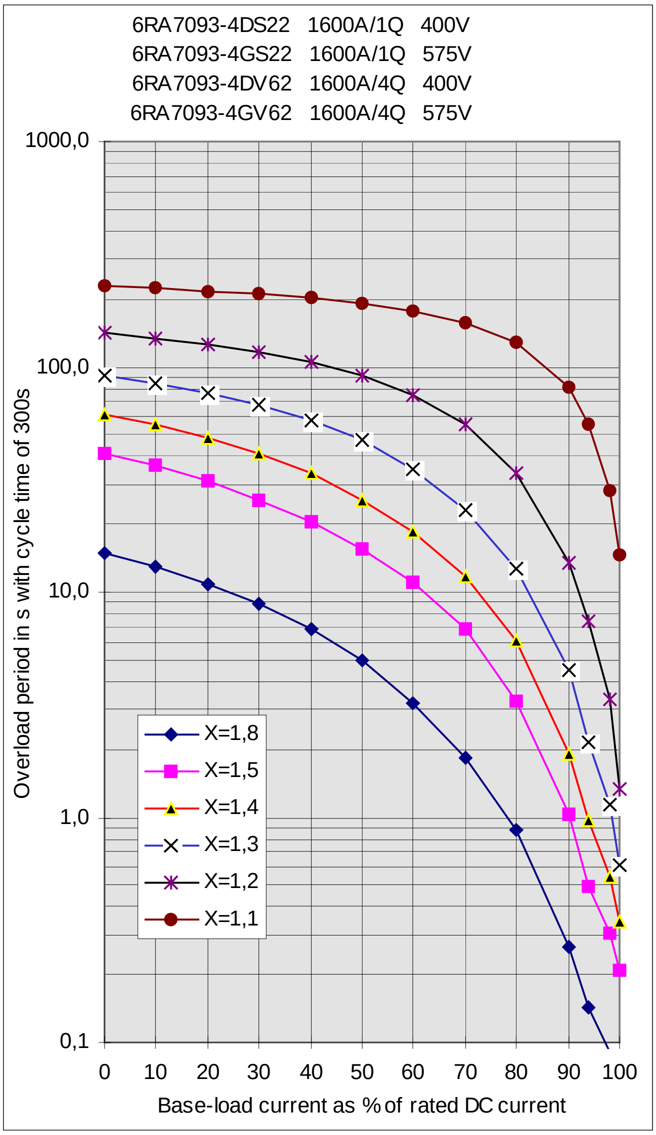


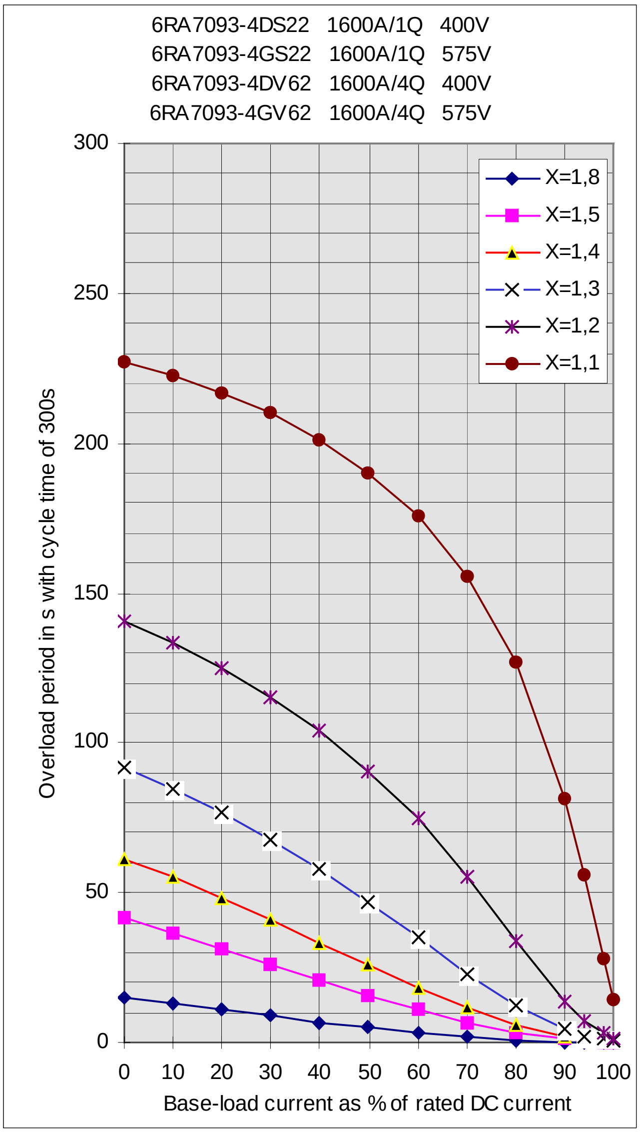
6RA7093-4DS22 and 6RA7093-4GS22
6RA7093-4DV62 and 6RA7093-4GV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	15.040	41.340	61.280	91.820	140.780	227.360
10	12.954	36.316	55.103	84.796	133.569	222.650
20	10.869	31.083	48.348	76.885	125.211	216.969
30	8.805	25.773	41.070	67.986	115.478	210.017
40	6.830	20.551	33.418	57.998	104.075	201.343
50	4.928	15.577	25.708	46.892	90.612	190.226
60	3.200	10.975	18.373	34.932	74.597	175.591
70	1.825	6.826	11.783	23.052	55.559	155.476
80	0.871	3.283	6.134	12.641	33.675	127.036
90	0.264	1.028	1.905	4.482	13.555	81.104
94	0.144	0.496	0.964	2.176	7.393	55.811
98	0.091	0.304	0.550	1.133	3.350	28.291
100	0.065	0.208	0.342	0.612	1.328	14.530

X	t_{an} (s)
1.1	518.0
1.2	219.0
1.3	122.0
1.4	73.0
1.5	45.0
1.8	14.5

t_{ab} (s) = 548



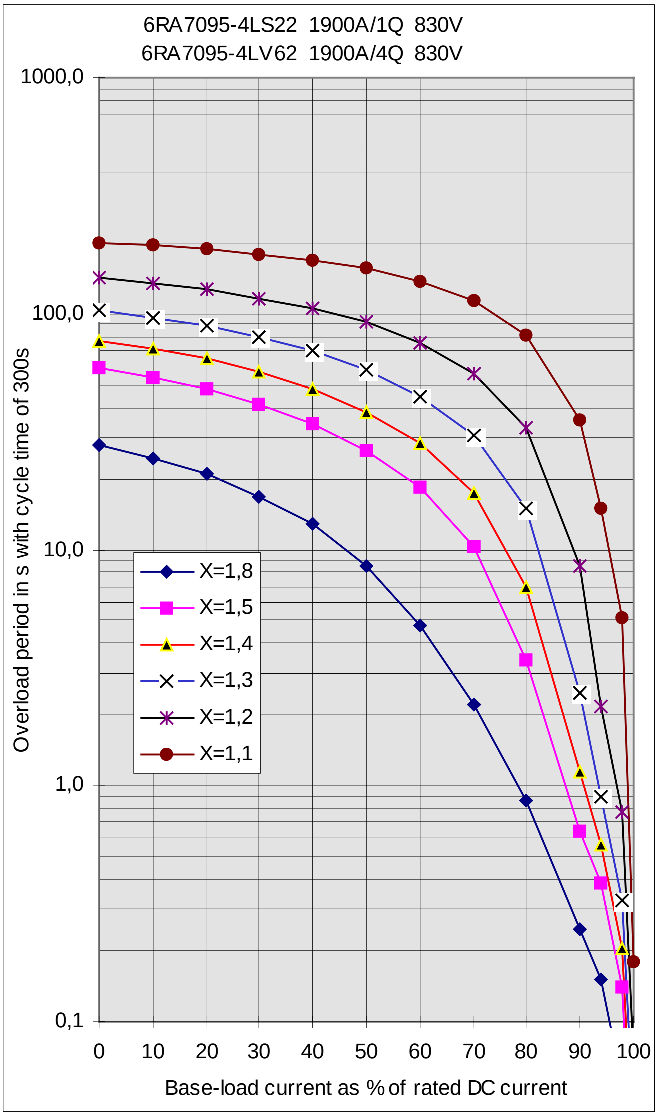


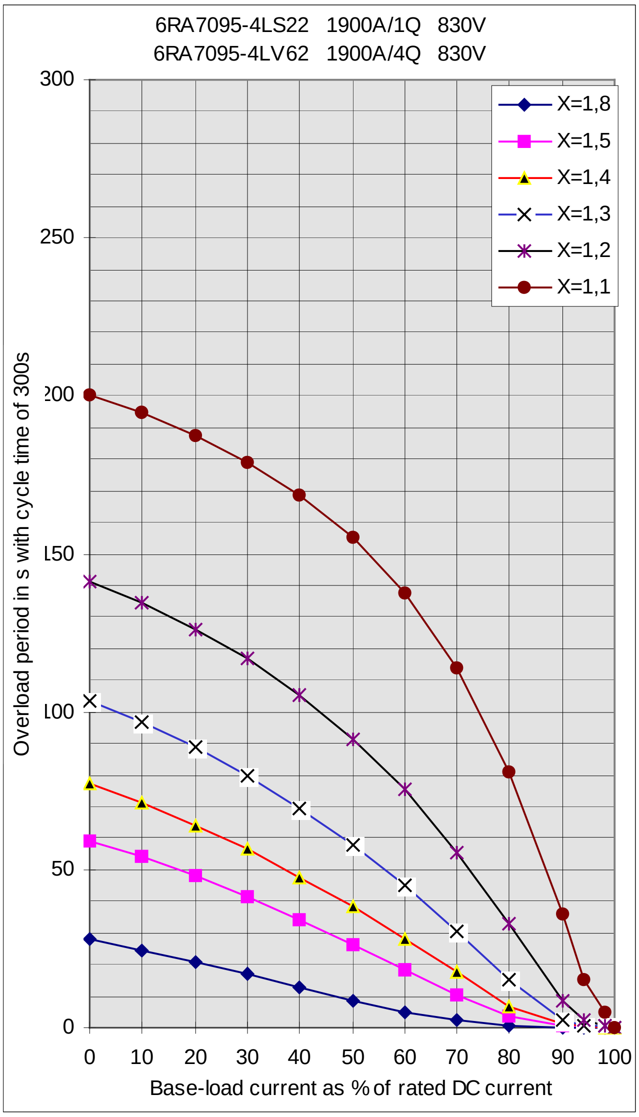
6RA7095-4LS22 and 6RA7095-4LV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	27.940	59.320	77.240	103.320	141.420	200.360
10	24.487	53.864	71.061	96.528	134.447	194.568
20	20.784	47.829	64.114	88.735	126.266	187.592
30	16.870	41.224	56.347	79.809	116.633	179.035
40	12.774	34.075	47.728	69.588	105.208	168.391
50	8.585	26.448	38.274	57.927	91.562	154.899
60	4.759	18.459	28.103	44.762	75.176	137.352
70	2.224	10.297	17.464	30.275	55.529	113.823
80	0.866	3.403	6.908	15.091	32.654	81.138
90	0.248	0.644	1.152	2.475	8.588	35.600
94	0.151	0.383	0.561	0.901	2.175	14.997
98	0.055	0.139	0.203	0.326	0.772	5.118
100	0.006	0.016	0.024	0.038	0.070	0.179

X	t_{an} (s)
1.1	513.0
1.2	259.0
1.3	160.0
1.4	108.0
1.5	76.0
1.8	30.8

t_{ab} (s) = 1056



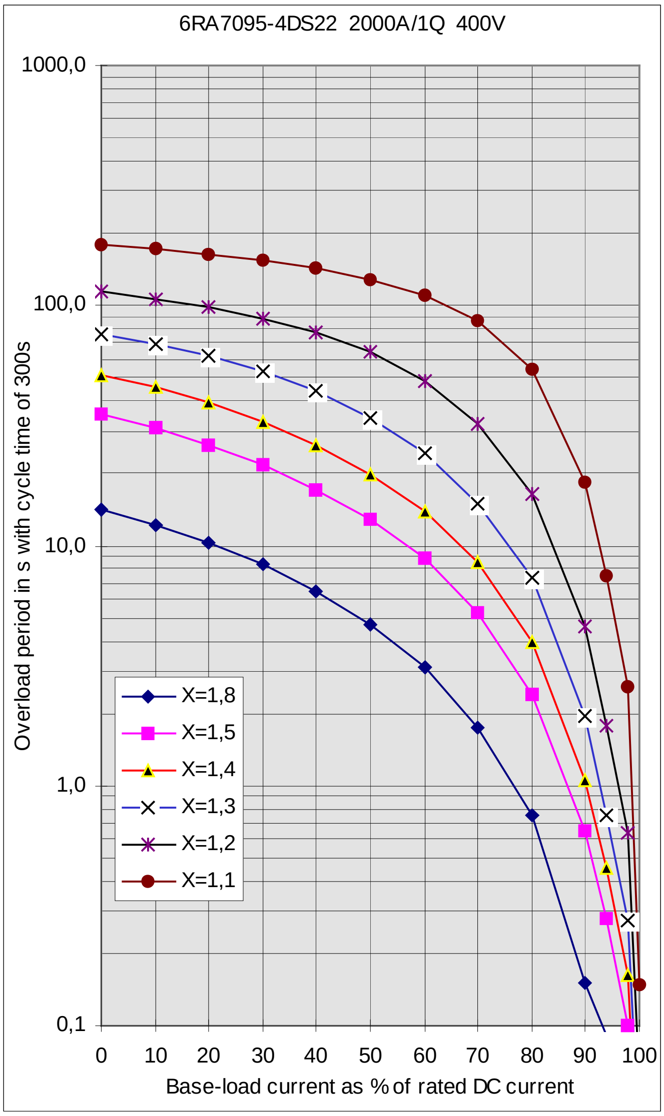


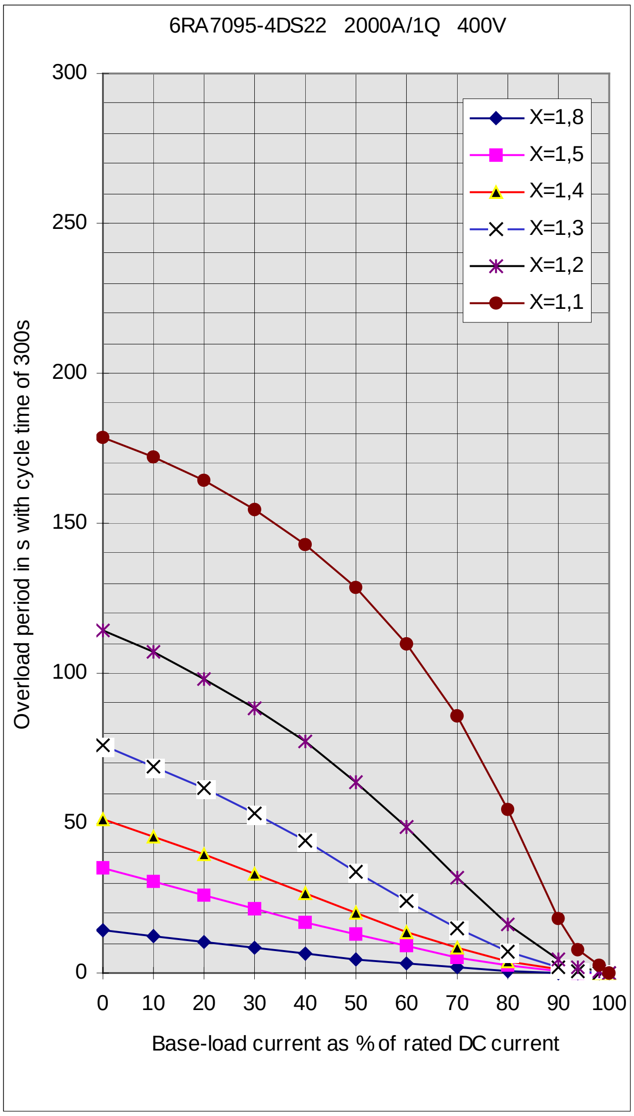
6RA7095-4DS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	14.080	35.260	51.320	75.880	114.220	178.880
10	12.164	30.801	45.618	69.144	106.834	172.191
20	10.242	26.203	39.457	61.597	98.330	164.219
30	8.340	21.590	32.954	53.180	88.514	154.610
40	6.490	17.086	26.323	43.913	77.142	142.861
50	4.731	12.802	19.857	34.013	63.949	128.285
60	3.124	8.827	13.843	24.086	48.749	109.844
70	1.755	5.256	8.476	15.005	32.049	86.007
80	0.750	2.411	3.965	7.384	16.379	54.679
90	0.150	0.644	1.059	1.958	4.647	18.411
94	0.091	0.280	0.455	0.758	1.781	7.489
98	0.033	0.101	0.164	0.273	0.632	2.595
100	0.004	0.011	0.018	0.030	0.057	0.148

X	t_{an} (s)
1.1	321.0
1.2	164.0
1.3	96.0
1.4	59.0
1.5	38.0
1.8	13.7

t_{ab} (s) = 600



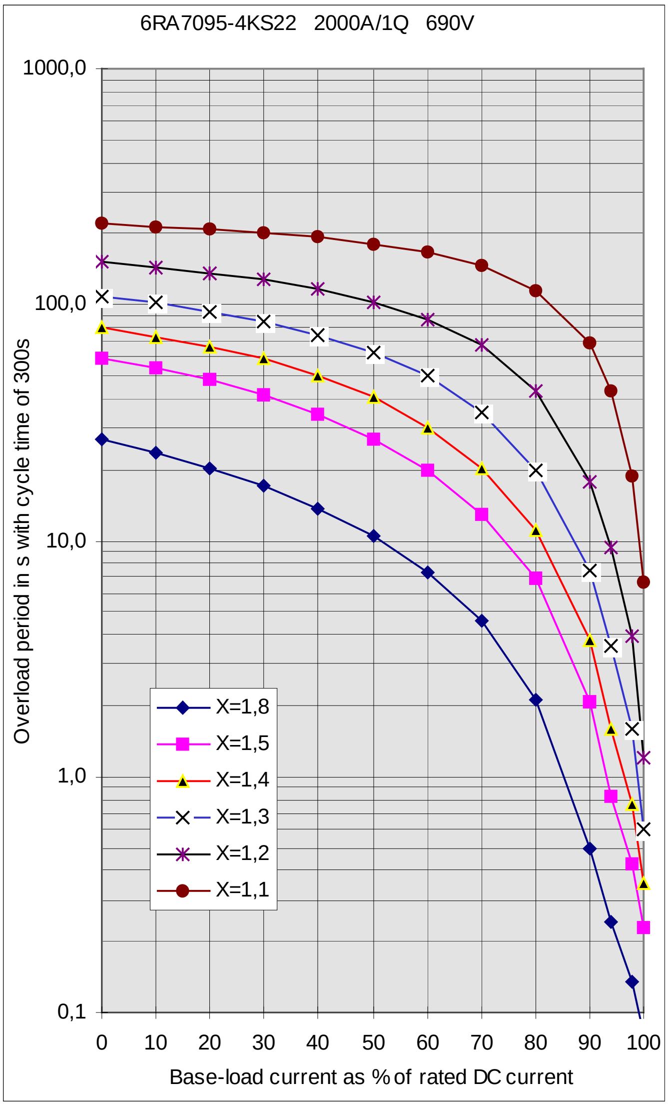


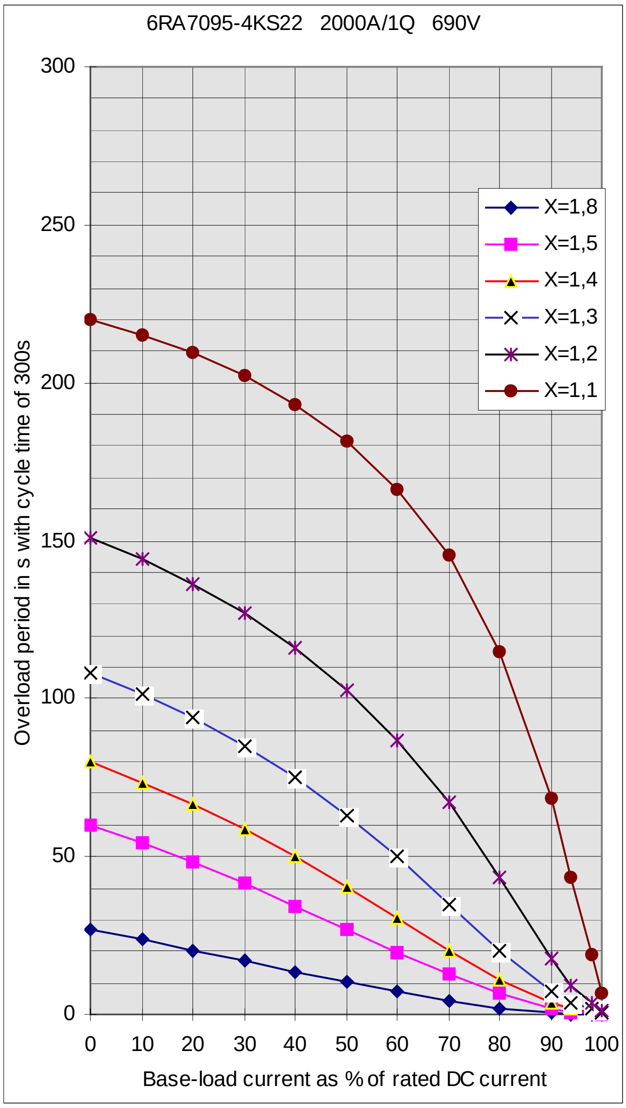
6RA7095-4KS22

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	26.880	59.700	79.780	108.360	151.120	220.200
10	23.649	54.174	73.569	101.610	144.367	215.318
20	20.327	48.089	66.581	93.882	136.463	209.406
30	16.978	41.460	58.758	85.031	127.152	202.144
40	13.665	34.367	50.050	74.872	116.097	193.067
50	10.445	27.004	40.484	63.200	102.850	181.458
60	7.380	19.715	30.318	49.860	86.799	166.159
70	4.552	12.906	20.226	35.021	67.180	145.210
80	2.097	6.899	11.149	20.032	43.331	114.998
90	0.496	2.090	3.812	7.485	17.833	68.545
94	0.243	0.828	1.607	3.608	9.406	43.196
98	0.135	0.427	0.770	1.602	3.935	18.871
100	0.081	0.227	0.351	0.599	1.200	6.709

X	t_{an} (s)
1.1	479.7
1.2	248.5
1.3	155.7
1.4	104.8
1.5	73.4
1.8	28.7

t_{ab} (s) = 663



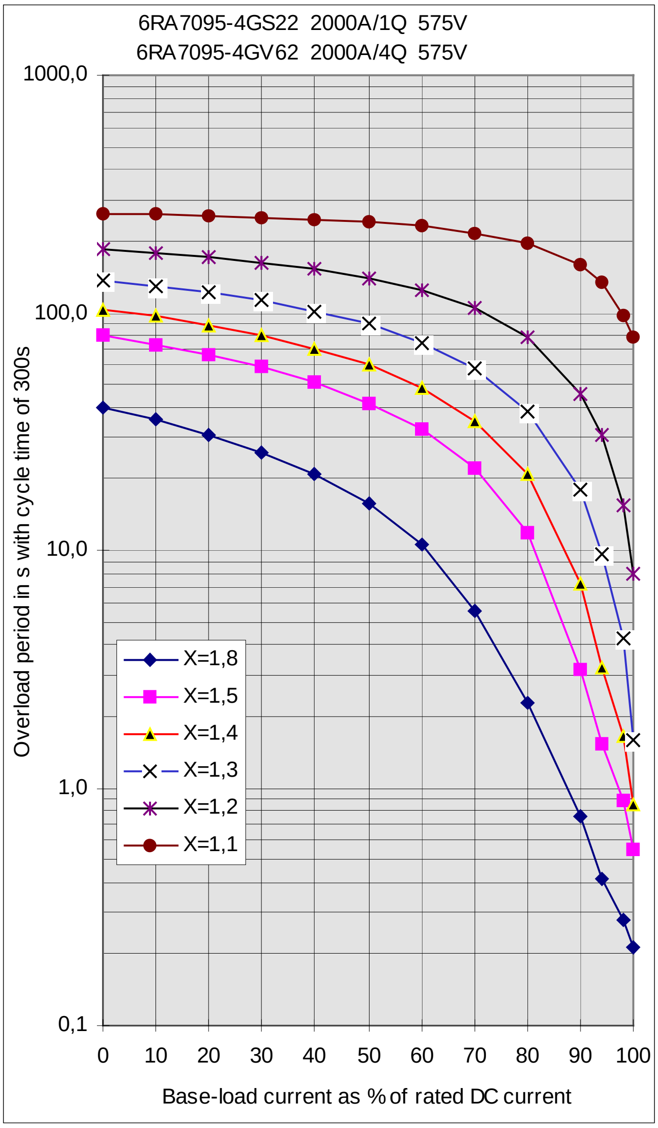


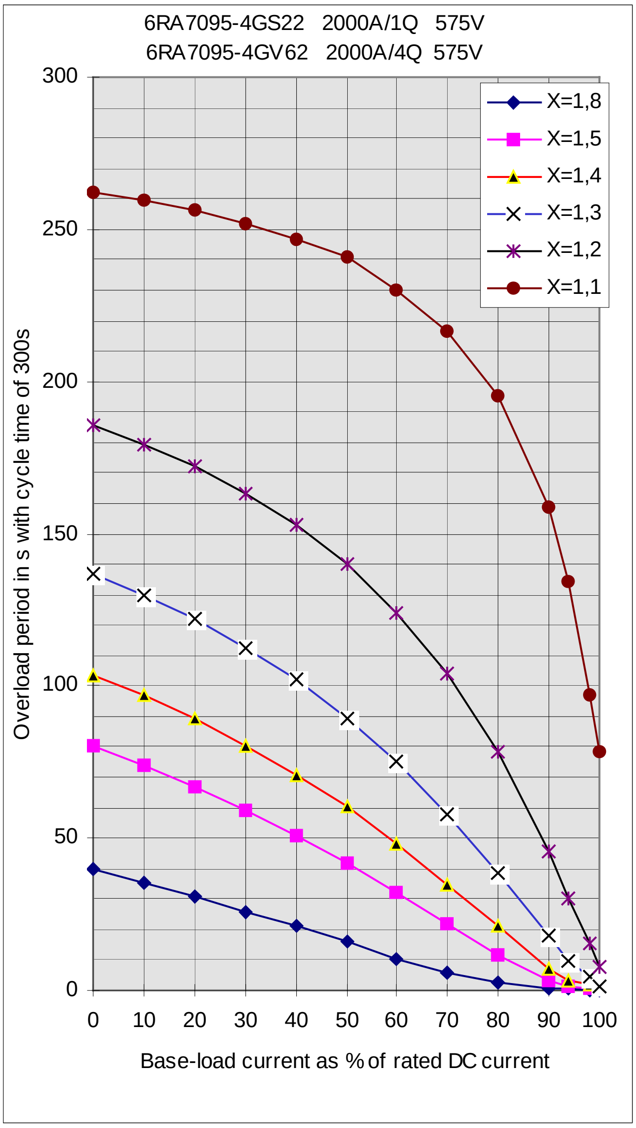
6RA7095-4GS22 and 6RA7095-4GV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	39.720	80.060	103.680	136.840	185.580	262.160
10	35.381	73.782	96.869	129.838	179.331	259.402
20	30.789	66.849	89.218	121.817	171.987	256.043
30	25.968	59.224	80.620	112.580	163.277	251.935
40	20.951	50.876	70.958	101.897	152.798	246.641
50	15.779	41.819	60.123	89.469	140.037	241.189
60	10.524	32.135	48.069	74.951	124.224	230.257
70	5.568	22.016	34.904	58.026	104.256	216.666
80	2.295	11.757	21.027	38.670	78.552	195.547
90	0.753	3.171	7.298	17.853	45.497	158.419
94	0.411	1.542	3.225	9.642	30.440	134.458
98	0.280	0.883	1.640	4.265	15.415	96.988
100	0.214	0.553	0.848	1.576	7.902	78.254

X	t_{an} (s)
1.1	1247.5
1.2	421.2
1.3	241.9
1.4	159.2
1.5	111.9
1.8	46.6

t_{ab} (s) = 1064



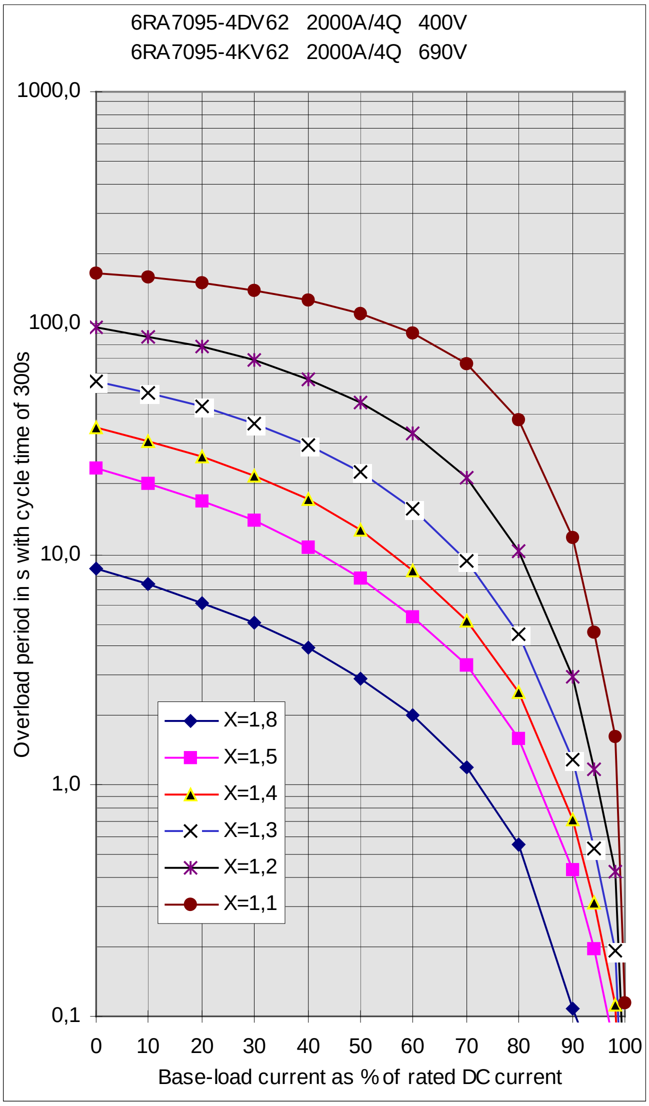


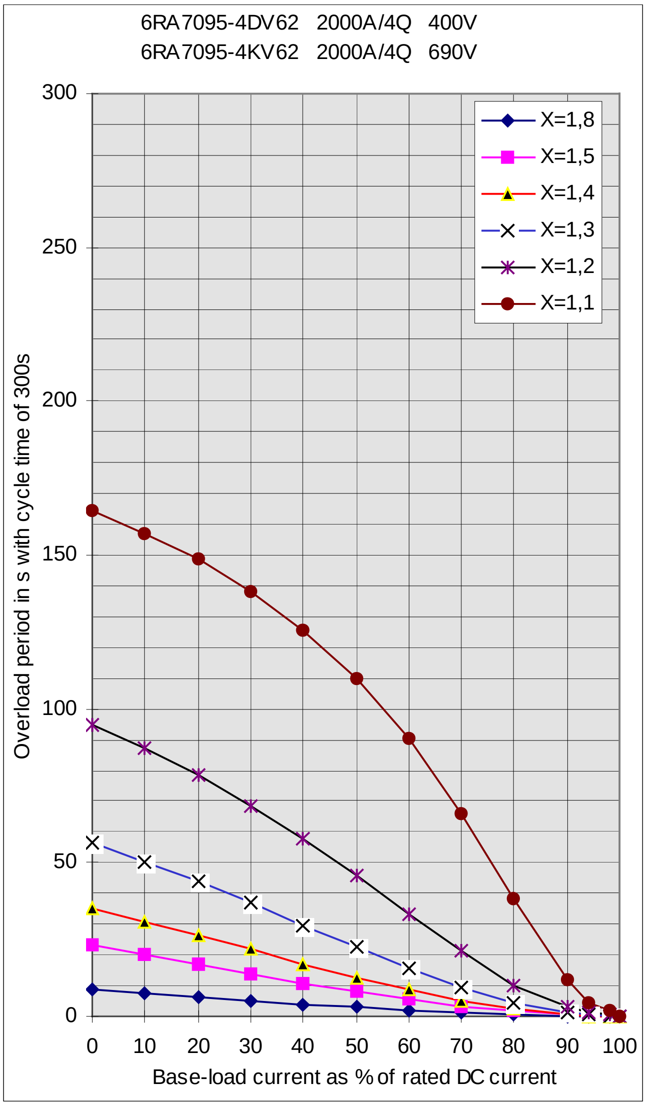
6RA7095-4DV62 and 6RA7095-4KV62

Ig (%)	Tp (s) X=1.8	Tp (s) X=1.5	Tp (s) X=1.4	Tp (s) X=1.3	Tp (s) X=1.2	Tp (s) X=1.1
0	8.620	23.520	35.400	56.300	94.920	164.420
10	7.378	20.361	31.064	50.189	87.161	157.186
20	6.169	17.114	26.540	43.681	78.348	148.563
30	5.012	13.871	21.887	36.852	68.439	138.188
40	3.922	10.752	17.198	29.797	57.475	125.541
50	2.910	7.889	12.663	22.639	45.671	109.901
60	1.992	5.385	8.571	15.623	33.425	90.316
70	1.197	3.281	5.173	9.344	21.245	65.970
80	0.559	1.596	2.535	4.520	10.275	38.038
90	0.107	0.428	0.709	1.302	2.929	11.665
94	0.062	0.195	0.311	0.533	1.179	4.610
98	0.022	0.070	0.112	0.192	0.421	1.613
100	0.002	0.008	0.012	0.021	0.043	0.115

X	t_{an} (s)
1.1	274
1.2	128
1.3	65
1.4	37
1.5	23
1.8	8

t_{ab} (s) = 493



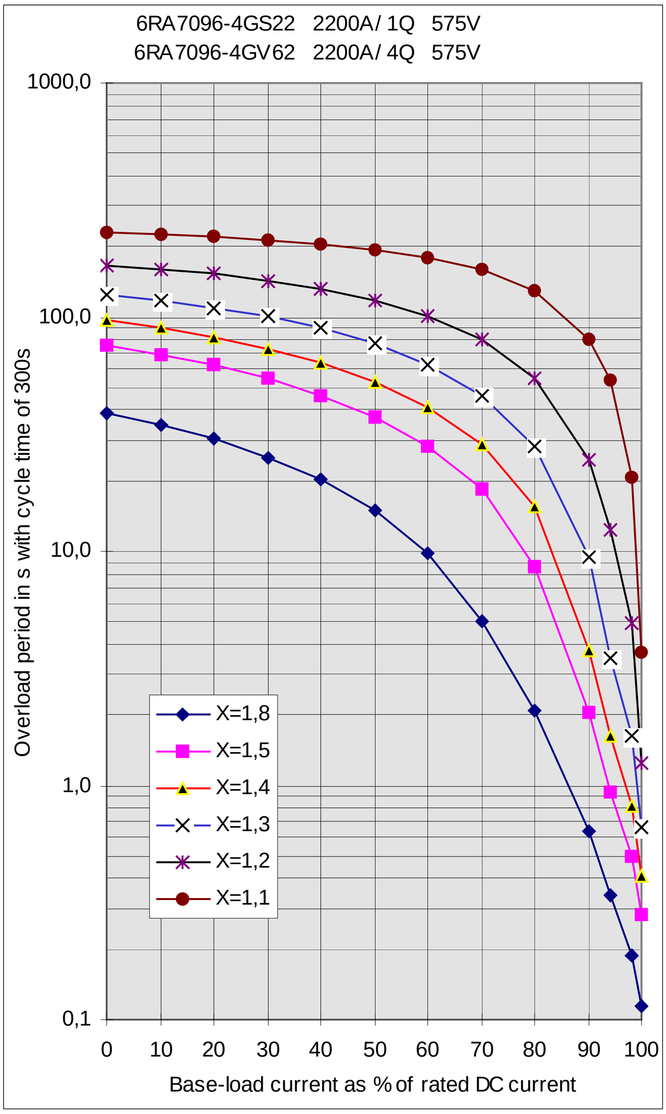


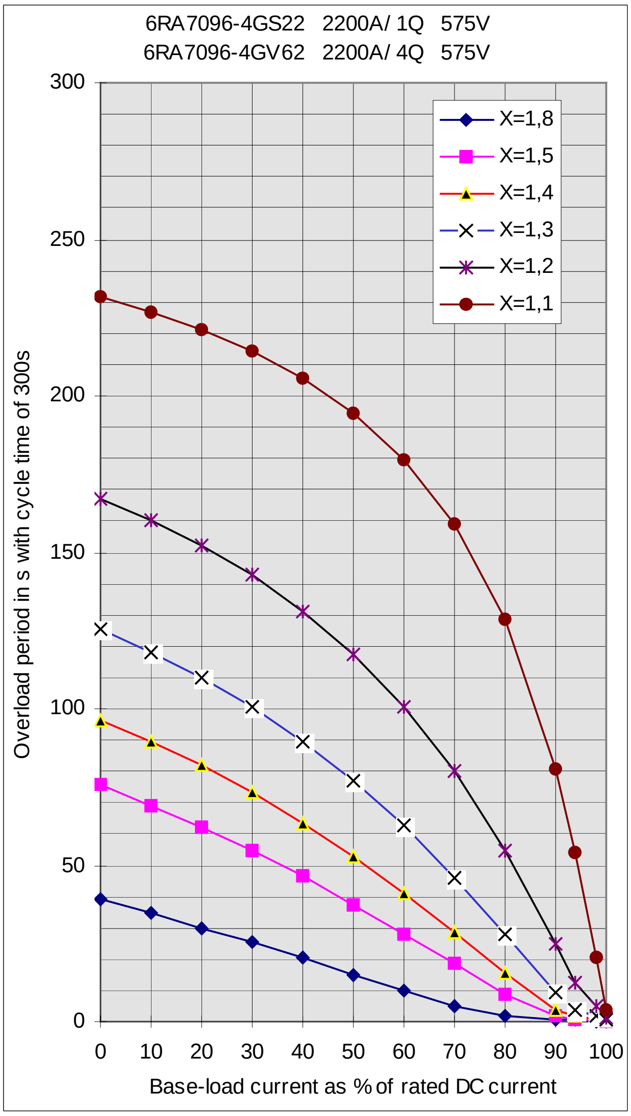
6RA7096-4GS22 and 6RA7096-4GV62

Ig (%)	Tp (s) X=1,8	Tp (s) X=1,5	Tp (s) X=1,4	Tp (s) X=1,3	Tp (s) X=1,2	Tp (s) X=1,1
0	39,000	75,480	96,440	125,460	167,360	231,500
10	34,653	69,163	89,521	118,189	160,398	226,803
20	30,048	62,221	81,784	109,887	152,267	221,147
30	25,226	54,625	73,140	100,396	142,699	214,187
40	20,218	46,366	63,494	89,496	131,303	205,444
50	15,067	37,482	52,786	76,940	117,591	194,231
60	9,838	28,083	41,038	62,485	100,872	179,350
70	5,003	18,370	28,453	46,016	80,237	158,741
80	2,073	8,650	15,482	27,901	54,722	128,525
90	0,636	2,032	3,781	9,411	24,713	80,823
94	0,341	0,930	1,630	3,521	12,433	54,030
98	0,190	0,496	0,818	1,616	4,978	20,492
100	0,114	0,279	0,412	0,663	1,251	3,722

X	t_{an} (s)
1,1	753
1,2	340
1,3	209
1,4	142
1,5	102
1,8	45

t_{ab} (s) = 985





9.16 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,

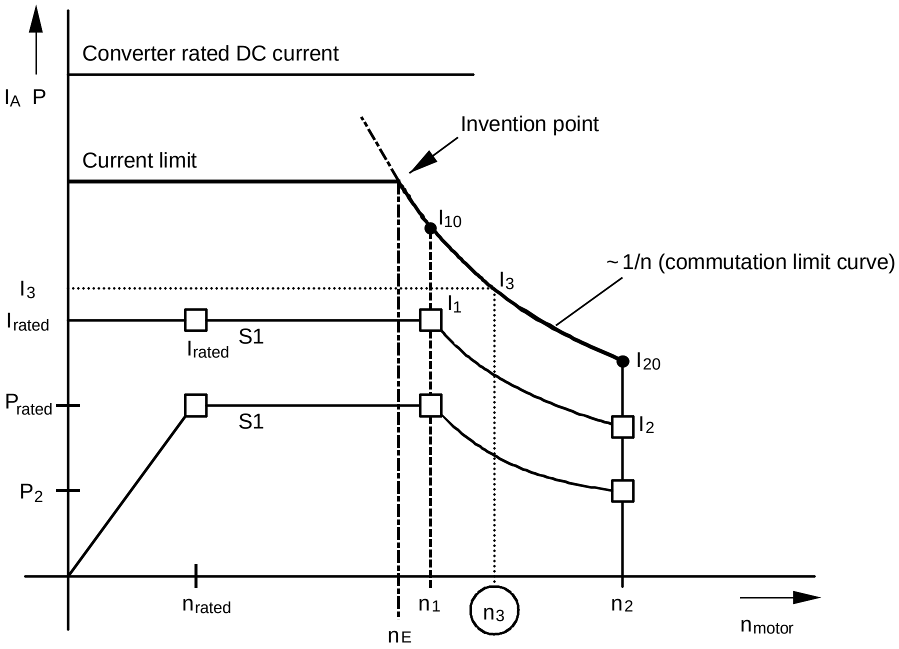
– P741 with actual speed supplied by an analog tacho,

– 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!

9.16.1 Setting the speed-dependent current limitation for motors with commutation transition



□ Motor rating plate data

● Permissible limit values

n_E = Point at which speed-dependent current limitation intervenes

(n_3) = Maximum operating speed

$I_{10} = 1.4 * I_1$

$I_{20} = 1.2 * I_2$

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})

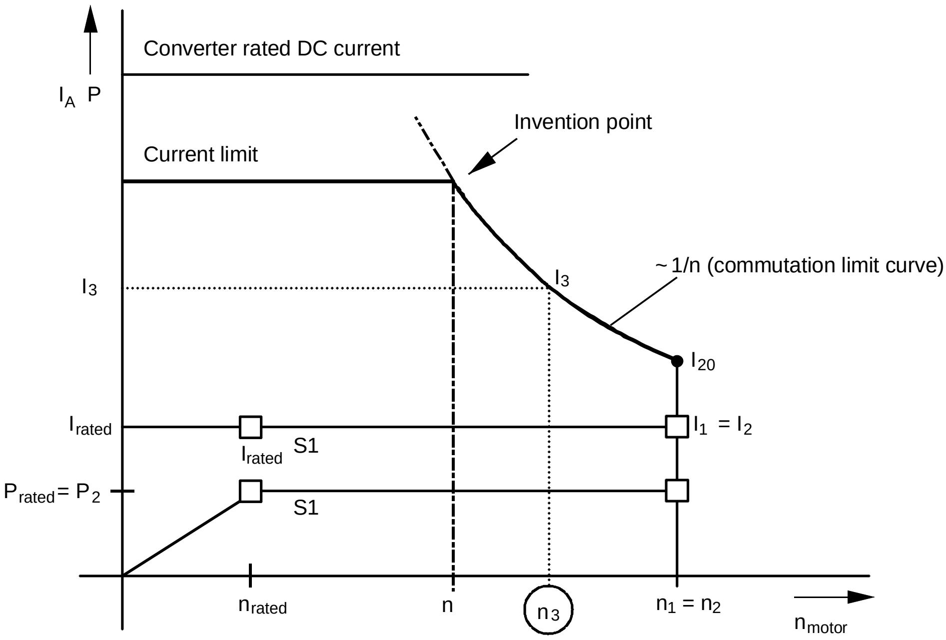
P108 = n_3 (defines speed normalization)

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
NRE EN 60034
V n_1 1/MIN n_2 I_1 A I_2 KW
46-380 50-1490 78.0-78.5 0.880-26.0
380 3400 / 4500 REG. 80.0 / 58.0 26.0 / 19.0
ERR. V A THYR.: B6C LV= 0MH 380V/ 50HZ
SEP. 310 2.85 IP 23 IM B3
77/51 0.87/0.60 I.CL.F
Z: A11 G18 K01 K20
SEP. VENTIL.

9.16.2 Setting of speed-dependent current limitation for motors without commutation transition



□ Motor rating plate data

● Permissible limit values

n_E = Point at which speed-dependent current limitation intervenes

(n_3) = Maximum operating speed

$I_{20} = 1.2 * I_2$

Example of a motor rating plate:

* S H U N T -MOT.			1GG5116-0FH40-6HU7-Z		
	NRE				EN 60034
V	$n_2 = n_1$	1/MIN	A		KW
46-380		50-2300	36.0-37.5		0.265-12.0
380	6000	REG.	38.5	$I_2 = I_1$	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.					

9.17 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 converter 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
$I_{field\ act} < 50\%\ I_{field\ set}$)

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.

9.18 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.

9.18.1 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 (" Close field contactor 1" (B0260) = 1, " Close field contactor 2" (B0261) = 0)
	1	Negative field direction is selected (" 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 ≥ 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. 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).

9.18.2 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 ≤ 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 ≤ 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 ≥ 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 ≥ 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 9.18.1.

Delay times for field reversal (parameter P092)

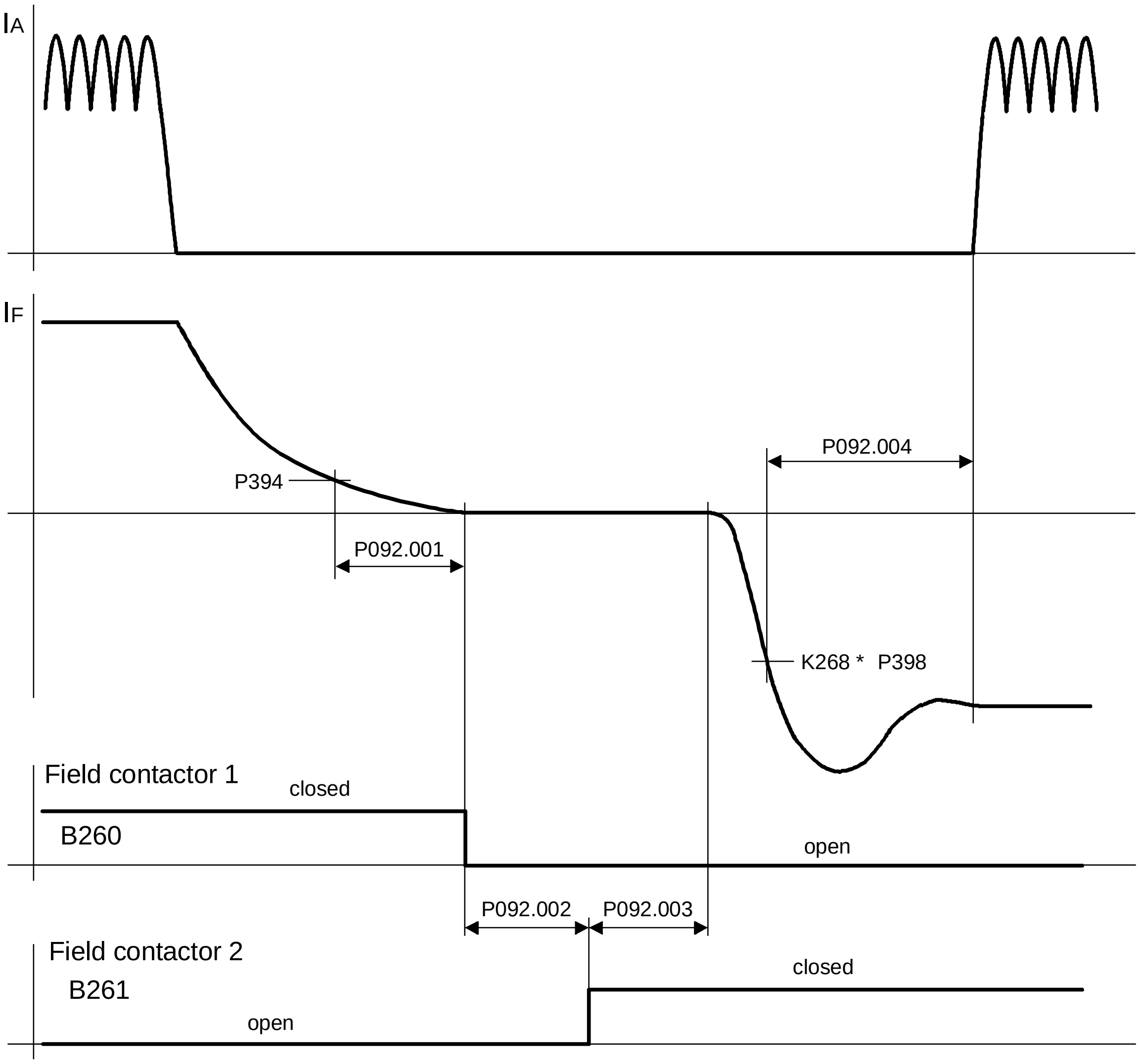
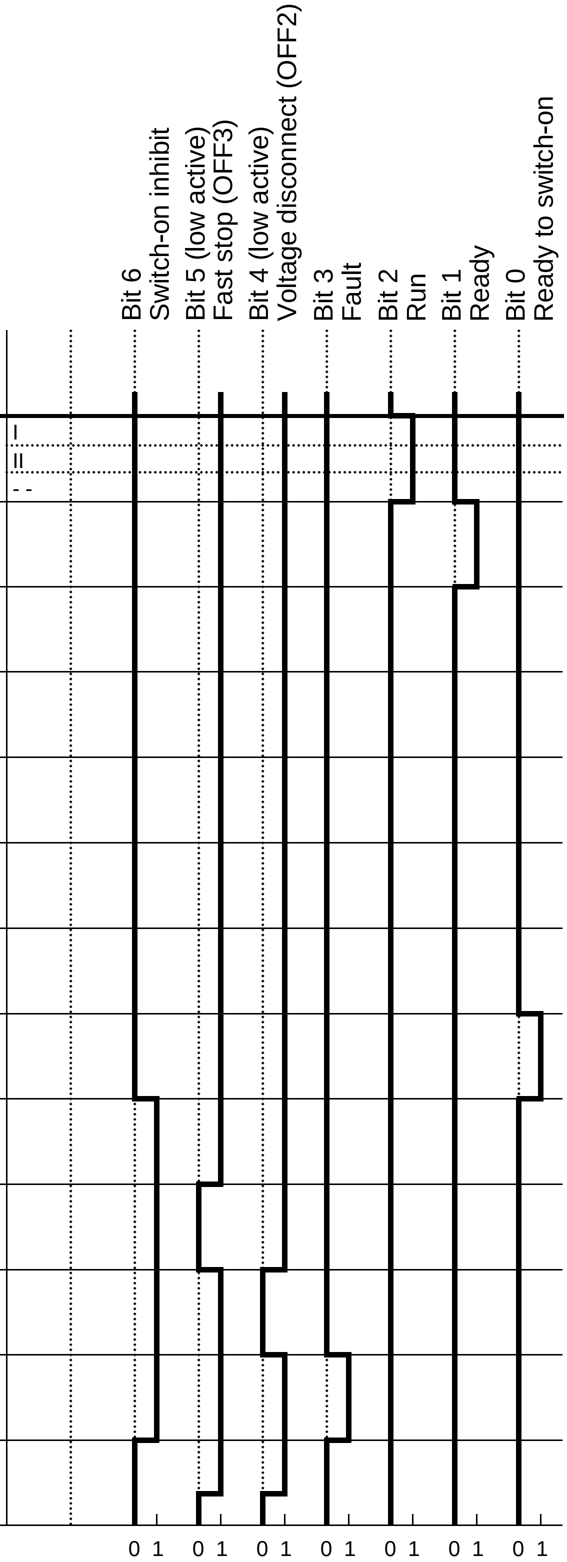


Bild 9.18.1

9.19 Status description of some bits of status word ZSW1

Operating status	Code
M0, MI or MII (=RUN)	I ,II ,- -
Waiting for operating enable (=READY)	o1
reserved	o2
Test phase	o3
Wait for voltage (armature)	o4
Wait for field current	o5
Wait status before closing the line contactor	o6
Wait for switch-on (=READY TO SWITCH-ON)	o7
Wait for acknowledgement of the switch-on inhibit	o8
Fast stop (OFF3)	o9
Voltage disconnect (OFF2)	o10
Fault	o11
Electronics not initialized	o12



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.)
- Parameters
  r047 (fault diagnostic memory)
  r049 (fault time)
  r947 (fault memory, see also r947 in Section 11, Parameter List)
  r949 (fault value)
  P952 (number of faults)
  are updated

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	
	Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)

10.1.2.1 Supply faults

F001	**Failure of electronics power supply** (active in all operating states) 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. Possible fault causes: • Line contactor has opened in “RUN” state • Brief supply failure • Supply voltage too low 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	-
F004	**Phase failure in armature supply** (active in operating states of ≤ o4) 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 $P078.001 * \frac{P353}{100\%}$ The distance between two identical supply zero passages of a phase must not exceed 450 degrees. If one of these two conditions remains unfulfilled for longer than the “restart time” set in P086, a fault message is activated 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. Possible fault causes: • Parameter P353 is incorrectly set • Armature phase has failed • Line contactor opened in operation • Fuse has blown on three-phase side in armature circuit • Fuse has blown in power section • Interruption in a thyristor firing pulse cable (auxiliary cathodes at connectors X12, X14, X16 are voltage carriers).	

Fault No.	Description Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
	Fault value: 1 Voltage failure has occurred in armature supply (1U1, 1V1, 1W1) (when P086=0) 2 Delay time set in parameter P089 has expired in operating state o4 3 Fuse has blown in power section 4 Voltage failure has lasted longer than period set in P086 (if this is > 0) 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 [V1.8 and later] .	
F005	**Fault in the field circuit** (active in operating states of ≤ o5) 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 $P078.002 * \frac{P353}{100\%}$ The distance between two identical network zero passages of the voltage for the field converter must not exceed 450 degrees. 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. [In SW 1.9 and later, the percentage (50%) and time (500ms) can be altered in P396 and P397 respectively] If one of the fault conditions described persists in operation (or ≤ o4) for longer than the “restart” time set in P086, the fault message is output. 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. Monitoring for timeout as the field decays or builds up after initiation of field reversal (fault values 6 and 7) is not implemented until SW 1.7 and later. Possible fault causes • Threshold for phase failure (P353) set incorrectly • Field phase failed • Line contactor opened during operation • Fuse blown in the field circuit • Field current controller and/or field current precontrol not optimized or badly optimized (check P112, P253 to P256; possibly execute current controller optimization) • Check P396 (field current monitoring threshold) and P397 (field current monitoring time) • 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 I_field < I_field_min) must be checked • 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 I_field < I_field_x) must be checked Fault value:	
	1 Voltage failure occurred in the field supply (terminals 3U1 and 3W1) (if P086 = 0) 2 Delay time according to P089 elapsed in state o5.1 (waiting for voltage at the field power section) 3 Delay time according to P089 elapsed in state o5.0 (waiting until $I_{field\ act}$ (K0265) is > 50% of the instantaneous field current setpoint K0268) [threshold settable in P396 as of SW 1.9] 4 After P086 > 0 has elapsed (time for automatic restart) in operating state ≤ o4: Voltage failure in the field supply or $I_{field\ act}$ (K0265) < 50% $I_{field\ set}$ (K0268) for longer than 500 ms [settable via P396 and P397 as of SW 1.9] 5 When P086 = 0 (no automatic restart) in operating state ≤ o4: $I_{field\ act}$ (K0265) < 50% $I_{field\ set}$ (K0268) for longer than 500 ms [settable via P396 and P397 as of SW 1.9] 6 If field reduction before field reversal, I_field ≤ I_field_min (P394) is not reached within 30 s 7 If field build-up after field reversal, I_field > I_field_x (P398) is not reached within 30 s	

Fault No.	Description	
	Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
F006	**Undervoltage** (active in operating states of ≤ o4) 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. Response threshold for armature supply voltage: $P078.001 * (1 + \frac{P351}{100\%})$ Response threshold for field supply voltage: $P078.002 * (1 + \frac{P351}{100\%})$ Possible fault causes • Line undervoltage • Monitoring values set too sensitively or incorrectly (P351, P078)	
	Fault value:	r047 Index 002 to 016:
	1 Undervoltage has occured	i002 Number of phase that has activated fault message 0.... Phase UV 1.... Phase VW 2.... Phase WU 3.... Phase field i003 Incorrect voltage value (normalized to 16384)
	4 Undervoltage persists for longer than time set in parameter P086 (if this is set to > 0)	-
F007	**Overvoltage** (active in operating states of ≤ o4) 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). Response threshold for armature supply voltage: $P078.001 * (1 + \frac{P352}{100\%})$ Response threshold for field supply voltage: $P078.002 * (1 + \frac{P352}{100\%})$ Possible fault causes • Line overvoltage • Monitoring values set too sensitively or incorrectly (P352, P078)	
	NOTICE 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 0.... Phase UV 1.... Phase VW 2.... Phase WU 3.... Phase field i003 Incorrect voltage value (normalized to 16384)
	4 Undervoltage persists for longer than time set in parameter P086 (if this is > 0)	-
F008	**Line frequency less than the minimum line frequency acc. to parameter P363** (active in operating states of ≤ o5) 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). Note: Up to software version 1.7 the threshold for activation of the fault message (minimum line frequency) is 45Hz.	

Fault No.	Description Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
	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)	
F009	**Line frequency greater than the maximum line frequency acc. to parameter P364** (active in operating states of ≤ o5) 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). Note: 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)	

10.1.2.2 Interface error

F011	**Telegram failure at GSST1** when P780 = 2: **USS telegram failure at G-SST1** (active from the first receipt of a valid protocol in all operating states) After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P787. Possible fault causes • Cable break • Error in USS master
F012	**Telegram failure at GSST2** when P790 = 2: **USS telegram failure at G-SST2** (active from the first receipt of a valid protocol in all operating states) After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P797. Possible fault causes • Cable break • Error in USS master when P790 = 4 or 5 and P798 = 32 or 33: **Peer-to-peer telegram failure at G-SST2** (active in operating states of ≤ o6) After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P797. Possible fault causes • Interruption in connecting cable • EMC interference on connecting cable • P797 is set too low

Fault No.	Description Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
F013	**Telegram failure at GSST3** when P800 = 2 and P808 = 32 or 33: **USS telegram failure to G-SST3** (active from the first receipt of a valid protocol in all operating states) After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P807. Possible fault causes • Cable break • Error in USS master when P800 = 4 or 5: **Peer-to-peer telegram failure at G-SST3** (active in operating states of ≤ o6) After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P807. Possible fault causes • Interruption in connecting cable • EMC interference on connecting cable • P807 is set too low	
F014	**Telegram failure at paralleling interface** (active when U800 = 1 or 2 from the first receipt of a valid protocol in all operating states) After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter U807. Possible fault causes • Interruption in connecting cable • EMC interference on connecting cable • U807 is set too low	
F015	**Telegram failure on one SIMOLINK board** (active when U741 > 0 as soon as the first valid telegram is received) After receipt of one valid telegram, no further valid telegrams have arrived within the period set in parameter U741. Possible fault causes • Break in connecting cable • Parameter setting change during telegram exchange (for parameters see Section 11 "Configuration of SIMOLINK board) • U741 is set to low Fault value:	
	1 Telegram failure on 1st SLB 2 Reserved	
F016	**Hardware fault on expansion board EB1** Fault value:	
	1 Fault on first EB1 2 Fault on second EB1	
F017	**Hardware fault on expansion board EB2** Fault value:	
	1 Fault on first EB2 2 Fault on second EB2	

Fault No.	Description	
	Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
F018	**Short circuit or overloading of binary outputs** (active in all operating states) Possible fault causes • Short circuit or overload at terminals 46, 48, 50 or 52 and 26 or 34 Fault value:	r047 Index 002 to 016:
	1 Short circuit or overload at binary outputs	i002 Bit 8 = 1: Overload at terminal 46 Bit 9 = 1: Overload at terminal 48 Bit 10 = 1: Overload at terminal 50 Bit 11 = 1: Overload at terminal 52 Bit 12 = 1: Overload at terminal 26 (15 V output) Bit 13 = 1: Overload at terminal 34, 44 and/or 210 (24 V output)
	NOTICE This monitoring function is deactivated in the delivery state. It can be activated via parameter P820.	

10.1.2.3 External faults

F019	**Fault message from free function block FB286** (active in all operating states) Fault value: 1 the binector wired via parameter U100 Index.005 is in the state log.” 1” 2 the binector wired via parameter U100 Index.006 is in the state log.” 1” 3 the binector wired via parameter U100 Index.007 is in the state log.” 1” 4 the binector wired via parameter U100 Index.008 is in the state log.” 1”
F020	**Fault message from free function block FB287** (active in all operating states) Fault value: 1 the binector wired via parameter U101 Index.005 is in the state log.” 1” 2 the binector wired via parameter U101 Index.006 is in the state log.” 1” 3 the binector wired via parameter U101 Index.007 is in the state log.” 1” 4 the binector wired via parameter U101 Index.008 is in the state log.” 1”
F021	**External fault 1** (active in all operating states) Bit 15 in control word 1 was in the log. "0" state for longer than the time set in P360 index 001
F022	**External fault 2** (active in all operating states) Bit 26 in control word 2 was in the log. "0" state for longer than the time set in P360 index 002
F023	**Fault message from free function block FB2** (active in all operating states) Fault value: 1 the binector wired via parameter U100 Index.001 is in the state log.” 1” 2 the binector wired via parameter U100 Index.002 is in the state log.” 1” 3 the binector wired via parameter U100 Index.003 is in the state log.” 1” 4 the binector wired via parameter U100 Index.004 is in the state log.” 1”
F024	**Fault message from free function block FB3** (active in all operating states) Fault value: 1 the binector wired via parameter U101 Index.001 is in the state log.” 1” 2 the binector wired via parameter U101 Index.002 is in the state log.” 1” 3 the binector wired via parameter U101 Index.003 is in the state log.” 1” 4 the binector wired via parameter U101 Index.004 is in the state log.” 1”

Fault No.	Description	
	Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)

10.1.2.4 Fault messages from motor sensors

F025	**Brush length too short** (active in operating states of ≤ o3) When parameter P495=2 (binary sensing of brush length), fault message at log." 0" signal (longer than 10s) at terminal 211 Possible fault causes • Encoder for brush length has responded • Open circuit in encoder cable
F026	**Bearings in bad condition** (active in operating states of ≤ o6) When parameter P496=2 (bearing condition sensing) fault message at log. "1" signal (longer than 2 s) at terminal 212 Possible fault causes • Encoder for bearing condition has responded
F027	**Air-flow monitoring of motor fan** (active in operating states of < o6) When parameter P497=2 (air-flow monitoring), fault message at log " 0" signal (longer than 40s) at terminal 213 Possible fault causes • Encoder for fan monitoring has responded • Open circuit in encoder cable
F028	**Motor overtemperature** (active in operating states of ≤ o6) When parameter P498=2 (thermostat connected), fault message at log. "0" signal (longer than 10s) at terminal 214 Possible fault causes • Thermostat for monitoring motor temperature has responded • Open circuit in encoder cable
F029	**Motor overtemperature** (active in all operating states) Select via P493=2 or 3 (temperature sensor at terminals 22 / 23) or P494=2 or 3 (temperature sensor at terminals 204 / 205) When parameter P490.01=1 (KTY84 at terminals 22 / 23) or P490.02=1 (KTY84 at terminals 204 / 205): The fault message is activated if the motor temperature reaches or exceeds the value set in parameter P492. 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): The fault message is activated if the motor temperature reaches or exceeds the response value of the selected PTC thermistor. Fault value:
	1 Fault activation through temperature sensor at terminals 22 / 23 2 Fault activation through temperature sensor at terminals 204 / 205

10.1.2.5 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	**Pulse blocked because armature current actual value too high** (active in all operating states) Armature actual value Ia at end stop Possible causes of error: • Power dips during regenerative operation • Current control loop not optimized

Fault No.	Description	
	Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
F031	**Speed controller monitoring** (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 • Open control loop • Controller not optimized • P590 or P591 is not correctly parameterized	

10.1.2.6 External faults

F033	**Fault message from free function block FB4** (active in all operating states) Fault value: 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"
F034	**Fault message from free function block FB5** (active in all operating states) Fault value: 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"

10.1.2.7 Drive faults

F035	**Drive is blocked** (active in operating states of – –, I, II) This monitoring function responds if the following conditions are fulfilled for longer than the period set in parameter P355: • Positive or negative torque or armature current limit • The armature current is higher than 1% of the converter rated armature DC current • The actual speed is less than 0.4% of maximum speed Possible fault causes • Drive is blocked
F036	**No armature current is flowing** (active in operating states of – –, I, II) 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. Possible fault causes • Armature circuit is open (e.g. DC fuses have blown, open circuit, etc.) • Rectifier stability limit α_G (P150) is incorrectly set • Drive is operating at α_G limit (e.g. due to supply undervoltag) • EMF is too high because maximum speed setting is too high, refer to P083, P115, P143, P741) • EMF is too high because field weakening is not selected (refer to P082) • EMF is too high because field current is set too high (refer to P102) • EMF is too high because transition speed for field weakening is set too high (refer to P101) ? ?
F037	**I^2t motor monitor has responded** (active in operating states of – –, I, II) This monitoring function responds when an I^2t value is reached which corresponds to the final temperature at 110% of the rated motor armature current. Possible fault causes • Parameter P114 is incorrectly set • Drive has been operating for too long at > 110% of rated motor armature current

Fault No.	Description Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
F038	**Overspeed** (active in operating states of – –, I, II) This fault message is activated if the actual speed value (selected in P595) exceeds the positive (P380) or negative (P381) threshold by 0.5%. Possible fault causes • Lower current limit has been input • Current-controlled operation • P512, P513 are set too low • Tachometer cable contact fault in operation close to maximum speed	
F039	**I^2t power section monitor has responded** (active in operating states of – –, I, II) This monitoring function responds if the calculated I^2t value of the power section reaches the permissible value for the power section concerned (see also P075). Possible fault causes • Drive has been operating at overload for too long • Parameter P075 is incorrectly set • Parameter P077 is incorrectly set	
F040	**Electronics supply disconnected in active fault status** (active in all operating states) This fault message is activated if the electronics power supply has been disconnected, even though a fault was displayed and not yet acknowledged. Possible fault causes • Not all fault messages have been acknowledged Fault value:	
	Last active fault message	
F041	**Ambiguous selection of parameter set or ramp-function generator** (active in all operating states) • While an optimization run is in progress, the funtion 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. • 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. Possible fault causes • P676 or P677 (selection of binectors which determine the active function data set in control word 2, bits 16 and 17) is incorrectly set • P637 or P638 (selection of binectors which determine ramp-function generator setting) is incorrectly set Fault value:	
	2 The selection of the function data set has been changed during an optimization run 3 Ambiguous selection of ramp-function generator parameter set	

Fault No.	Description: Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)

F042 **Tachometer fault**

(active in operating states of – –, I, II)

A check is performed every 20ms to ensure that $\frac{\text{Actual speed (K0179)}}{\text{Actual EMF (K0287)}}$ is > +5%

If the check result is incorrect for 4 times in succession, the fault message is activated.

The following rule applies:

100% actual speed = maximum speed

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 $P078.001 * \frac{3 * \sqrt{2}}{\pi}$

The monitoring function is effective only if the EMF > a % of $P078.001 * \frac{3 * \sqrt{2}}{\pi}$

"a" is a percentage that can be set in parameter P357 (default setting 10%).
The monitoring function is effective only if the armature current is > 2% of the converter rated DC current set in r072.002.

Possible fault causes

- Open circuit in tachometer or pulse encoder cable.
- Tachometer of pulse encoder cable incorrectly connected.
- Pulse encoder supply has failed.
- Polarity for actual speed value (P743) is incorrectly set.
- Armature circuit data (P110 und P111) are incorrectly set (execute current controller optimization run).
- Tachometer or pulse encoder defective
- Pulse encoder supply voltage is incorrectly set (P140)
- The field polarity is not reversed by the external hardware when the field is reversed.

Fault value:	r047 Index 002 to 016:
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

F043 **EMF too high for braking operation**

(active in operating states of – –, I, II)

This fault message is activated if the following 5 conditions are fulfilled when a torque direction reversal is requested (selection of MI or MII):

- P272=0 (fault message is parameterized and not alarm + field weakening)
- A parameterized, additional, torque-free interval (P160 ≠ 0) has expired
- Parallel drive is ready for engagement of the new torque direction
- The absolute value of the armature current (K0118) requested in the new torque direction is > 0.5% of P072
- The calculated firing angle (K0101) for the armature current requested for the new torque direction is > 165 degrees.

Possible fault causes

- No “speed-dependent field weakening" (P081=0) is parameterized even though operation in the field weakening range is needed for the requested maximum speed
  Note:
  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 α_G=30° (rectifier stability limit P150) and low armature currents.
- Setpoint EMF for field weakening operation too high (parameter P101 is set too high)
- Supply voltage dip
- EMF controller or field current controller is not optimized, possibly resulting in excessive EMF on power-up.

Fault value:	r047 Index 002 to 016:
Calculated firing angle (armature) before limitation (K0101)	i002 Instantaneously measured actual EMF (K0287) i003 Armature current controller setpoint (K0118)

F044 **A slave connected to the paralleling interface is not operating**

(active when U800 = 1 or 2 and U806> 10 (master) 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 (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
F046	**Analog select input for main setpoint (terminals 4 and 5) faulty** (active in operating states of ≤ o6) This fault message is activated when P700=2 (current input 4 to 20 mA) and an input current of less than 2mA is flowing. Possible fault causes • Open circuit in supply cable • P700 is incorrectly set	
F047	**Analog select input 1 (terminals 6 and 7) is faulty** (active in operating states of ≤ o6) This fault message is activated when P710=2 (current input 4 to 20 mA) and an input current of less than 2mA is flowing. Possible fault causes • Open circuit in supply cable • P710 is incorrectly set	
F048	**Fault in measuring channel for digital speed sensing using pulse encoder** (active in all operating states) <u>1. Disturbances on encoder cables:</u> 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. The fault message is activated if 10 consecutive pulse encoder signal evaluations identify “direction of rotation change” at a speed of ≥ 48 rev/min and an EMF > threshold (see below). <u>2. Pulse encoder defective:</u> The fault message is activated if, at an EMF > threshold (see below) 10 consecutive pulse encoder signal evaluations identify “implausible charracteristics” of these signals (i.e. frequent rotational direction changes, edges too close together, failureof an encoder cable or short circuit between two encoder cables). Possible fault causes • EMC-related interference on a pulse encoder signal (terminals 28 to 31) • Pulse encoder defective • Interruption in an encoder cable • Short circuit between an encoder cable and the supply voltage or another encoder cable • P110 or P111 is incorrectly set (resulting in incorrectly calculation of EMF) Note: 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). For this reason, fault F048 is not activuated until the EMF > 10% of $P078.001 * \frac{3 * \sqrt{2}}{\pi}$. Fault value:	
	1 Disturbances on encoder cables 2 Defective pulse encoder	

10.1.2.8 Start-up faults

F050	**Optimization run not possible** (active in all operating states) A fault has occurred during an optimization run.
	NOTE 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 (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
	Fault value:	
	1 Armature current is too low when α=30° and EMF=0. (average armature current < 75% of $I_{A,\ motor}$ or < 75% of $I_{A,\ rated}$) Possible cause: • Armature circuit interrupted • High-resistance load • P150 (Alpha G limit) has been set to excessively high value	
	2 It was not possible to determine the armature circuit resistance (P110) because the armature current was ≥ 37.5 % of P100 in fewer than 20 of the 150 firing cycles of the measuring phase. Possible cause: •Armature current of 37.5% of P100 ($I_{A,\ motor}$) is no longer possible (although a current of 75% of P100 was already flowing, maybe a fuse has blown).	
	3 Armature current peaks are too small at α=30° and EMF=0 (armature current peak value < 50% of $I_{A,\ motor}$ or < 50% of $I_{A,rated}$) Possible cause: • Armature circuit inductance is too high (field supply from armature terminals) • P150 (Alpha G limit) has been set to excessively high value Possible remedy: • Reduce P100 ($I_{A,motor}$) while this optimization run is in progress	
	4 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 Possible cause: •P100 ($I_{A,motor}$) or r072.i002 ($I_{A,rated}$) very much smaller than actual motor rated current of the armature •L_A > 327.67mH (armature circuit inductance too large) •P100 ($I_{A,motor}$) very much smaller than r072.i002 ($I_{A,rated}$) •Armature circuit short-circuited	
	5 Offset adjustment of actual field current sensing is not possible (value detected for P825 is outside permissible value range) Possible cause: • Fault in actual field current sensing circuit (defective A7004 gating board or A7001 electronics board)	
	7 The field circuit resistance (P112) is indeterminable (the actual field current does not reach the internally specified setpoint of 95% of P102 as a result of P112 variation) Possible cause: • R_A > 3276.7Ω • Fault in actual field current sensing circuit (defective gating board or A7001 electronics board) • The command “Inject standstill field” is applied • P102 is set too high • A thyristor in the field bridge is not firing	
	8 80% of rated EMF (K287=P101 – P100 * P110) cannot be reached within 15s (or maximum of the three set acceleration times) Possible cause: • Acceleration time (P303, P307, P311) is set too low • P101 does not match the set maximum speed (U_A at n_{max} < P101) or setting for P102 is too low • The command “Ramp-function generator enable” =0 or ” Ramp-function generator stop” =1	
	9 Field current control loop is not stable enough to record field characteristics (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) Possible cause: • 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))	
	10 Field characteristic is not uniform (i.e. in spite of field current setpoint reduction, the flux values of this measuring point calculated from EMF and actual speed are rising) Possible cause: • High armature reaction and sharp load variations during recording of field characteristics • 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))	

Fault No.	Description: Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
	11 A lower field current limit of ≥ 50% of P102 ($I_{F,motor}$) is applied (for this reason, it is not possible to plot a minimum of 9 field weakening measuring points) Possible cause: • P103 ≥ 50% of P102 Check P614 !	
	12 The drive has reached the positive torque limit even though the applied field current setpoint is still ≥ 50% of P102 ($I_{F,motor}$) Possible cause: • 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. • Check torque limits	
	13 The drive has reached the positive armature current limit even through the applied field current setpoint is still ≥ 50% of P102 ($I_{F,motor}$) Possible cause: • 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 • Check armature current limits	
	14 The speed has changed by more than 12.5% at a constant speed setpoint even through the applied field current setpoint is still ≥ 50% of P102 ($I_{F,motor}$) Possible cause: as for fault value 12	
	15 The EMF setpoint is too small to plot a field characteristic $EMF_{set} = U_A - I_{A,motor} * R_A$ = P101 – P100 * P110 < 10% of 1.35 * P078.i001 (e.g. P078.i001 = 400 V . . . minimum EMF_{set} = 54 V)	
	16 Field weakening operation is not allowed in operation without a tachometer (P083=3)	
	17 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) Possible cause: • Setting in P103 is too high • Field circuit inductance is too high • Fault in actual field current sensing circuit (gating board or A7001 electronics board defective) • Ratio r073.02 / P102 is too high (change P076.02 if necessary)	
	18 Field weakening range is too wide, i.e. during power-up (at full field) to a speed setpoint of +10% n_{max} , the | EMK| is > 77% of setpoint EMF (P101 – P100 * P110) Possible cause: • Maximum speed setting is incorrect • Pulse encoder parameters are incorrect (P140 to P143) • Parameters for tachometer adaptation are incorrect (P741) • Setpoint EMF is not correct (P101, P100, P110) • 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	
	19 A steady-state actual speed of +10%, +20%, +30% . . . or +100% 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 < 0.1% n_{max} for a specific time period) Possible cause: • Acceleration time is set too low (P303, P307, P311) • Drive is blocked • 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 • Poor speed controller setting (P225, P226, P228) or speed controller is parameterized as pure P controller or with droop • A band elimination filter (P201, P202 or P203, P204) is active • Command “Ramp-function generator enable” =0 or ” Ramp-function generator STOP” =1 is applied	

Fault No.	Description	
	Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
	20 Current limit is too low (With speed controller optimization run: Less than 30% or 45% of P100 ($I_{A,motor}$) + the armature current required for zero speed, With optimization run for friction moment and moment of inertia compensation: Less than 20% of P100 ($I_{A, motor}$) + the armature current required for a steady-state speed corresponding to 10% of maximum speed)	
	21 Field weakening range is too wide (n_{act} < +7% n_{max} produces | EMF| > 54% setpoint EMF) (setpoint EMF= K289= P101 – P100 * P110) Possible cause: • Maximum speed setting is incorrect • Pulse encoder parameters are incorrect (P140 to P143) • Parameters for tachometer adaptation are incorrect (P741) • Setpoint EMF is not correct (P101, P100, P110) • Caution: Even a high absolute negative actual speed value can produce an | EMF | of > 54% setpoint EMF	
	22 With speed controller optimization run: With an acceleration current equaling 20% or 30% of P100 ($I_{A, motor}$) + armature current required for zero speed or With optimization run for friction moment and moment of inertia compensation: 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% Possible cause: • Centrifugal mass is too large • Drive is blocked, heavily speed-dependent or excessively high load torque • "Active" load is attempting to maintain a certain speed Possible remedy: • 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 $I_{A, motor}$ (+ armature current for zero speed) is applied as the armature current setpoint, $I_{A,motor}$ (P100) can thus be increased to 2.2 times the value at maximum without exceeding 100% $I_{A, motor}$ during optimization)	
	23 With speed controller optimization run: With an acceleration current equaling 20% or 30% of P100 ($I_{A, motor}$) + armature current required for zero speed or With optimization run for friction moment and moment of inertia compensation: With an acceleration current equalling 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% Possible cause: • Flywheel mass is too large • Drive is blocked, heavily speed-dependent or excessively high load torque • "Active" load is attempting to maintain a certain speed Possible remedy: • 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 $I_{A, motor}$ (+ armature current for zero speed) is applied as the armature current setpoint, $I_{A,motor}$ (P100) can thus be increased to 2.2 times the value at maximum without exceeding 100% $I_{A, motor}$ during optimization)	
	24 With speed controller optimization run: 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 With optimization run for field weakening: 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 With optimization run for friction moment and moment of inertia compensation: 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 Possible cause: • Single-quadrant drive coasts to a standstill too slowly	

<table>
<tr><th rowspan="2">Fault
No.</th><th colspan="2">Description</th></tr>
<tr><th>Cause as a function of fault value
(r047.001, r949.001 or r949.009 with acknowledged error)</th><th>Further information (r047.002 to r047.016)</th></tr>
<tr><td></td><td colspan="2">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
Possible cause:
• 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
• Distorted or disturbed actual speed value
• Large flywheel mass that is coupled to the drive via long shaft with high torsion, possibly via a coupling with large amount of play
Possible remedy:
• Reduce P100 for duration of the optimization run to decrease the acceleration current applied during optimization and thus to lengthen the measuring time</td></tr>
<tr><td></td><td colspan="2">26 Load torque too high (n_{set} =0% n_{max} results in n_{ict} ≥ 40% n_{max}) (actual speed value is averaged over 90 firing cycles, speed monitoring at ≥ 40% n_{max} does not start for 1s after application of speed setpoint of n_{set}=0)
Possible cause:
• 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)
• 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)
• Maximum speed setting is incorrect
• Pulse encoder parameters are incorrect (P140 to P143)
• Parameters for tachometer adjustment are not correct (P741)</td></tr>
<tr><td></td><td colspan="2">27 Load torque is too high (n_{set}=0% n_{max} results in | EMF| > 100% setpoint EMF) (EMF monitoring at ≥ (P101 – P100 * P110) does not start for 1 s after application of speed setpoint of n_{set}=0)
Possible cause:
• 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)
• 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)
• Maximum speed setting is incorrect
• Pulse encoder parameters are incorrect (P140 to P143)
• Parameters for tachometer adjustment are not correct (P741)
• Setpoint EMF settings are incorrect (P101, P100, P110)</td></tr>
<tr><td></td><td colspan="2">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_{max} for a total of 4s)
Possible cause: As for fault value 26</td></tr>
<tr><td></td><td colspan="2">29 The calculated armature circuit inductance is greater than 327.67 mH, therefore P111 = 327,67 mH has been set. 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).
Possible cause:
•e.g. field supply from the armature terminals</td></tr>
<tr><td></td><td colspan="2">30 The calculated armature circuit inductance is greater than 327.67 mH and the calculated armature circuit resistance is greater than 32.767 Ω, therefore P111 = 327,67 mH and P110 = 32,767 Ω has been set. All other parameters have also been set. However, the values of the current controller parameters P155 and P156 might differ from the optimum setting.
Possible cause:
•e.g. field supply from the armature terminals</td></tr>
<tr><td></td><td colspan="2">31 The calculated armature circuit resistance is greater than 32.767 Ω, therefore P110 = 32,767 Ω has been set. 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 .
Possible cause:
•e.g. field supply from the armature terminals</td></tr>
<tr><td></td><td colspan="2">r047 Index 002:</td></tr>
<tr><td></td><td colspan="2">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)</td></tr>
</table>

Fault No.	Description Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
F052	**Optimization run aborted as a result of external cause** (active in operating states of – –, I, II) 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 not activated if the optimization run for field weakening is interrupted after the 1st field weakening measuring point has been recorded or, in the case of the optimization run for friction and moment of inertia compensation, after 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 no longer operating in RUN mode 2 Run was aborted because EMERGENCY STOP command was applied (speed controller setpoint =0) 3 Run was aborted because STANDSTILL command was applied (ramp-function generator setpoint=0) 4 Operation has been aborted because P051 was changed during the optimization run 5 Run was aborted because SWITCH-ON command was not applied within 30 s of selection of optimization run 6 Operation has been aborted because the OPERATING ENABLE command was not entered within 1 minute of selection of the optimization run. 7 Operation has been aborted because converter was not in operating state < o7.2 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) i002=2 Fault has occurred during optimization run for speed controller (selected through setting P051=26) i002=3 Fault has occurred during optimization run for field weakening (selected through setting P051=27) i002=5 Fault has occurred in optimization run for friction and moment of inertia compensation (selected through setting P051=28)

10.1.2.9 External faults

F053	**Fault message from free function block FB288** (active in all operating states) Fault value: 1 the binector wired via parameter U102 Index.005 is in the state log." 1" 2 the binector wired via parameter U102 Index.006 is in the state log." 1" 3 the binector wired via parameter U102 Index.007 is in the state log." 1" 4 the binector wired via parameter U102 Index.008 is in the state log." 1"
F054	**Fault message from free function block FB289** (active in all operating states) Fault value: 1 the binector wired via parameter U103 Index.005 is in the state log." 1" 2 the binector wired via parameter U103 Index.006 is in the state log." 1" 3 the binector wired via parameter U103 Index.007 is in the state log." 1" 4 the binector wired via parameter U103 Index.008 is in the state log." 1"

10.1.2.10 Start-up faults

F055	**No field characteristic recorded** (active in operating states of – –, I, II) Possible fault causes • The optimization run for field weakening (P051=27) has not yet been executed. 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 (P117=0)

Fault No.	Description	
	Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
F056	**Important parameter is not set** (active in operating states of ≤ o6) This fault message is activated if certain parameters are still set to 0. Fault value:	
	1 Speed controller actual value selection in P083 is still set to 0 2 Rated motor armature current in P100 is still set to 0.0 3 Rated motor field current in P102 is still set to 0.00 (fault message only when P082 ≠ 0) 4 Rated DC current of external field device is still set to 0.00 in U838 (error message if P082 >= 21 only)	
F058	**Parameter settings are not consistent** (active in operating states of ≤ o6) Inconsistent values have been set in mutually dependent parameters. 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)) 3 The field characteristic is not uniform 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 5 P557 is set to greater than P560 6 P558 is set to greater than P561 7 If P083=1 (analog tachometer), then P746 may not equal 0 (main actual value is not connected) 8 If P083=2 (pulse encoder), then P140 may not equal x0 (no pulse encoder installed) 9 If P083=3 (EMF control) then P082 may not equal x1x (field weakening operation) 10 P090 (stabilization time for supply voltage) ≥ P086 (time for automatic restart) 11 P090 (stabilization time for supply voltage) ≥ P089 (waiting time in state o4 or o5) 12 P445=1 is set (switch-on, shutdown and crawl act as a pushbutton) although no binector is parameterized as a shudown button (P444=0) 13 If P067 > 1, then P075 must also be > 0 14 Parameter U673 > U674 (this setting is not permitted; see function diagram B152) 15 Parameter P169 = 1 and P170 = 1 (impermissible setting)	
F059	**Technology option S00 is disabled/will be disabled soon** (active in all operating statuses) Fault value:	
	1 Time credit for S00 = 0 hrs 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. 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. You will need to know the serial number of your SIMOREG DC Master. For further details, please refer to the description of parameters U977 and n978 in Chapter 11 of the Parameter List. 2 Time credit S00 < 100 Std. 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. 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. for permanent enabling of technology option S00. You will need to know the serial number of your SIMOREG DC Master. For further details, please refer to the description of parameters U977 and n978 in Chapter 11 of the Parameter List. 3 S00 operation will not be possible if an SLB cycle time of < 1 ms is set Owing to the available capacity of the electronics board, it is not possible to operate the S00 technology option at the same time as a SIMOLINK bus with an extremely short cycle time (U746 < 1 ms). See also parameter U746.	

Fault No.	Description	
	Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)

10.1.2.11 Hardware faults

F061 **Fault message from thyristor check function**
(active in operating state o3)

This fault message can be activated only if the thyristor check is activated via parameter P830.

If "Thyristor defective" or "Thyristor unable to block" is signaled, then the relevant thyristor module must be replaced.

Possible causes for irreparable damage to thyristors:

- Interruption in snubber circuit
- Current controller and precontrol are not optimized (excessive current peaks)
- 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)
- Excessive voltage peaks in incoming supply system
- External short circuit or fault to ground (check armature circuit)

If "Thyristor unable to block" is signaled, the cause can generally be attributed to a firing circuit fault, rather than to a defective thyristor.

Possible causes:

- Firing pulse cable to relevant thyristor is interrupted
- Ribbon cable X101 or X102 is incorrectly inserted or interrupted
- Defective electronics or gating board
- Internal interruption in gating cable in thyristor module

The designations of the firing cables and associated thyristors can be found in Section 6.4 (power connections).

Fault value:

1	Defective thyristor (short circuit in module V1, on 15A and 30 converters: V1 or V4)
2	Defective thyristor (short circuit in module V2, on 15A and 30 converters: V2 or V5)
3	Defective thyristor (short circuit in module V3, on 15A and 30 converters: V3 or V6)
4	Defective thyristor (short circuit in module V4, on 15A and 30 converters: V4 or V1)
5	Defective thyristor (short circuit in module V5, on 15A and 30 converters: V5 or V2)
6	Defective thyristor (short circuit in module V6, on 15A and 30 converters: V6 or V3)
8	Fault to ground in armature circuit
9	I=0 message defective Possible fault cause • Defective A7001 electronics board
11	Thyristor cannot be fired (X11)
12	Thyristor cannot be fired (X12)
13	Thyristor cannot be fired (X13)
14	Thyristor cannot be fired (X14)
15	Thyristor cannot be fired (X15)
16	Thyristor cannot be fired (X16)
17	2 or more thyristors (MI) cannot be fired Possible fault cause • Armature circuit interrupted
21	Thyristor cannot be fired (X21)
22	Thyristor cannot be fired (X22)
23	Thyristor cannot be fired (X23)
24	Thyristor cannot be fired (X24)
25	Thyristor cannot be fired (X25)
26	Thyristor cannot be fired (X26)
27	2 or more thyristors (MII) cannot be fired

Fault No.	Description Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
	31 Thyristor unable to block (X11 or X21) 32 Thyristor unable to block (X12 or X22) 33 Thyristor unable to block (X13 or X23) 34 Thyristor unable to block (X14 or X24) 35 Thyristor unable to block (X15 or X25) 36 Thyristor unable to block (X16 or X26)	

10.1.2.12 Internal faults

F062	**Fault in parameter memory** (active in all operating states) Software monitoring of correct functioning of the EEPROM module (non-volatile memory) on the A7009 board. 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: • Connection between the A7001 electronics board and the EEPROM on the A7009 backplane wiring assembly • Whether the parameter values stored on the EEPROM are within the permissible value range • 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 • Whether the checksum of the non-volatile process data in the EEPROM is correct Possible causes for all fault types: 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 Possible fault causes • A7001 electronics board is defective • A7009 backplane wiring assembly is defective • Plug-in connection X109 is defective	
	2 Parameter value is outside permissible value range Possible fault causes • “Restore to default value” has never been executed with this software (e.g. after software replacement) • A7009 backplane wiring assembly is defective Possible remedy: • Acknowledge fault, execute “Restore to default value” and start up the drive again	i002 Number of faulty parameter i003 Index of faulty parameter i004 Faulty parameter value
	3 Parameter value cannot be stored on EEPROM Possible fault causes • A7001 electronics board is defective • A7009 backplane wiring assembly is defective • Plug-in connection X109 is defective	i002 Address of fault memory location i003 Faulty value in EEPROM i004 Correct parameter value
	11 Checksum of non-volatile data (part 1) is not correct 12 Checksum of non-volatile data (part 2) is not correct 13 Checksum of non-volatile data (part 3) is not correct 20 Checksum of configuring table of parameter values is not correct Possible fault causes • Defective EEPROM • “Restore to default value” has never been executed with this software (e.g. after software replacement) Possible remedy: • Acknowledge fault, execute “Restore to default value” and start up the drive again! Check interference suppression measures and improve if necessary.	i002 Calculate checksum i003 Checksum found in EEPROM

Fault No.	Description	
	Cause as a function of fault value (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
F063	**Errors in compensation data of analog inputs and outputs** (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: • Defective A7001 or A7006 electronics board 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 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
F064	**Watchdog timer has initiated a reset** (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 • A7001 electronics board is defective • Excessive EMC-related interference is present (e.g. due to unprotected contactors, unscreened cables, loose shield connections)	
F065	**Illegal microprocessor status** (active in all operating states) An internal microprocessor hardware function monitors the microprocessor for illegal operating states. Possible fault causes • A7001 electronics board is defective • Excessive EMC-related interference is present (e.g. due to unprotected contactors, unscreened cables, loose shield connections)	
F067	**Converter cooling faulty** (active in operating states of ≤ o13) The heatsink temperature monitoring function is activated 6s after connection of the electronics supply. (The current heat sink temperature is indicated at parameter r013 and on connector K050) Fault value:	r047 Index 002 to 016:
	1 Heatsink temperature > impermissible heatsink temperature	i002 Measured heatsink temperature (16384 .. 100°C)
	2 Heatsink temperature sensor is defective	i003 Measured ADC value
	3 Converter fan is defective	
F068	**Analog measuring channel faulty (main setpoint, main actual value or analog select input)** (active in all operating states) Hardware monitoring of measuring circuits Possible fault causes • A7001 module defective • Measuring circuit saturated (input voltage at terminals 4 and 5 or 6 and 7 higher than approx. 11.3V) 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 (r047.001, r949.001 or r949.009 with acknowledged error)	Further information (r047.002 to r047.016)
F069	**MLFB data are faulty** (active in all operating states) Possible fault causes • Excessive EMC-related interference is present (e.g. due to unprotected contactors, unscreened cables, loose shield connections) • A7009 backplane wiring assembly is defective 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	-

10.1.2.13 Communication errors with supplementary boards

F070	**SCB1: Serious initialization error** (active in all operating states) 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	
F073	**SCB1: Current below 4mA minimum value at analog input1 of slave 1** (active in all operating states) The cause of the fault may be a cable break	
F074	**SCB1: Current below 4mA minimum value at analog input2 of slave 1** (active in all operating states) The cause of the fault may be a cable break	
F075	**SCB1: Current below 4mA minimum value at analog input3 of slave 1** (active in all operating states) The cause of the fault may be a cable break	
F076	**SCB1: Current below 4mA minimum value at analog input1 of slave 2** (active in all operating states) The cause of the fault may be a cable break	
F077	**SCB1: Current below 4mA minimum value at analog input2 of slave 2** (active in all operating states) The cause of the fault may be a cable break	
F078	**SCB1: Current below 4mA minimum value at analog input3 of slave 2** (active in all operating states) The cause of the fault may be a cable break	
F079	**SCB1: Telegram failure** (active in all operating states) Check function of SCB1 (activity LEDs) and connection to SCI slaves (fiber optics)	
F080	**Error in initialization of a CB/TB board** Possible causes for fault values 1 and 6: • CB/TB board is defective • CB/TB board is not installed correctly • CB/TB board is taking too long to run up (e.g. due to very complex TB configuration) 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: 1 TB or 1st CB 2 2nd 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: 2 Slot D 3 Slot E 4 Slot F 5 Slot G 6 CB when configuration includes TB

Fault No.	Description Cause as a function of fault value (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: 1 TB or 1st CB 2 2nd CB
	6 The initialization run for a CB/TB board has not been completed within 40 s	i015 Code number of board: 1 TB or 1st CB 2 2nd CB
F081	**CB/TB heartbeat error** CB/TB has not incremented the monitoring counter for a period of 800 ms Possible causes of fault • CB/TB board is defective • CB/TB board is not correctly installed	i015 Code number of board: 1 TB or 1st CB 2 2nd CB
F082	**CB/TB message timeout or error in data exchange** Possible causes of fault • CB/TB PZD message timeout (with fault value 10) • Excessive EMC-related interference (e.g. due to unprotected contactors, unscreened cables, loose screen connections) • CB/TB board is defective • CB/TB board is not correctly inserted 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: 1 TB or 1st CB 2 2nd 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: 1 TB or 1st CB 2 2nd CB
	6 Fault in parameter response channel from basic unit to CB	i015 Code number of board: 1 1st TB or 1st CB 2 2nd 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: 1 TB or 1st CB 2 2nd 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: 1 TB or 1st CB 2 2nd CB
	16 Fault in actual value channel from basic unit to CB/TB	i015 Code number of board: 1 TB or 1st CB 2 2nd CB

10.1.2.14 Fault messages from supplementary boards

F101 to F147	This group of fault messages is activated by supplementary boards 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 **No.**	**Description**
A015	**Simolink start** (active in all operating states) 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).
A018	**Short circuit at binary outputs** (active in all operating states) Hardware monitoring function to check for short circuit at one of the binary select outputs (see also F018 and r011).
A019	**Alarm message from free function block FB256** (active in all operating states) The binector wired via parameter U104 Index.002 is in the state log.” 1”
A020	**Alarm message from free function block FB257** (active in all operating states) The binector wired via parameter U105 Index.002 is in the state log.” 1”
A021	**External alarm 1** (active in all operating states) Bit 28 in control word 2 was in the log. "0" state for longer than the time set in P360 index 003.
A022	**External alarm 2** (active in all operating states) Bit 29 in control word 2 was in the log. "0" state for longer than the time set in P360 index 004.
A023	**Alarm message from free function block FB6** (active in all operating states) The binector wired via parameter U104 Index.001 is in the state log.” 1”
A024	**Alarm message from free function block FB7** (active in all operating states) The binector wired via parameter U105 Index.001 is in the state log.” 1”

Alarm No.	Description
A025	**Brush length too short** (active in all operating states) When parameter P495=1 (binary sensing of brush length): Alarm in response to log. "0" signal (longer than 10s) at terminal 211 Possible causes • Encoder for brush length has responded • Interruption in encoder cable
A026	**Poor bearing condition** (active in all operating states) When parameter P496=1 (bearing condition sensing): Alarm in response to log. "0" signal (longer than 2s) at terminal 212 Possible causes • Encoder for bearing condition has responded
A027	**Air flow monitoring** (active in operating states of < o6) When parameter P497=1 (air flow monitoring): Alarm in response to log. "0" signal (longer than 40s) at terminal 213 Possible causes • Encoder for fan monitoring has responded • Interruption in encoder cable
A028	**Motor overtemperature** (active in all operating states) When parameter P498=1 (thermostat connected): Alarm in response to log. "0" signal (longer than 10s) at terminal 214 Possible causes • Thermostat for monitoring motor temperature has responded • Interruption in encoder cable
A029	**Motor overtemperature** (active in all operating states) Selection via P493=1 or 3 (thermostat at terminals 22 / 23) or P494=1 or 3 (thermostat at terminals 204 / 205) When parameter P490.01=1 (KTY84 at terminals 22 / 23) or P490.02=1 (KTY84 at terminals 204 / 205): The alarm is activated if the motor temperature reaches or exceeds the values set in parameter P492. 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): The alarm is activated if the motor temperature reaches or exceeds the trip value of the selected PTC.
A031	**Speed controller monitoring** (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 causes • Control loop interrupted • Controller is not optimized • P590 or P591 is not correctly parameterized
A033	**Alarm message from free function block FB8** (active in all operating states) The binector connected via parameter U106 Index.001 is in the log. "1" state
A034	**Alarm message from free function block FB9** (active in all operating states) The binector connected via parameter U107 Index.001 is in the log. "1" state

Alarm No.	Description
A035	**Drive blocked** (active in operating states of – –, I, II) The monitoring function responds if the following conditions are fulfilled for longer than the time set in parameter P355: • Positive or negative torque or armature current limit reached • Armature current is greater than 1% of converter rated armature DC current • The actual speed value is less than 0.4% of maximum speed
A036	**No armature current can flow** (active in operating states of – –, I, II) 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.
A037	**I^2t motor monitor has responded** (active in operating states of – –, I, II) The alarm is activated when the calculated I^2t value of the motor reaches the value which corresponds to the final temperature at 100% of permissible continuous motor current (= P113* P100).
A038	**Overspeed** (active in operating states of – –, I, II) The monitoring function responds if the actual speed value (selected in P595) exceeds the positive (P512) or negative (P513) threshold by 0.5%. Possible causes • Lower current limit has been input • Current-controlled operation • P512, P513 are set too low • Tachometer cable contact fault in operation close to maximum speed
A039	**I^2t value of power section too high** (active in all operating states) This alarm is activated if the permissible I^2t value for the relevant power section is reached. At the same time, the current limit is set to P077 * 100% of the converter rated DC current. This limit is not cancelled again until the setpoint drops below 100% of the converter rated DC current. See also Fault F039 and Parameter P075.
A043	**Automatic field current reduction if EMF is too high in operation** (active in operating states of – –, I, II) This alarm is active only when parameter P272=1 and activated if the following equation applies to firing angle α (armature) before limitation (K101): $\alpha > (\alpha_W$ (inverter stability limit acc. to P151) – 5 degrees) or , at a low (pulsating) current $\alpha >$ (165 degrees – 5 degrees) The field is reduced simultaneously with A043, implemented through control of the armature firing angle to (α_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. 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. See also parameter P082.
A044	**An alarm is active on one slave connected to the paralleling interface** (active in all operating states)
A046	**Analog select input for main setpoint (terminals 4 and 5) faulty** (active in operating states of ≤ o6) This alarm is activated when P700=2 (current input 4 to 20 mA) and the input current is less than 3mA.
A047	**Analog select input 1 (terminals 6 and 7) faulty** (active in operating states of ≤ o6) This alarm is activated when P710=2 (current input 4 to 20 mA) and the input current is less than 3mA.
A049	**SCB1: No SCI slave connected** (active in all operating states)
A050	**SCB1: Not all required SCI slaves are available** (active in all operating states) The SCI slave required to perform the parameterized functions is not available
A053	**Alarm message from free function block FB258** (active in all operating states) The binector connected via parameter U106 Index.002 is in the log. "1" state

Alarm No.	Description
A054	**Alarm message from free function block FB259** (active in all operating states) The binector connected via parameter U107 Index.002 is in the log. "1" state
A059	**Remaining time for temporary enabling of the S00 technology option is now less than 100 operating hours** (active in all operating statuses) Remaining time for temporary enabling of the S00 technology option is now less than 100 operating hours. The functions will soon be unavailable. 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. You will need to know the serial number of your SIMOREG DC Master. For further details, please refer to the description of parameters U977 and n978 in Chapter 11 of the Parameter List.
A067	**Converter cooling faulty** (active in all operating states) The heatsink temperature is > 90 °C. The monitoring function is activated 6s after the electronics supply is connected. (The current heat sink temperature is indicated at parameter r013 and on connector K050)
A081 to **A088**	**CB alarm of 1st CB** (active in all operating states ≤ o11) The meaning of these alarms depends on the type of board used. For further information, refer to Section 7.7, Start-Up of Optional Supplementary Boards, in the relevant board description.
A089 to **A096**	**CB alarm of 2nd CB** (active in all operating states ≤ o11) The meaning of these alarms depends on the type of board used. For further information, refer to Section 7.7, Start-Up of Optional Supplementary Boards, in the relevant board description.
A097 to **A128**	**TB alarms** (active in operating states ≤ o11) 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 DC MASTER converter**
P067 - P079	**Definition of SIMOREG DC MASTER power section**
P080 - P096	**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**
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**
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**
P520 - 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 - P646	**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 - r952	**Fault memory**
r953 - r960	**Visualization parameters: Alarms**
r964	**Device identification**

Range of parameter numbers	Function
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
U660 - U668	Evaluation of a 4-step master switch for cranes
U690 - n699	Configuration of SCB1 with SCI1
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 - U833	Parameters for SIMOREG CM (Control Module)
U838	Rated DC current of external field device
U840	Simulation operation
n845 - n909	Parameters for DriveMonitor
U910	Slot deactivation
n911 - 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 * FDS	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P520 * **1)** FDS **2)** **8) 9)** (G153) **10)**	**Friction at 0% speed** Setting as % of converter rated DC current or converter rated torque	0.0 to 100.0 [%] 0.1% **4)**	Ind: 4 FS=0.0 **5)** Type: O2 **3)**	P052 = 3 P051 ≥ 20 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 ≥ o1.0

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 [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.1 Operating status display

PNU	Description	Value range	No. indices / Type	See / Change
r000	**Operating status display** **Status display, fault and alarm messages** **Torque direction M0, MI or MII (=RUN)** - - No torque direction active I Torque direction I active (MI) I I Torque direction II active (MII) **o1 Waiting for operating enable (=READY)** o1.0 Brake release delay time running. o1.1 Waiting for operating enable at terminal 38. o1.2 Waiting for operating enable via binector (acc. to selection in P661) or control word, bit 3 (acc. to selection in P648) o1.3 Inching command cancellation delay time running. o1.4 Waiting for field to be reversed. Waiting for cancellation of command "Brake by field reversal" o1.5 Waiting for operating enable from optimization run (the optimization run does not output the operating enable signal at the end until $n<n_{min}$ has been reached and SHUTDOWN input). o1.6 Waiting for cancellation of immediate pulse disable via binector (acc. to selection with P177) [SW 1.8 and later] **o2 Wait for setpoint > P091.002** o2.0 If |n-set| (|K0193|) and |n-actual| (K0166) are less than P091.002, the firing pulses are disabled and the drive goes into state o2.0. [SW 2.0 and later] **o3 Test phase** o3.0 Waiting for completion of thyrsitor check (selectable function). o3.1 Waiting for completion of line symmetry check. o3.2 Waiting for a DC contactor to pick up o3.3 Waiting for "Main contactor checkback" (control word 2 bit 31, see P691) [SW 1.8 and later] **o4 Waiting for voltage (armature)** 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) o4.1 Waiting for fuse monitoring to signal OK [SW 1.7 and later] **o5 Waiting for field current** o5.0 Waiting until actual field current (K0266) equals >50% of field current setpoint (K0275) and for "$I_{field\ extern} > I_{f\ min}$". 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) **NOTE** 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. **o6 Wait status before the line contactor is closed** o6.0 Waiting for auxiliaries to be switched on (delay in P093) o6.1 Waiting for a setpoint ≤ P091 to be applied to the ramp-function generator input (K0193) **o7 Waiting for switch-on command (=READY TO SWITCH ON)** o7.0 Waiting for switch-on command via terminal 37. o7.1 Waiting for switch-on command via binector (acc. to selection in P654) or control word, bit 0 (acc. to selection in P648). 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"		Ind: None Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

o7.3 Waiting for completion of "Restore factory settings" operation.
o7.4 Waiting for switch-on command before execution of an optimization run
o7.5 Wait for completion of "Read in parameter set" operation.
o7.6 Wait for completion of "Load MLFB" operation (performed at factory)
o7.9 reserved for firmware download for optional supplementary modules [SW 2.0 and later]

o8 Waiting for acknowledgement of starting lockout
o8.0 Waiting for acknowledgement of starting lockout through input of SHUTDOWN command (OFF1).
o8.1 Simulation operation active (see under U840) [SW1.7 and later]

o9 Fast stop (OFF3)
o9.0 Fast stop has been input via binector (acc. to selection in P658) or control word, bit 1 (acc. to selection in P648).
o9.1 Fast stop has been input via binector (acc. to selection in P659).
o9.2 Fast stop has been input via binector (acc. to selection in P660).
o9.3 Fast stop is stored internally (memory can be reset by cancelling FAST STOP command and entering SHUTDOWN).

o10 Voltage disconnection (OFF2)
o10.0 Voltage disconnection has been input via binector (acc. to selection in P655) or control word, bit 1 (acc. to selection in P648).
o10.1 Voltage disconnection has been input via binector (acc. to selection in P656).
o10.2 Voltage disconnection has been input via binector (acc. to selection in P657).
o10.3 E-Stop (safety shutdown) has been input via terminal 105 or 107
o10.4 Wait for receipt of a valid telegram on G-SST1 (only if telegram failure time monitoring is set with P787 $\neq$ 0)
o10.5 Waiting for receipt of a valid telegram on G-SST2 (only if telegram failure time monitoring is set with P797 $\neq$ 0)
o10.6 Waiting for receipt of a valid telegram on G-SST3 (only if telegram failure time monitoring is set with P807 $\neq$ 0)

o11 Fault
o11.0 = Fxxx Fault message is displayed, red LED lights up.

o12 Electronics initialization in progress
o12.1 Basic converter electronics initialization in progress
o12.2 Initialization of supplementary board in location 2 in progress
o12.3 Initialization of supplementary board in location 3 in progress
o12.9 Restructuring of parameters in non-volatile storage after software update (takes approx. 15s)

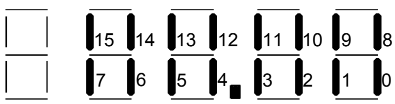
o13 Software update in progress
o13.0 Waiting for arrival of start command from HEXLOAD PC routine (press the DOWN key to abort this status and start a RESET)
o13.1 Deletion of Flash EPROM in progress
xxxxx Display of address currently being programmed
o13.2 The Flash EPROM has been successfully programmed (a RESET is performed automatically after approx. 1 second)
o13.3 Programming of the Flash EPROM has failed (press UP key to return to operating state o13.0)

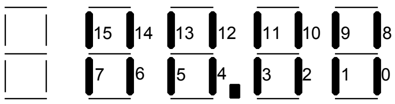
o14 Loading of boot sector in progress
(this operation is performed only in factory)

o15 Electronics not connected to voltage
Dark display: Waiting for voltage at terminals 5U1, 5W1 (electronics supply voltage).

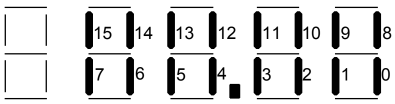
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.2 General visualization parameters

r001 (G113)	**Display of terminals 4 and 5 (main setpoint)**	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r002 (G113)	**Analog input, terminals 103 and 104 (main actual value)**	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r003 (G113)	**Analog input, terminals 6 and 7 (selectable input 1)**	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r004 (G114)	**Analog input, terminals 8 and 9 (selectable input 2)**	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r005 (G114)	**Analog input, terminals 10 and 11 (selectable input 3)**	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r006 (G115)	**Analog output, terminals 14 and 15** Display of output value <u>before</u> normalization and offset	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r007 (G115)	**Analog output, terminals 16 and 17** Display of output value <u>before</u> normalization and offset	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r008 (G116)	**Analog output, terminals 18 and 19** Display of output value <u>before</u> normalization and offset	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r009 (G116)	**Analog output, terminals 20 and 21** Display of output value <u>before</u> normalization and offset	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r010 (G110)	**Display of status of binary inputs** Representation on operator panel (PMU):  Segment ON: Corresponding terminal is activated (HIGH level is applied) Segment OFF: Corresponding terminal is not activated (LOW level is applied) Segment or bit 0 .... Terminal 36 1 .... Terminal 37 (switch-on) 2 .... Terminal 38 (operating enable) 3 .... Terminal 39 4 .... Terminal 40 5 .... Terminal 41 6 .... Terminal 42 7 .... Terminal 43 8 .... Terminal 211 9 .... Terminal 212 10 .... Terminal 213 11 .... Terminal 214 12 .... Safety shutdown (E-Stop is applied) 1) 13 .... (not used) 14 .... (not used) 15 .... (not used) 1) The safety shutdown command is applied (segment dark) if - terminal XS-105 is open (switch operation, see also Section 9) or - 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 Type: V2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r011 (G112) (G117)	**Display of status of binary outputs** Representation on operator panel (PMU):  Segment ON: Corresponding terminal is activated (HIGH level is applied) or overloaded or short-circuited Segment OFF: Corresponding terminal is not activated (LOW level is applied) or not overloaded or not short-circuited Display of status of binary output terminals: Segment or bit 0 ..... Terminal 46 1 ..... Terminal 48 2 ..... Terminal 50 3 ..... Terminal 52 7 ..... Terminal 109/110 (relay contact for line contactor) Display of overloading of binary outputs: Segment or bit 8 ..... Terminal 46 9 ..... Terminal 48 10 .... Terminal 50 11 .... Terminal 52 12 .... Terminal 26 (15V output) 13 .... Terminal 34, 44 and/or 210 (24V output)		Ind: None Type: V2	P052 = 3
r012 (G185)	**Motor temperature** Display of motor temperature when a KTY 84 temperature sensor is connected (P490.x=1). A value of "0" is always output in r012 when a PTC thermistor or no temperature sensor is installed. i001: Motor temperature 1 (sensor at terminals 22 / 23) i002: Motor temperature 2 (sensor at terminals 204 / 205)	-58 to +200 [°C] 1°C	Ind: 2 Type: I2	P052 = 3
r013	**Heatsink temperature** Display of heatsink temperature	-47 to +200 [°C] 1°C	Ind: None Type: I2	P052 = 3
r014	**Temperature rise** i001: Calculated motor temperature rise (see P114) i002: Calculated thyristor temperature rise (see P075)	0.0 to 200.0 [%] 0.1%	Ind: 2 Type: O2	P052 = 3
r015	**Display of line voltage (armature)** (generated as arithmetic rectification average, RMS value display applies to sinusoidal voltage, average over 3 line-to-line voltages)	0.0 to 1500.0 [V] 0.1V	Ind: None Type: O2	P052 = 3
r016	**Display of line voltage (field)** (generated as arithmetic rectification average, RMS value display applies to sinusoidal voltage)	0.0 to 800.0 [V] 0.1V	Ind: None Type: O2	P052 = 3
r017	**Display of line frequency**	0.00 to 120.00 [Hz] 0.01Hz	Ind: None Type: O2	P052 = 3
r018 (G163)	**Display of firing angle (armature)**	0.00 to 180.00 [degrees] 0.01degrees	Ind: None Type: O2	P052 = 3
r019 (G162)	**Display of actual armature current** The internal actual armature current value is displayed (arithmetic average between two gating pulses)	-400.0 to 400.0 [% of P100] 0.1% of P100	Ind: None Type: I2	P052 = 3
r020 (G162)	**Display of the absolute value of armature current setpoint**	0.0 to 300.0 [% of P100] 0.1% of P100	Ind: None Type: I2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r021 (G160)	**Display of torque setpoint after torque limitation** Steps: 1 ≙ 0.1% of rated motor torque (=rated motor armature current (P100) * magnetic flux at rated motor field current (P102))	-400.0 to 400.0 [%] 0.1% (see column on left)	Ind: None Type: I2	P052 = 3
r022 (G160)	**Display of torque setpoint before torque limitation** Steps: 1 ≙ 0.1% of rated motor torque (=rated motor armature current (P100) * magnetic flux at rated motor field current (P102))	-400.0 to 400.0 [%] 0.1% (see column on left)	Ind: None Type: I2	P052 = 3
r023 (G152)	**Display of speed controller setpoint/actual value deviation**	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r024 (G145)	**Display of actual speed value from pulse encoder**	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r025 (G152)	**Display of actual speed controller value**	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r026 (G152)	**Display of speed controller setpoint**	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r027 (G136)	**Display of ramp-function generator output**	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r028 (G136)	**Display of ramp-function generator input**	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r029 (G135)	**Display of main setpoint before limitation**	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r034 (G166)	**Display of firing angle (field)**	0.00 to 180.00 [degrees] 0.01degrees	Ind: None Type: O2	P052 = 3
r035 (G166)	**Display of field current controller actual value**	0.0 to 199.9 [% of P102] 0.1% of P102	Ind: None Type: O2	P052 = 3
r036 (G166)	**Display of field current controller setpoint**	0.0 to 199.9 [% of P102] 0.1% of P102	Ind: None Type: O2	P052 = 3
r037 (G165)	**Display of actual EMF value**	-1500.0 to 1500.0 [V] 0.1V	Ind: None Type: I2	P052 = 3
r038	**Display of actual armature voltage value**	-1500.0 to 1500.0 [V] 0.1V	Ind: None Type: I2	P052 = 3
r039 (G165)	**Display of EMF setpoint** This parameter displays the EMF setpoint which is applied as the control quantity in the field-weakening range. This value is calculated from: $Umotor_{rated} - Imotor_{rated} * R_A$ (= P101 – P100 * P110)	0.0 to 1500.0 [V] 0.1V	Ind: None Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r040	**Display of limitations:** Representation on operator panel (PMU):  Segment ON: Corresponding limitation is reached Segment OFF: Corresponding limitation is not reached Segment or bit 0 α_W limit (field) reached (P251) 1 Negative current limit (field) reached (K0274) 2 α_W limit (armature) reached (α_W acc. to P151 for continuous current, 165° for discontinuous current) 3 .... Negative current limit (armature) reached (K0132) 4 .... Negative maximum speed reached (P513) Speed limiting controller responds (B0201) 5 .... Negative torque limit reached (B0203) 6 .... Neg. limitation at ramp generator output reached (K0182) 7 .... Neg. limitation at ramp generator input reached (K0197) 8 .... α_G limit (field) reached (P250) 9 .... Positive current limit (field) reached (K0273) 10 .... α_G limit (armature) reached (P150) 11 .... Positive current limit (armature) reached (K0131) 12 .... Positive maximum speed reached (P512) Speed limiting controller responds (B0201) 13 .... Positive torque limit reached (B0202) 14 .... Pos. limitation at ramp generator output reached (K0181) 15 .... Pos. limitation at ramp generator input reached (K0196) Note: This parameter has the same bit assignments as connector K0810.		Ind: None Type: V2	P052 = 3

Connector and binector displays				
r041 (G121)	**High-resolution connector display:** i001: Display of connector selected in P042.01 i002: Display of connector selected in P042.02 The display value is filtered with a time constant of 300ms (see Section 8, Sheet G121)	-200.00 to 199.99 [%] 0.01%	Ind: 2 Type: I2	P052 = 3
P042 * (G121)	**High-resolution connector display:** i001: Selection of connector to be displayed in r041.01 i002: Selection of connector to be displayed in r041.02 The display value is filtered with a time constant of 300ms (see Section 8, Sheet G121)	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Online
r043 (G121)	**Connector display:** i001: Display of connector selected in P044.01 i002: Display of connector selected in P044.02 i003: Display of connector selected in P044.03 i004: Display of connector selected in P044.04 i005: Display of connector selected in P044.05 i006: Display of connector selected in P044.06 i007: Display of connector selected in P044.07	-200.0 to 199.9 [%] 0.1%	Ind: 7 Type: I2	P052 = 3
P044 * (G121)	**Connector display:** i001: Selection of connector displayed in r043.01 i002: Selection of connector displayed in r043.02 i003: Selection of connector displayed in r043.03 i004: Selection of connector displayed in r043.04 i005: Selection of connector displayed in r043.05 i006: Selection of connector displayed in r043.06 i007: Selection of connector displayed in r043.07	All connector numbers 1	Ind: 7 FS=0 Type: L2	P052 = 3 P051 = 40 Online
r045 (G121)	**Binector display:** i001: Display of binector selected in P046.01 i002: Display of binector selected in P046.02 i003: Display of binector selected in P046.03 i004: Display of binector selected in P046.04	0 to 1	Ind: 4 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P046 * (G121)	**Binector display:** i001: Selection of binector displayed in r045.01 i002: Selection of binector displayed in r045.02 i003: Selection of binector displayed in r045.03 i004: Selection of binector displayed in r045.04	All binector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r047	**Display of fault diagnostic memory** Provides more detailed information about the cause of a fault after activation of a fault message (see Section 10). i001 Word 1 (fault value) i002 Word 2 ... i016 Word 16 (fault number)	0 to 65535 1	Ind: 16 Type: O2	P052 = 3
r048 (G189)	**Hours run** Display of time (hours) in which drive has been operating in states I, II or - -. All times of ≥ approx. 0.1 s are included in the count.	0 to 65535 [hours] 1 hour	Ind: None Type: O2	P052 = 3
r049 (G189)	**Fault time** Display of time at which the current fault, and the last 7 acknowledged faults, were activated. i001: Current fault hours i002: 1st acknowledged fault hours i003: 2nd acknowledged fault hours i004: 3rd acknowledged fault hours i005: 4th acknowledged fault hours i006: 5th acknowledged fault hours i007: 6th acknowledged fault hours i008: 7th acknowledged fault hours	0 to 65535 [hours] 1 hour	Ind: 8 Type: O2	P052 = 3
P050 *	**Language** Language of plaintext display on optional OP1S operator panel and in DriveMonitor PC service routine 0: German 1: English 2: Spanish 3: French 4: Italian	0 to 4 1	Ind: None FS=0 Type: O2	P052 = 3 P051 ≥ 0 Online

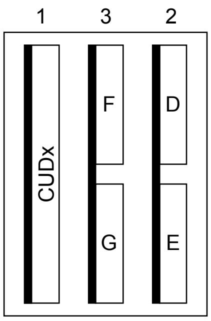
11.3 Access authorization levels

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P051 *	**Key parameters** 0 No access authorization 6 Do not set (for use by DriveMonitor) 7 Do not set (for use by DriveMonitor) 21 Restore factory settings All parameters are reset to their defaults (factory settings). Parameter P051 is then automatically reset to factory setting "40". 22 Execute internal offset compensation (see Section 7.4) 25 Optimization run for precontrol and current controller (armature and field) (see Section 7.5) 26 Optimization run for speed controller (see Section 7.5) 27 Optimization run for field weakening (see Section 7.5) 28 Optimization run for compensation of friction and moment of inertia (see Section 7.5) 29 Optimization run for the speed controller with an oscillating mechanical system (see Section 7.5) 40 Access authorization to parameter values for authorized service personnel	see column on left	Ind: None FS=40 Type: O2	P052 = 3 P051 ≥ 0 Online
P052 *	**Selection of display parameters** 0 0 Display only parameters that are not set to original factory settings 1 Display only parameters for simple applications 3 Display all parameters used	0, 1, 3	Ind: None FS=3 Type: O2	P052 = 3 P051 ≥ 0 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P053 *****	**Control word for the permanent memory** [SW 1.7 and later] Disabling or enabling write accesses to the permanent memory i001: Disabling or enabling write accesses to the parameter memory 0 Only save parameter P053 in the permanent memory; parameter changes are active immediately but the changed values are only stored temporarily and are lost when the electronics supply voltage is switched off 1 Save all parameter values in the permanent memory i002: Disabling or enabling write accesses to the memory of the nonvolatile process data 0 Do not save nonvolatile process data in the permanent memory 1 Save all nonvolatile process data in the permanent memory If the nonvolatile process data are not stored (P053.002=0), data are lost when the electronics supply of the SIMOREG DC Master is switched off, i.e. they have the value 0 after the electronics supply is switched on again: K0240: Setpoint of the motor potentiometer K0309: Motor heating K0310: Thyristor heating K9195: Output of the 1st tracking/storage element K9196: Output of the 2nd tracking/storage element	0 to 1 1	Ind: 2 FS=1 Type: O2	P052 = 3 P051 = 0 on-line
P054	**OP1S – Background lighting** 0 ON continuously 1 ON when panel is in use	0, 1	Ind: None FS=0 Type: O2	P052 = 3 P051 ≥ 0 Online
P055 ***** (G175)	**Copy function data set** This parameter allows parameter set 1, 2, 3 or 4 to be copied to parameter set 1, 2, 3 or 4. This function is applicable only to parameters with 4 indices in the function data set (see also Section 9.1, Data sets and Section 9.11, and Section 8, Sheet G175). 0xy Do nothing, automatic resetting value at the end of a copy operation. 1xy The contents of parameter set x (source data set, x=1, 2, 3 or 4) are copied to parameter set y (target data set, y=1, 2, 3 or 4) (parameter set x remains unchanged, the original contents of parameter set y are overwritten). x and y are the respective parameter set numbers (1, 2, 3 or 4) of the source and target parameter sets. Each copy operation is started by switching P055 over into parameter mode when P055=1xy. During the copy operation, the numbers of the parameters being copied are displayed on the operator panel (PMU). At the end of the copy operation, P055 is reset to P055=0xy.	011 to 143 1	Ind: None FS=012 Type: L2	P052 = 3 P051 = 40 Offline
r056 (G175)	**Display of active function data set**	1 to 4 1	Ind: None Type: O2	P052 = 3
P057 ***** (G175)	**Copy Bico data set** This parameter allows parameter set 1 or 2 to be copied to parameter set 1 or 2. This function is applicable only to parameters with 2 indices in the Bico data set (see also Section 9.1, Data sets and Section 9.11, and Section 8, Sheet G175). 0xy Do nothing, automatic resetting value at the end of a copy operation. 1xy The contents of parameter set x (source data set, x=1 or 2) are copied to parameter set y (target data set, y=1 or 2) (parameter set x remains unchanged, the original contents of parameter set y are overwritten). x and y are the respective parameter set numbers (1 or 2) of the source and target parameter sets. Each copy operation is started by switching P057 over into parameter mode when P057=1xy. During the copy operation, the numbers of the parameters being copied are displayed on the operator panel (PMU). At the end of the copy operation, P057 is reset to P057=0xy.	011 to 121 1	Ind: None FS=012 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r058 (G175)	**Display of active Bico data set**	1 to 2 1	Ind: None Type: O2	P052 = 3
r059	**Display of operating state** Meaning as for r000	0.0 to 14.5 0.1	Ind: None Type: O2	P052 = 3

11.4 Definition of SIMOREG DC MASTER converter

r060 (G101)	**Software version** Converter software release i001: CUD i002: Slot D (board location 2) i003: Slot E (board location 2) i004: Slot F (board location 3) i005: Slot G (board location 3)	0.0 to 9.9 0.1	Ind: 5 Type: O2	P052 = 3
r061 (G101)	**Creation date of software** i001: Year i002: Month i003: Day i004: Hour i005: Minute		Ind: 5 Type: O2	P052 = 3
r062 (G101)	**Checksum** i001: Converter firmware checksum i002: Boot sector checksum		Ind: 2 Type: L2	P052 = 3
r063 (G101)	**Board code** Identification code of boards mounted in locations 1 to 3 of electronics box.  Arrangement of board locations 1 to 3 and slots D to G in electronics box i001: Board in location 1 71: CUD1 72: CUD1 + CUD2 i002: Board in slot D (upper slot of location 2) 111: Pulse encoder board (SBP) [SW 1.8 and later] 131 to 139: Technology board 141 to 149: Communications board 151, 152, 161: Special board (EB1, EB2, SLB) i003: Board in slot E (lower slot of location 2) 111: Pulse encoder board (SBP) [SW 1.8 and later] 131 to 139: Technology board 141 to 149: Communications board 151, 152, 161: Special board (EB1, EB2, SLB) i004: Board in slot F (upper slot of location 3) 111: Pulse encoder board (SBP) [SW 1.8 and later] 141 to 149: Communications board 151, 152, 161: Special board (EB1, EB2, SLB) i005: Board in slot G (lower slot of location 3) 111: Pulse encoder board (SBP) [SW 1.8 and later] 141 to 149: Communications board 151, 152, 161: Special board (EB1, EB2, SLB)		Ind: 5 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r064 (G101)	**Board compatibility** Compatibility identifier of boards in locations 1 to 3 of electronics box. 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). Indices: i001: Compatibility identifier of board in location 1 i002: Compatibility identifier of board in slot D i003: Compatibility identifier of board in slot E i004: Compatibility identifier of board in slot F i005: Compatibility identifier of board in slot G Example: Index Value Bit representation Compatible with CUD i001 253 0000 0000 1111 1101 i002 002 0000 0000 0000 0010 no i003 001 0000 0000 0000 0001 yes		Ind: 5 Type: O2	P052 = 3
r065 (G101)	**Software identifiers** Extended software version identifiers in locations 1, 2, and 3 of the electronics box Indices: i001: Software identifier of the board in location 1 i002: Software identifier of the board in slot D i003: Software identifier of the board in slot E i004: Software identifier of the board in slot F i005: Software identifier of the board in slot G		Ind: 5 Type: O2	P052 = 3

11.5 Definition of SIMOREG DC MASTER power section

PNU	Description	Value range	No. indices	See Change
P067 ***** (G101)	**Load class** [SW1.8 and later] 1 Load class DC I 2 Load class DC II 3 Load class DC III 4 Load class DC IV 5 US rating The load classes are described in Chapter 3.4.1. Depending on the load class selected, the device rated DC of the SIMOREG DC Master is reduced to a value of different magnitude to suit the power section and load class. The current value of the device rated DC is indicated in parameter r072.002. Notes: If the device rated DC is reduced via parameter P076.001, the lesser of the two values is active. If you set a value of > 1 in P067, you must ensure that the "Dynamic overload capability of power module“ is enabled, i.e. a value of > 0 must be set in parameter P075. The SIMOREG DC Master does <u>not</u> monitor for compliance with the criteria of the load class set in parameter P067. If permitted by the power module, the unit can operate for overload periods in excess of those defined by the load class. The permissible overload period for the installed power module is always longer than the period defined for the load class. The SIMOREG DC Master <u>does monitor</u> the actual permissible overload period for the power module. See Section 9.15.	1 to 5 1	Ind: None FS=1 Type: O2	P052 = 3 P051 = 40 off-line
r068 (G101)	**Options according to rating plate** 0 No option 1 Option L04 (low voltage, 85V) 2 Option K01 (terminal expansion) 3 L04 and K01		Ind: None Type: 02	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r069 (G101)	**Serial number of SIMOREG DC Master converter** i001: 1st and 2nd places of serial number i002: 3rd and 4th places of serial number i003: 5th and 6th places of serial number i004: 7th and 8th places of serial number i005: 9th and 10th places of serial number i006: 11th and 12th places of serial number i007: 13th and 14th places of serial number i008 to i015: 0 i016: Checksum for serial number The serial number ASCII code is displayed in this parameter. The number is output in plaintext on the OP1S panel.		Ind: 16 Type: L2	P052 = 3
r070 (G101)	**MLFB (order number) of SIMOREG DC Master converter** The corresponding MLFB is displayed in encoded form in this parameter. The MLFB is displayed in plaintext on the OP1S panel.	0 to 57 1	Ind: None Type: O2	P052 = 3
r071 (G101)	**Converter rated supply voltage (armature)** Converter rated supply voltage (armature) as specified on rating plate	10 to 830 [V] 1V	Ind: None Type: O2	P052 = 3
r072 (G101)	**Converter rated DC current (armature)** i001: Converter rated DC current (armature) as specified on rating plate (output DC current at power terminals 1C1 and 1D1) i002: Actual converter rated DC current (armature) according to setting in parameter P076.001 or P067	1.0 to 6553.5 [A] 0.1A	Ind: 2 Type: O2	P052 = 3
r073 (G101)	**Converter rated DC current (field)** i001: Converter rated DC current (field) as specified on rating plate (output DC current at power terminals 3C and 3D) i002: Actual converter rated DC current (field) as set in parameter P076.002	1.00 to 100.00 [A] 0.01A	Ind: 2 Type: O2	P052 = 3
r074 (G101)	**Converter rated supply voltage (field)** Converter rated supply voltage (field) as specified on rating plate	10 to 460 [V] 1V	Ind: None Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P075 ***** (G101) (G161)	**Control word for power section** Selection of operating characteristics of thermal monitor (I^2t monitoring) of power section (see also Section 9.16 "Dynamic overload capability of power section"). The "Dynamic overload capability of the power module" allows the SIMOREG DC Master to operate for short periods on armature currents that are higher than the converter rated DC current specified on the rating plate (=r072.001). The permissible overload period is determined solely by the power module and the preceding operating history. The "thermal power module monitoring" function does not monitor operation in compliance with the load class criteria set in parameter P067. If permitted by the power module, the unit can operate for overload periods in excess of those defined by the load class. 0 Dynamic overload capability is not permitted The armature current is limited to P077 * r072.001. 1 Dynamic overload capability is permitted, alarm A039 The armature current is limited to P077 * 1.8 * r072.001 as long as the calculated thyristor temperature does not exceed the permitted value. If the temperature exceeds the permitted value, the SIMOREG DC Master protects itself by reducing the current limit to P077 * r072.001. Alarm A039 is output at the same time. The armature current setpoint limit is not increased to P077 * 1.8 * r072.001 (alarm A039 also disappears) until the calculated thyristor temperature has dropped below the limit value again and the armature current setpoint is lower than the converter rated DC current (r072.001). 2 Dynamic overload capability is permitted, fault F039 The armature current is limited to P077 * 1.8 * r072.001 as long as the calculated thyristor temperature does not exceed the permitted value. Fault message F039 is output if the permissible temperature limit is exceeded.	0 to 2 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P076 ***** (G101)	**Reduction of converter rated DC current** i001: Reduction of converter rated DC current (armature) i002: Reduction of converter rated DC current (field) 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. The current value of the device rated DC is indicated in parameter r072.002. The following values can be set: 10.0%, 20.0%, 33.3%, 40.0%, 50.0%, 60.0%, 66.6% 70.0%, 80.0%, 90.0% and 100.0% Note: If a load class is selected in parameter P067 which causes a reduction in the converter rated DC current, then the lower of the two parameter setting values is effective.	see column on left	Ind: 2 FS=100.0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P077 (G101) (G161)	**Total thermal reduction factor** The factor set in this parameter effects a reduction in the armature current limit (as defined by the setting in P075). The converter must be derated in the following instances: – Operation at high ambient temperatures: If the ambient temperature is higher than 45°C (on naturally air-cooled converters) or 35°C (on converters with forced air-cooling), the possible load capability of the converter decreases as a consequence of the maximum permissible thyristor junction temperature by percentage reduction "a" as specified in the table in Section 3.4, resulting in a temperature reduction factor of $k_{temp} = k1$ – Installation altitudes of over 1000m above sea level: In this case, the lower air density and thus less effective cooling reduce the possible load capability of the converter to the percentage load **"b1"** specified in the table in Section 3.4, resulting in an installation altitude reduction factor of $k_{altitude} = k2$ P077 must be set as follows: **P077 =** $k_{temp} * k_{altitude}$ Note: A general reduction in the converter rated DC current (through appropriate setting of parameter P076.001) can be included in this calculation.	0.50 to 1.00 0.01	Ind: None FS=1.00 Type: O2	P052 = 3 P051 = 40 Offline
P078 (G101)	**Reduction of converter rated supply voltage** i001: Rated input voltage converter armature i002: Rated input voltage converter field The rated voltage value of the power system actually used to supply the power section must be set in this parameter. 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 **NOTE** If a SIMOREG converter is operated at a rated input voltage that is lower than its rated supply voltage, then the rated DC voltage specified in the technical data (Section 3.4) cannot be reached !	i001: 10 to r071 i002: 10 to r074 [V] 1V	Ind: 2 FS= i001: r071 i002: 400V except when r071 = 460V then 460V Type: O2	P052 = 3 P051 = 40 Offline
P079 * (G163)	**Short pulses / long pulses, armature gating unit** 0 Short pulses (0.89 ms=approx. 16 degrees at 50 Hz) are output on the armature gating unit. 1 Long pulses (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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

11.6 Setting values for converter control

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P080 * (G140)	**Control word for brake control** 1 The brake is a holding brake (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.) 2 The brake is an operating brake (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 FS=1 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P081 ***** (G165)	**EMF-dependent field weakening** 0 No field-weakening operation as a function of speed or EMF (100% of rated motor field current is applied constantly as the internal field current setpoint). 1 Field-weakening operation by internal closed-loop EMF control to ensure that in field-weakening operation, i.e. at speeds above the motor rated speed (="field-weakening activation limit speed"), the motor EMF is maintained constantly at the setpoint EMF_{set} (K0289) = P101 – P100 * P110 (field current setpoint is the product of the EMF controller output and the precontrol component determined by the actual speed according to the field characteristic). **NOTICE** When P081=1, a valid field characteristic must be available (P117=1), otherwise the optimization run for field weakening (P051=27) must be executed.	0 to 1 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

<table>
<tr><th>PNU</th><th>Description</th><th>Value range
[Unit]
Steps</th><th>No. indices
Factory setting
Type</th><th>See
Change
(Access / Status)</th></tr>
<tr><td>P082
*

(G166)</td><td>Operating mode for field

No field
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 not 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.
Internal field power module
1 The field is switched with the line contactor - 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).
2 Automatic injection of standstill field set in P257 after expiry of a time period set in P258, after converter has reached operating state o7 or higher.
3 Field ACTIVE continuously.
4 The field is switched with the "Auxiliaries ON“ (B0251) signal
External field power module (40.00A field)
11 Board C98043-A7044 (40A field power module) is inserted at connector X102 on board C98043-A7002 or C98043-A7003. The field is controlled as described in para. 1.
12 As described in para. 11, but the field is controlled as described in para. 2.
13 As described in para. 11, but the field is controlled as described in para. 3.
14 As described in para. 11, but the field is controlled as described in para. 4.
External field device
21 An external field device 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).
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.
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.
If the external field device supplies an "I field < I field min“ signal, then this can be fed in at P265.
The field is controlled as described in para. 1.
22 As described in para. 21, but the field is controlled as described in para. 2.
23 As described in para. 21, but the field is controlled as described in para. 3.
24 As described in para. 21, but the field is controlled as described in para. 4.

NOTICE
Even though changes to the parameter value from > 0 to = 0 are accepted in operating states of ≥ o1.0, they do not take effect until the converter reaches an operating state of ≥ o7.0.
[Values 11 to 24 can be set only in SW 1.9 and later]</td><td>0 to 24
1</td><td>Ind: None
FS=2
Type: O2</td><td>P052 = 3
P051 = 40
Offline</td></tr>
</table>

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P083 ***** FDS (G152)	**Selection of actual speed value** 0 Actual speed value is not yet selected (fixed value 0%) 1 Actual speed value supplied by "Main actual value" channel (K0013) (terminals XT.103, XT.104) 2 Actual speed value supplied by "Actual speed from pulse encoder" channel (K0040) 3 Actual speed value supplied by "Actual EMF" channel (K0287), but weighted with P115 (operation without tacho) Note: 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 actual field current value is too low. 4 Actual speed value is wired up freely (selected in P609)	0 to 4 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P084 ***** (G160)	**Selection of closed-loop speed / current or torque control** 1 Operation under closed-loop speed control 2 Operation under closed-loop current / torque control (the setpoint supplied by the ramp-function generator output is input as a current or torque setpoint (speed controller is bypassed)	1 to 2 1	Ind: None FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P085	**Wait period after cancellation of inching command** 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 [s] 0.1s	Ind: None FS=10.0 Type: O2	P052 = 3 P051 = 40 Online
P086	**Voltage failure period for automatic restart** 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 <45Hz) or too high (F009 frequency >65Hz), 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. 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. Setting this parameter to 0.0s deactivates the "Automatic restart" function.	0.0 to 2.0 [s] 0.1s	Ind: None FS=0.4 Type: O2	P052 = 3 P051 = 40 Online
P087 (G140)	**Brake release time** -10.00 to -0.01 s 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. 0.00 to +10.00 s 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 [s] 0.01s	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P088 (G140) (G187)	**Brake closing time** 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 [s] 0.01s	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P089	**Maximum wait time for voltage to appear at power section** 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 [s] 0.1s	Ind: None FS=2.0 Type: O2	P052 = 3 P051 = 40 Online
P090	**Stabilization time for line voltage** 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. Caution: The setting in P090 must be lower than the settings in P086 (except when P086=0.0) and P089!	0.01 to 1.00 [s] 0.01s	Ind: None FS=0.02 Type: O2	P052 = 3 P051 = 40 Online
P091	**Setpoint threshold** i001: <u>Threshold for function "Switch on only if setpoint is low“</u> 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. i002: <u>Threshold for function "Automatic pulse disable if setpoint is low“</u> [SW 2.0 and later] If |n-set| (|K0193|) and |n-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 [%] 0.01%	Ind: 2 FS= i001: 199.99 i002: 0.00 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P092 (G200)	**Delay times for field reversal** These times are used to control a reversing contactor for reversing the field polarity on a 1-quadrant converter with field reversal. i001: <u>Delay time for the field reduction before opening of the current field contactor</u> When field polarity reversal is initiated, the delay time set in P092.i001 elapsed after reaching I_{field} (K0265) < $I_{field\ min}$ (P394) before the current field contactor is opened. i002: <u>Delay time before actuation of the new field contactor</u> [only SW 1.7 and later] 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). i003: <u>Delay time for enabling the field firing pulses</u> [only SW 1.7 and later] 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. i004: <u>Delay time after the field build-up before armature enable</u> [only SW 1.7 and later] After - directly following the field firing pulse enable - the actual field current value I_{field} in the "new" field direction has reached the value I_{field} (K0265) > $I_{field\ set}$ (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 ≥ o1.4 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 [s] 0.1s	Ind: 4 FS= i001: 3.0 i002: 0.2 i003: 0.1 i004: 3.0 Type: O2	P052 = 3 P051 = 40 on-line
P093	**Pick-up delay for line contactor** 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 [s] 0.1s	Ind: None FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P094	**Switch-off delay for auxiliaries** 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 [s] 0.1s	Ind: None FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P095	**Pick-up time for a contactor in the DC circuit** 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 o5. If the timer has still not run down by the time the converter exits state o4, then the converter dwells in state o3.2 until the timer has finished. 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 o3.3 until the timer has finished and fault message F004 is then output with fault value 6.	0.00 to 1.00 [s] 0.01s	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P096	**After-running time for the device fan** [SW 1.6 and later] After the drive has been shut down (operating state ≥ 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. Note: 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 [min] 0.1min	Ind: None FS=4.0 Type: O2	P052 = 3 P051 = 40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.7 Definition of motor

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P100 * FDS (G165)	**Rated motor armature current (acc. to motor rating plate)** 0.0 Parameter not yet set	0.0 to 6553.0 [A] 0.1A	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Offline
P101 * FDS (G165)	**Rated motor armature voltage (acc. to motor rating plate)** Notes: One of the functions of this parameter is to determine the point at which field-weakening operation commences. 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 2000 [V] 1V	Ind: 4 FS=400 Type: O2	P052 = 3 P051 = 40 Offline
P102 * FDS (G165)	**Rated motor field current (acc. to motor rating plate)** 0.00 Parameter not yet set	0.00 to 600.00 [A] 0.01A	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P103 * FDS (G165)	**Minimum motor field current** Note: P103 must be set to <50% of P102 to execute the optimization run for field weakening (P051=27).	0.00 to 100.00 [A] 0.01A	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline
P104 * FDS (G161)	**Speed n1 (acc. to motor rating plate)** 1st point (speed value) in speed-dependent current limitation. 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 [rev/min] 1rev/min	Ind: 4 FS=5000 Type: O2	P052 = 3 P051 = 40 Offline
P105 * FDS (G161)	**Armature current I1 (acc. to motor rating plate)** 1st point (current value) in speed-dependent current limitation. 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 [A] 0.1A	Ind: 4 FS=0.1 Type: O2	P052 = 3 P051 = 40 Offline
P106 * FDS (G161)	**Speed n2 (acc. to motor rating plate)** 2nd point (speed value) in speed-dependent current limitation. 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 [rev/min] 1rev/min	Ind: 4 FS=5000 Type: O2	P052 = 3 P051 = 40 Offline
P107 * FDS (G161)	**Armature current I2 (acc. to motor rating plate)** 2nd point (current value) in speed-dependent current limitation. 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 [A] 0.1A	Ind: 4 FS=0.1 Type: O2	P052 = 3 P051 = 40 Offline
P108 * FDS (G161)	**Maximum operating speed n3** 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, must be entered in this parameter: When P083=1 (analog tacho): Speed at which a tacho voltage as set in P741 is reached When P083=2 (pulse encoder): Same value as maximum speed set in P143 When P083=3 (operation without tacho): Speed at which EMF as set in P115 is reached	1 to 10000 [rev/min] 1rev/min	Ind: 4 FS=5000 Type: O2	P052 = 3 P051 = 40 Offline
P109 * FDS (G161)	**Control word for speed-dependent current limitation** 0 Speed-dependent current limitation is deactivated 1 Speed-dependent current limitation is activated	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P110 FDS (G162) (G165)	**Armature circuit resistance** This parameter is set automatically during the optimization run for precontrol and current controller (armature and field) (P051=25).	0.000 to 32.767 [Ω] 0.001Ω	Ind: 4 FS=0.000 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P111 FDS (G162) (G165)	**Armature circuit inductance** This parameter is set automatically during the optimization run for precontrol and current controller (armature and field) (P051=25).	0.000 to 327.67 [mH] 0.01mH	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P112 FDS (G166)	**Field circuit resistance** This parameter is set automatically during the optimization run for precontrol and current controller (armature and field) (P051=25).	0.0 to 3276.7 [Ω] 0.1Ω	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P113 ***** FDS	**Continuous current factor torque control / current control** This parameter defines the current to be permitted as a continuous current by the I^2t motor monitoring function without activation of alarm message A037 or fault message F037. This current is the product of calculation P113 * P100.	0.50 to 2.00 0.01	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 Offline
P114 FDS	**Thermal time constant of motor** (see Section 9.15) 0.0 I^2t monitoring deactivated	0.0 to 80.0 [min] 0.1min	Ind: 4 FS=10.0 Type: O2	P052 = 3 P051 = 40 Online
P115 FDS	**EMF at maximum speed in operation without tachometer** (see also Section 8, Function Diagram Sheet G152) 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 [% of P078.001] 0.01%	Ind: 4 FS=100.00 Type: O2	P052 = 3 P051 = 40 Online
P117 ***** FDS (G152)	**Control word for field characteristic** 0 No valid field characteristic has yet been recorded 1 Valid field characteristic (P118 to P139 valid) The parameter is set automatically during the field-weakening optimization run (P051=27).	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P118 FDS (G165)	**Rated EMF value** (see also Section 8, Sheet G165) EMF that is reached with a full field (according to parameter P102) and a speed as set in parameter P119. The parameter is set automatically during the field-weakening optimization run (P051=27) and specifies in this case the setpoint EMF in the field-weakening range. Note: 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 need not be repeated. However, P118 then no longer defines the setpoint EMF in the field-weakening range. When the setting in parameter P102 is changed subsequently, the field-weakening optimization run must be repeated, the same applies if the maximum speed setting is subsequently re-adjusted.	0 to 1400 [V] 1V	Ind: 4 FS=340 Type: O2	P052 = 3 P051 = 40 Offline
P119 FDS (G165)	**Rated speed** Speed at which an actual EMF value as set in parameter P118 is reached at full field (according to parameter P102). This parameter is set automatically during the optimization run for field weakening (P051=27) and specifies in this case the field-weakening activation limit speed. Note: 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 need not be repeated. However, P119 then no longer defines the field-weakening activation limit speed. When the setting in parameter P102 is changed subsequently, the field-weakening optimization run must be repeated, the same applies if the maximum speed setting is subsequently re-adjusted.	0.0 to 199.9 [%] 0.1%	Ind: 4 FS=100.0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

Magnetization characteristic (field characteristic)

Parameters P120 to P139 determine the curve shape of the magnetization characteristic (field characteristic) in normalized representation (see example field characteristic below for further details).

Note:
When the setting in parameter P102 is changed subsequently, the field-weakening optimization run must be repeated, 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).

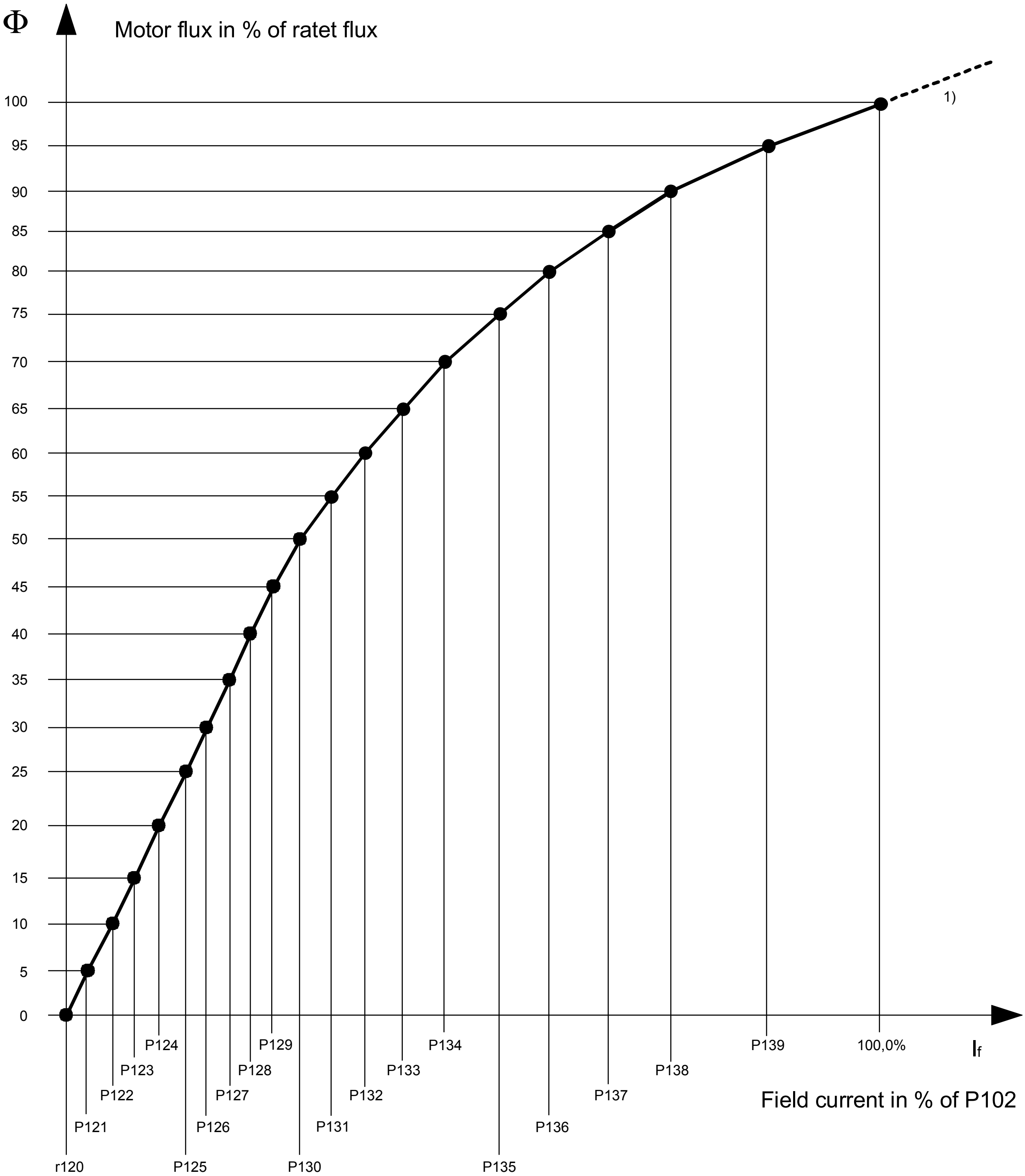
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r120 FDS (G165) (G166)	**Field current for 0% motor flux (field characteristic, point no. 0)**	0.0 [% of P102] 0.1% of P102	Ind: 4 Type: O2	P052 = 3
P121 FDS (G165) (G166)	**Field current for 5% motor flux (field characteristic, point no. 1)**	0.0 to 100.0 [%] 0.1% of P102	Ind: 4 FS=3.7 Type: O2	P052 = 3 P051 = 40 Offline
P122 FDS (G165) (G166)	**Field current for 10% motor flux (field characteristic, point no. 2)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=7.3 Type: O2	P052 = 3 P051 = 40 Offline
P123 FDS (G165) (G166)	**Field current for 15% motor flux (field characteristic, point no. 3)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=11.0 Type: O2	P052 = 3 P051 = 40 Offline
P124 FDS (G165) (G166)	**Field current for 20% motor flux (field characteristic, point no. 4)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=14.7 Type: O2	P052 = 3 P051 = 40 Offline
P125 FDS (G165) (G166)	**Field current for 25% motor flux (field characteristic, point no. 5)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=18.4 Type: O2	P052 = 3 P051 = 40 Offline
P126 FDS (G165) (G166)	**Field current for 30% motor flux (field characteristic, point no. 6)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=22.0 Type: O2	P052 = 3 P051 = 40 Offline
P127 FDS (G165) (G166)	**Field current for 35% motor flux (field characteristic, point no. 7)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=25.7 Type: O2	P052 = 3 P051 = 40 Offline
P128 FDS (G165) (G166)	**Field current for 40% motor flux (field characteristic, point no. 8)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=29.4 Type: O2	P052 = 3 P051 = 40 Offline
P129 FDS (G165) (G166)	**Field current for 45% motor flux (field characteristic, point no. 9)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=33.1 Type: O2	P052 = 3 P051 = 40 Offline
P130 FDS (G165) (G166)	**Field current for 50% motor flux (field characteristic, point no. 10)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=36.8 Type: O2	P052 = 3 P051 = 40 Offline
P131 FDS (G165) (G166)	**Field current for 55% motor flux (field characteristic, point no. 11)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=40.6 Type: O2	P052 = 3 P051 = 40 Offline
P132 FDS (G165) (G166)	**Field current for 60% motor flux (field characteristic, point no. 12)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=44.6 Type: O2	P052 = 3 P051 = 40 Offline
P133 FDS (G165) (G166)	**Field current for 65% motor flux (field characteristic, point no. 13)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=48.9 Type: O2	P052 = 3 P051 = 40 Offline
P134 FDS (G165) (G166)	**Field current for 70% motor flux (field characteristic, point no. 14)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=53.6 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P135 FDS (G165) (G166)	**Field current for 75% motor flux (field characteristic, point no. 15)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=58.9 Type: O2	P052 = 3 P051 = 40 Offline
P136 FDS (G165) (G166)	**Field current for 80% motor flux (field characteristic, point no. 16)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=64.9 Type: O2	P052 = 3 P051 = 40 Offline
P137 FDS (G165) (G166)	**Field current for 85% motor flux (field characteristic, point no. 17)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=71.8 Type: O2	P052 = 3 P051 = 40 Offline
P138 FDS (G165) (G166)	**Field current for 90% motor flux (field characteristic, point no. 18)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=79.8 Type: O2	P052 = 3 P051 = 40 Offline
P139 FDS (G165) (G166)	**Field current for 95% motor flux (field characteristic, point no. 19)**	0.0 to 100.0 [% of P102] 0.1% of P102	Ind: 4 FS=89.1 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

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.

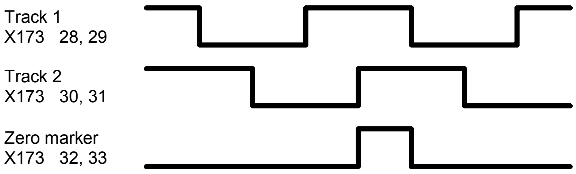


1) For actual field currents I_f of > 100% of P102, the characteristic is extended linearly for internal calculation of the motor flux.

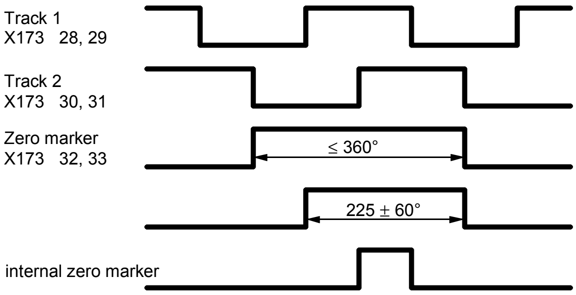
11.8 Definition of pulse encoder, speed sensing using pulse encoder

The following types of pulse encoder can be used (type selection in P140):

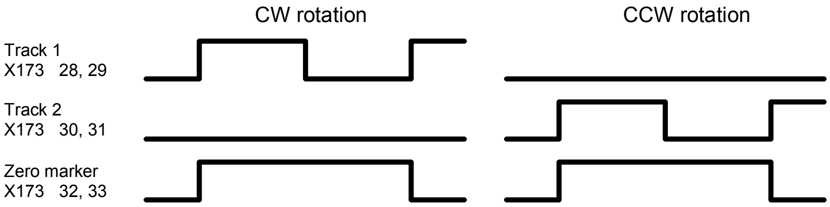
1. Pulse encoder type 1
   Encoder with two pulse tracks mutually displaced by 90° (with/without zero marker)



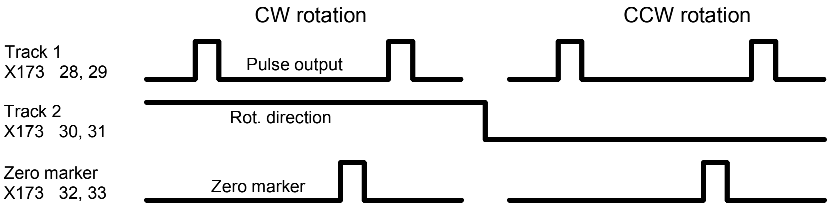
2. Pulse encoder type 1a
   Encoder with two pulse tracks mutually displaced by 90° (with/without zero marker). The zero marker is converted internally to a signal
   in the same way as on encoder type 1.



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 [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

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:

$$n_{min}[rev/min] = 21973 * \frac{1}{X * P141}$$

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:

$$n_{max}[rev/min] = \frac{18000000}{P141}$$

When selecting a pulse encoder, therefore, it is important to ensure that the lowest possible speed ≠ 0 is significantly higher than n_{min} and the highest possible speed does not exceed n_{max}.

$$IM >> \frac{21973}{X * n_{min}[rev/min]}$$

$$IM \leq \frac{18000000}{n_{max}[rev/min]}$$

Equations for selection of pulses per revolution IM of pulse encoder

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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P140 (G145)	**Selection of pulse encoder type** See beginning of this Section (11.8) for pulse encoder types 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	0 to 4 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P141 (G145)	**Number of pulses of pulse encoder**	1 to 32767 [pulses/rev] 1 pulse/rev	Ind: None FS=500 Type: O2	P052 = 3 P051 = 40 Offline
P142 (G145)	**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. **CAUTION** 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 is must be provided for pulse encoders requiring a 5V supply.	0 to 1 1	Ind: None FS=1 Type: O2	P052 = 3 P051 = 40 Offline

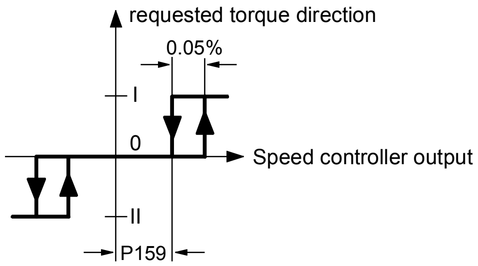
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P143 FDS (G145)	**Setting the maximum speed for pulse encoder operation** The speed set in this parameter corresponds to an actual speed (K0040) of 100%.	1.0 to 6500.0 [rev/min] 0.1rev/min	Ind: 4 FS=500.0 Type: O4	P052 = 3 P051 = 40 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.				
P144 * FDS (G145)	**Multiple evaluation of encoder signals** 0 1x evaluation of pulse encoder signals 1 2x evaluation of pulse encoder signals (for encoder types 1, 1a, 2) 2 4x evaluation of pulse encoder signals (for encoder types 1, 1a) Note: 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 1	Ind: 4 FS=2 Type: O2	P052 = 3 P051 = 40 Offline
P145 * FDS (G145)	**Automatic measuring range switchover for measurement of low speeds - switchover of multiple evaluation** 0 Automatic switchover of multiple evaluation of pulse encoder signals OFF (i.e. P144 is always active) 1 Automatic switchover of multiple evaluation 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) As opposed to P145 = 0, this setting reduces the minimum measurable speed by up to a factor of 4. Caution: Switching over the multiple evaluation method for encoder pulses also affects the position sensing function 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 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P146 * FDS (G145)	**Automatic measuring range switchover for measurement of low speeds - switchover of measuring time** 0 Automatic switchover of measuring time OFF (i.e. P147 is always active) 1 Automatic switchover of measuring time ON 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) Caution: 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 actual speed sensing delay in the extended minimum speed range.	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P147 * FDS (G145)	**Nominal measuring time of pulse encoder signal evaluation** 0 Nominal measuring time 1 ms, gating-pulse-synchronized measurement 1 Nominal measuring time 2 ms, gating-pulse-synchronized measurement (produces "steadier" actual speed value than setting 0) 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) 12 Nominal measuring time 0.2 ms, asynchronous measurement 13 Nominal measuring time 0.3 ms, asynchronous measurement ... 20 Nominal measuring time 1 ms, asynchronous measurement Note: 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] Notice: 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 actual speed sensing delay. For this reason, P200 should be parameterized to at least 5ms before the optimization run for the speed controller is executed.	0 to 20 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P148 * FDS (G145)	**Pulse encoder monitoring function** 0 Pulse encoder monitoring OFF (activation of F048 in response to a defective pulse encoder is disabled) 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 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline

11.9 Closed-loop armature current control, auto-reversing stage, armature gating unit

P150 FDS (G163)	**Alpha G limit (armature)** Rectifier stability limit for firing angle of armature converter.	0 to 165 [degrees] 1 degrees	Ind: 4 FS=5 / 30 (for 1Q / 4Q converters) Type: O2	P052 = 3 P051 = 40 Online
P151 FDS (G163)	**Alpha W limit (armature)** Inverter stability limit for firing angle of armature converter. This firing angle limitation is active only when the armature current is continuous. In the case of a discontinuous armature current, the firing angle is limited to 165 degrees.	120 to 165 [degrees] 1 degrees	Ind: 4 FS=150 Type: O2	P052 = 3 P051 = 40 Online
P152 * FDS (G163)	**Line frequency correction (armature)** 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 FS=20 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P153 * FDS (G162)	**Control word for the armature precontrol** 0 Armature precontrol disabled, output of the precontrol=165° 1 Armature precontrol active 2 Armature precontrol active but EMF influence only active on change in torque direction 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) [can only be set on SW 1.7 and later]	0 to 3 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 off-line
P154 * FDS (G162)	**Set armature current controller I component to zero** 0 Set controller I component to zero (i.e. to obtain pure P controller) 1 Controller I component is active	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P155 FDS (G162)	**Armature current controller P gain** Proportional gain of armature current controller This parameter is automatically set during the optimization run for precontrol and current controller (armature and field) (P051=25). See also parameter P175	0.01 to 200.00 0.01	Ind: 4 FS=0.10 Type: O2	P052 = 3 P051 = 40 Online
P156 FDS (G162)	**Armature current controller reset time** This parameter is automatically set during the optimization run for precontrol and current controller (armature and field) (P051=25). See also parameter P176	0.001 to 10.000 [s] 0.001s	Ind: 4 FS=0,200 Type: O2	P052 = 3 P051 = 40 Online
P157 * FDS (G162)	**Control word for current setpoint integrator** 0 Reduced gearbox stressing 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 1st time after a change in torque direction). 1 Current setpoint integrator The integrator is always active (acts as ramp-function generator for the armature current setpoint)	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P158 FDS (G162)	**Ramp-up time for current setpoint integrator (reduced gearbox stressing)** Period of an acceleration ramp with a setpoint step change from 0% to 100% at r072.002. 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 [s] 0.001s	Ind: 4 FS=0.000 Type: O2	P052 = 3 P051 = 40 Online
P159 FDS (G163)	**Switchover threshold for auto-reversing stage (armature)**  	0.00 to 100.00 [%] 0.01% of n controller output	Ind: 4 FS=0.01 Type: O2	P052 = 3 P051 = 40 Online
P160 FDS (G163)	**Additional torque-free interval** 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 [s] 0.001s	Ind: 4 FS=0.000 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P161 FDS (G163)	**Additional Alpha W pulses with disabled second pulses** 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 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P162 * FDS (G162)	**EMF calculation method for armature precontrol** 0 The EMF derived from the <u>measured</u> armature voltage is applied 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 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P163 * FDS (G162)	**EMF filtering method for armature precontrol** 0 No filtering 1 Filtering element, filter time constant = approx. 10 ms (for use by works engineers only) 2 Averaging over the last 2 EMF values (for use by works engineers only) 3 Averaging over the last 3 EMF values	0 to 3 1	Ind: 4 FS=3 Type: O2	P052 = 3 P051 = 40 Offline
P164 * FDS (G162)	**Set armature current controller P component to zero** 0 Set controller P component to zero (i.e. to obtain pure I controller) 1 Controller P component is active	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P165 * BDS (G163)	**Select the binector to control the "Enable a torque direction for torque direction change" function** 0 = Binector B0000 1 = Binector B0001 etc. Binector status = 0 ... Enable for M0 or MII 1 ... Enable for M0 or MI	All binector numbers 1	Ind: 2 FS=220 Type: L2	P052 = 3 P051 = 40 Offline

11.10 Current limitation, torque limitation

PNU	Description	Value range	No. indices	See
P169 * FDS (G160)	**Select closed-loop torque / current control** See parameter P170	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P170 * FDS (G160)	**Select closed-loop torque / current control** <u>P169</u> <u>P170</u> 0 0 Closed-loop current control and current limitation 0 1 Closed-loop torque control with torque limitation (the torque setpoint is converted to a current setpoint: Current setpoint = torque setpoint / motor flux) Current limitation is active additionally 1 0 Closed-loop current control with torque limitation (the specified torque limit is converted to a current limit: Current limit = torque limit / motor flux) Current limitation is active additionally 1 1 Do not set! Note: A valid field characteristic (P117=1) must be available when P169 or P170=1. If one is not, the optimization run for field weakening (P051=27) must be executed. P263 determines the input quantity for the motor flux calculation.	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P171 FDS (G160) (G161)	**System current limit in torque direction I**	0.0 to 300.0 [% of P100] 0.1% of P100	Ind: 4 FS=100.0 Type: O2	P052 = 3 P051 = 40 Online
P172 FDS (G160) (G161)	**System current limit in torque direction II**	-300.0 to 0.0 [% of P100] 0.1% of P100	Ind: 4 FS=-100.0 Type: I2	P052 = 3 P051 = 40 Online
P173 ***** BDS (G160)	**Source for "Torque control / Current control" switchover** [SW 1.9 and later] The binector selected here has the same effect as parameter P170. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P175 * FDS (G162)	**Source for variable P gain** [SW 1.8 and later] The content of the selected connector acts as the P gain for the armature current controller after multiplication with P155.	All connector numbers 1	Ind: 4 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
P176 * FDS (G162)	**Source for variable Integration time** [SW 1.8 and later] The content of the selected connector acts as the integration time for the armature current controller after multiplication with P156.	All connector numbers 1	Ind: 4 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
P177 ***** BDS (G163)	**Source for the command "no immediate pulse disable"** [SW 1.8 and later] 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. This command can be used, for example, if it is not a motor that is supplied by the SIMOREG DC Master but a field and the current is to be reduced via an external parallel-connected de-excitation resistance.	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
P178 ***** BDS (G163)	**Source for the command "fire all thyristors simultaneously"** [SW 1.8 and later] 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 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
P179 FDS (G163)	**Additional Alpha W pulses with disabled second pulses** [SW 1.9 and later] 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. When a change in torque direction is required, the current in the existing direction must be reduced. This is achieved in the following ways: If P179 > 0: 1) Alpha W pulses with <u>enabled</u> second pulses until the I=0 signal arrives 2) Additional Alpha W pulses with <u>enabled</u> second pulses (number as set in P179.F) 3) Additional Alpha W pulses with <u>disabled</u> second pulses (number as set in P161.F) 4) Additional torque-free interval (period as set in P160.F) If P179 = 0: 1) Alpha W pulses with <u>disabled</u> second pulses until the I=0 signal arrives 2) Additional Alpha W pulses with <u>disabled</u> second pulses (number as set in P161.F) 3) Additional torque-free interval (period as set in P160.F)	0 to 100 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P180 FDS (G160)	**Positive torque limit 1**	-300.00 to 300.00 [%] 0.01% of rated motor torque	Ind: 4 FS=300.00 Type: I2	P052 = 3 P051 = 40 Online
P181 FDS (G160)	**Negative torque limit 1**	-300.00 to 300.00 [%] 0.01% of rated motor torque	Ind: 4 FS=-300.00 Type: I2	P052 = 3 P051 = 40 Online
P182 FDS (G160)	**Positive torque limit 2** 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 [%] 0.01% of rated motor torque	Ind: 4 FS=300.00 Type: I2	P052 = 3 P051 = 40 Online
P183 FDS (G160)	**Negative torque limit 2** 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 [%] 0.01% of rated motor torque	Ind: 4 FS=-300.00 Type: I2	P052 = 3 P051 = 40 Online
P184 FDS (G160)	**Threshold speed for torque limits** 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 [%] 0.01% of maximum speed	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

P190 FDS (G162)	**Filter time for setpoint for armature current precontrol** [SW 1.9 and later] Filtering of the armature current setpoint at the input of the precontrol for the armature current controller. The purpose of this filter is to decouple the armature current precontrol from the armature current controller.	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line
P191 FDS (G162)	**Filter time for setpoint for armature current controller** [SW 1.9 and later] Filtering of the armature current setpoint at the input of the armature current controller. The purpose of this filter is to decouple the armature current precontrol from the armature current controller.	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line

11.11 Speed controller

further parameters for the speed controller P550 - P567

Setting values for speed controller - actual value/setpoint processing				
P200 FDS (G152)	**Filter time for actual speed controller value** Filtering of the actual speed value by means of a PT1 element. This filter setting is taken into account by the speed controller optimization run (P051=26).	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P201 FDS (G152)	**Band-stop 1: Resonant frequency**	1 to 140 [Hz] 1Hz	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Online
P202 FDS (G152)	**Band-stop 1: Quality** 0 Quality = 0.5 1 Quality = 1 2 Quality = 2 3 Quality = 3	0 to 3 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P203 FDS (G152)	**Band-stop 2: Resonant frequency**	1 to 140 [Hz] 1Hz	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Online
P204 FDS	**Band-stop 2: Quality** 0 Quality = 0.5 1 Quality = 1 2 Quality = 2 3 Quality = 3	0 to 3 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P205 FDS (G152)	**D element: Derivative-action time**	0 to 1000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P206 FDS (G152)	**D element: Filter time**	0 to 100 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online

r217 (G152)	**Indication of the active droop of the speed controller** [SW 1.7 and later]	0.0 to 10.0 [%] 0.1%	Ind: None Type: O2	P052 = 3
r218 (G151) (G152)	**Indication of the active integration time of the speed controller** [SW 1.7 and later]	0.010 to 10.000 [s] 0.001s	Ind: None Type: O2	P052 = 3
r219 (G151) (G152)	**Display of effective P gain of speed controller**	0.01 to 200.00 0.01	Ind: None Type: O2	P052 = 3

P221 FDS (G152)	**Speed controller: Hysteresis for PI/P controller switchover** [SW 1.9 and later] See P222 for further details.	0.00 to 100.00 [%] 0.01% of maximum speed	Ind: 4 FS=2.00 Type: O2	P052 = 3 P051 = 40 Online
P222 FDS (G152)	**Speed controller: PI / P controller switchover threshold** 0.00 Automatic switchover from PI to P controller deactivated. > 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. This function allows the drive to be stopped without overshoot using a zero setpoint with the controllers enabled. This function is active only if the binector selected in P698 is in the log. "1" state.	0.00 to 10.00 [%] 0.01% of maximum speed	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

Setting values for speed controller				
P223 * FDS (G152)	**Control word for speed controller precontrol** 0 Speed controller precontrol disabled 1 Speed controller precontrol acts as torque setpoint (is added to n controller output)	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P224 * FDS	**Control word for speed controller I component** 0 Set controller I component to 0 (i.e. to achieve a pure P controller) 1 Controller I component is active The I component is stopped when a torque or current limit is reached 2 Controller I component is active The I component is stopped when a torque limit is reached 3 Controller I component is active The I component is stopped only when ±199.99% is reached	0 to 3 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P225 FDS (G151)	**Speed controller P gain** See also setting values for "Speed controller adaptation" function (P550 to P559). This parameter is set automatically during the speed controller optimization run (P051=26).	0.10 to 200.00 0.01	Ind: 4 FS=3.00 Type: O2	P052 = 3 P051 = 40 Online
P226 FDS (G151)	**Speed controller reset time** This parameter is set automatically during the speed controller optimization run (P051=26).	0.010 to 10.000 [s] 0.001s	Ind: 4 FS=0,650 Type: O2	P052 = 3 P051 = 40 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).				
P227 FDS (G151)	**Speed controller droop** 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). See also P562, P563, P630 and P684	0.0 to 10.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P228 FDS (G152)	**Filter time for speed setpoint** Filtering of setpoint by means of a PT1 element. 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 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P229 * FDS (G152)	**Control of I component tracking for slave drive** 0 On a slave drive, the I component of the speed controller is made to follow such that M(set, ncontr.) = M(set, limit), the speed setpoint is set to the actual speed value 1 Tracking deactivated	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P230 FDS (G152)	**Setting period of speed controller integrator** [SW 1.9 and later] 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 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line
P234 * FDS	**Set speed controller P component to zero** 0 Set controller P component to zero (i.e. to obtain a pure I controller) 1 Controller P component is active	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P236 * FDS	**Specifying the dynamic response of the speed control loop** [SW 2.0 and later] The parameter value is used as the optimization criterion for the speed control loop. Note: Changes to this value do not take effect until the speed controller optimization run (P051 = 26, see Section 7.5) has been executed. Setting instructions: - For drives, for example, with gear backlash, optimization should be started with low dynamic response values (from 10%). - For drives with top synchronism and dynamic response requirements, values up to 100% should be used.	10 to 100 [%] 1	Ind: 4 FS=75 Type: O2	P052 = 3 P051 = 40 online

11.12 Closed-loop field current control, field gating unit

P250 FDS (G166)	**Alpha G limit (field)** Rectifier stability limit for firing angle of field converter	0 to 180 [degrees] 1 degree	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P251 FDS (G166)	**Alpha W limit (field)** Inverter stability limit for firing angle of field converter	0 to 180 [degrees] 1 degree	Ind: 4 FS=180 Type: O2	P052 = 3 P051 = 40 Online
P252 * FDS (G166)	**Filtering of line frequency correction (field)** 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. Using the units position, the line synchronization function can be altered additionally as follows: When the parameter is set to an uneven 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 [ms] 1ms	Ind: 4 FS=200 Type: O2	P052 = 3 P051 = 40 Offline
P253 * FDS (G166)	**Control word for field precontrol** 0 Field precontrol disabled, precontrol output = 180° 1 Field precontrol active, output is dependent on field current setpoint, field line voltage, P112	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P254 * FDS (G166)	**Set field current controller I component to zero** 0 Set controller I component to zero (i.e. to obtain pure P controller) 1 Controller I component is active	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P255 FDS (G166)	**Field current controller P gain** This parameter is set automatically during the optimization run for precontrol and current controller (armature and field) (P051=25).	0.01 to 100.00 0.01	Ind: 4 FS=5.00 Type: O2	P052 = 3 P051 = 40 Online
P256 FDS (G166)	**Field current controller reset time** This parameter is set automatically during the optimization run for precontrol and current controller (armature and field) (P051=25).	0.001 to 10.000 [s] 0.001s	Ind: 4 FS=0,200 Type: O2	P052 = 3 P051 = 40 Online
P257 FDS (G166)	**Standstill field** 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 [%] 0.1% of P102	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P258 FDS (G166)	**Delay time with automatic field current reduction** 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 [s] 0.1s	Ind: 4 FS=10.0 Type: O2	P052 = 3 P051 = 40 Online
P260 FDS (G166)	**Filter time for setpoint for field current precontrol** [SW 1.9 and later] Filtering of the field current setpoint at the input of the precontrol for the field current controller. The purpose of this filter is to decouple the field current precontrol from the field current controller.	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line
P261 FDS (G166)	**Filter time for setpoint for field current controller** [SW 1.9 and later] Filtering of the field current setpoint at the input of the field current controller. The purpose of this filter is to decouple the field current precontrol from the field current controller.	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line
P263 * FDS (G166)	**Input quantity for motor flux calculation** 0 The input quantity for the motor flux calculation is the field current controller actual value according to P612 (K0265), to be used in connection with a fully compensated DC machine 1 The input quantity for the motor flux calculation is the precontrol output for the EMF controller (K0293) (exception: Field current controller setpoint (K0268) with active standstill field or with disabled field pulses), to be used in connection with an non-compensated DC machine. The EMF controller must be active when this setting is selected (EMF controller compensates the armature reaction). 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 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P264 * FDS (G166)	**Set field current controller P component to zero** 0 Set controller P component to zero (i.e. to obtain pure I controller) 1 Controller P component is active	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P265 * BDS (G167)	**Source for selection of external field current monitoring signal** [SW 1.9 and later] Selection of the binector to supply the field monitoring signal when an external field device is used. (status "1" = field current is o.k., If > If-min) 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. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.13 Closed-loop EMF control

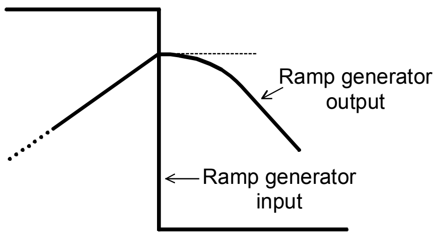
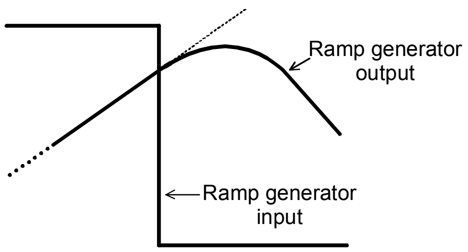
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P272 ***** (G165)	**Operating mode of closed-loop EMF control** 0 Fault message F043 ("EMF too high for braking operation") is active: If the EMF is too high when a torque direction change is requested (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). 1 Alarm A043 and automatic field reduction if EMF is too high in braking operation. If the EMF is too high in braking operation (i.e. if the following applies to the armature firing angle α before limitation (K0101): $\alpha > (\alpha_W - 5$ degrees)), alarm A043 is activated (α_W is the inverter stability limit according to P151 or 165 degrees with a discontinuous armature current). The field is reduced with activation of A043. This field reduction is achieved by regulating the armature firing angle to (αW – 5 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. When a torque direction change is requested, 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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P273 ***** FDS (G165)	**Control word for EMF controller precontrol** 0 EMF controller precontrol disabled, precontrol output = rated motor field current (P102) 1 EMF controller precontrol is active	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P274 ***** FDS (G165)	**Set EMF controller I component to zero** 0 Set controller I component to zero (i.e. to obtain pure P controller) 1 Controller I component is active	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P275 ***** FDS (G165)	**EMF controller P gain** This parameter is automatically set during the field weakening optimization run (P051=27).	0.10 to 100.00 0.01	Ind: 4 FS=0.60 Type: O2	P052 = 3 P051 = 40 Online
P276 ***** FDS (G165)	**EMF controller reset time** This parameter is automatically set during the field weakening optimization run (P051=27).	0.010 to 10.000 [s] 0.001s	Ind: 4 FS=0.200 Type: O2	P052 = 3 P051 = 40 Online
P277 ***** FDS (G165)	**EMF controller droop**	0.0 to 10.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P280 FDS (G165)	**Filter time for setpoint for EMF controller precontrol** [SW 1.9 and later] 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 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line
P281 FDS (G165)	**Filter time for setpoint for EMF controller** [SW 1.9 and later] 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 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line
P282 FDS (G165)	**Filter time for actual value for EMF controller** [SW 1.9 and later] Filtering of actual EMF value at the input of the EMF controller.	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P283 FDS (G165)	**Filter time for actual value for EMF controller precontrol** [SW 1.9 and later] 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 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line
P284 ***** FDS (G165)	**Set EMF controller P component to zero** 0 Set controller P component to zero (i.e. to obtain pure I controller) 1 Controller P component is active	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline

11.14 Ramp-function generator

(see also Section 8, Sheet G136 and Section 9)

See P639 and P640 for ramp-function generator setting parameters

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P295 FDS (G136)	**Mode for rounding the ramp-function generator** [SW 1.9 and later] 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).  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 no breakpoint in the signal at the generator output (i.e. there is no step change in the acceleration rate).  	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line
P296 FDS (G136)	**Ramp-down time of ramp generator with emergency stop (OFF3)** [SW 1.9 and later] 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.	0.00 to 650.00 [s] 0.01 s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 on-line
P297 FDS (G136)	**Lower transition rounding of ramp generator with emergency stop (OFF3)** [SW 1.9 and later]	0.00 to 100.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 on-line
P298 FDS (G136)	**Upper transition rounding of ramp generator with emergency stop (OFF3)** [SW 1.9 and later]	0.00 to 100.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 on-line

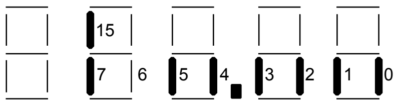
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Limitation at ramp-function generator output (setpoint limiting) The effective limitations are: Upper limit: Minimum value of P300 and the four connectors selected with P632 Lower limit: Maximum value 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.				
P300 FDS (G136)	**Positive limitation at ramp-function generator output**	-200.00 to 199.99 [%] 0.01%	Ind: 4 FS=100.00 Type: I2	P052 = 3 P051 = 40 Online
P301 FDS (G136)	**Negative limitation at ramp-function generator output**	-200.00 to 199.99 [%] 0.01%	Ind: 4 FS=-100.00 Type: I2	P052 = 3 P051 = 40 Online
P302 * FDS (G136)	**Select ramp-function generator / ramp-up integrator mode** 0 Normal ramp-function generator operation Ramp-function generator setting 1 (P303 to P306) is applied. 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 Ramp-up integrator operation: 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 Ramp-up integrator operation: 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 Ramp-up integrator operation: When the setpoint is reached for the first time, ramp-function generator setting 1 is switched over to generator setting 3 (P311 to P314)	0 to 3 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Ramp-function generator parameter set 1				
P303 FDS (G136)	**Ramp-up time 1**	0.00 to 650.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online
P304 FDS (G136)	**Ramp-down time 1**	0.00 to 650.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online
P305 FDS (G136)	**Lower transition rounding 1**	0.00 to 100.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P306 FDS (G136)	**Upper transition rounding 1**	0.00 to 100.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

Ramp-function generator parameter set 2 Ramp-function generator parameter set 2 is selected via the binector parameterized in P637.				
P307 FDS (G136)	**Ramp-up time 2**	0.00 to 650.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online
P308 FDS (G136)	**Ramp-down time 2**	0.00 to 650.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online
P309 FDS (G136)	**Lower transition rounding 2**	0.00 to 100.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P310 FDS (G136)	**Upper transition rounding 2**	0.00 to 100.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

Ramp-function generator parameter set 3 Ramp-function generator parameter set 3 is selected via the binector parameterized in P638.				
P311 FDS (G136)	**Ramp-up time 3**	0.00 to 650.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online
P312 FDS (G136)	**Ramp-down time 3**	0.00 to 650.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P313 FDS (G136)	**Lower transition rounding 3**	0.00 to 100.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P314 FDS (G136)	**Upper transition rounding 3**	0.00 to 100.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

Displays				
r315 (G136)	**Display of effective times** i001: Display of effective ramp-up time i002: Display of effective ramp-down time i003: Display of effective lower transition rounding i004: Display of effective upper transition rounding	0.00 to 650.00 / 10.00 [s] 0.01s	Ind: 4 Type: O2	P052 = 3
r316 (G136)	**Display of ramp-function generator status** Mode of representation on operator panel (PMU):  Segment: 0 RFG enable 1 RFG start 2 Setpoint enable & /OFF1 3 Set RFG 4 RFG tracking 5 Bypass RFG 7 Ramp-down 15 Ramp-up		Ind: None Type: V2	P052 = 3

P317 * FDS (G136)	**Ramp-function generator tracking** 0 Ramp-function generator tracking is not active 1 Ramp-function generator tracking is active	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P318 * FDS (G136)	**Set ramp-function generator output** This parameter determines how the ramp-function generator output is set at the commencement of a "Shutdown" process: 0 The ramp-function generator output is not set at the commencement of a "Shutdown" process” 1 At the commencement of "Shutdown", the output is set to the actual speed value K0167 (actual speed value K0167 is "unfiltered") 2 At the commencement of "Shutdown", the output is set to the actual speed value K0179 (value is filtered by PT1 in P200, other filters may also be active) (setting may not be used in conjunction with P205 > 0) 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 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

P319 FDS (G136)	**Delay time for enabling ramp-function generator** [SW 1.5 and later]	0.00 to 10.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

11.15 Setpoint processing

P320 FDS (G135)	**Multiplier for main setpoint**	-300.00 to 300.00 [%] 0.01%	Ind: 4 FS=100.00 Type: I2	P052 = 3 P051 = 40 Online
P321 FDS (G135)	**Multiplier for additional setpoint**	-300.00 to 300.00 [%] 0.01%	Ind: 4 FS=100.00 Type: I2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P322 * FDS (G135)	**Source for multiplier for main setpoint** 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P323 * FDS (G135)	**Source for multiplier for additional setpoint** 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

11.16 Setting values for monitoring functions and limits

Setting values for monitoring functions				
P351 FDS	**Threshold for undervoltage trip** 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 [%] Armature: 1% of P078.001 Field: 1% of P078.002	Ind: 4 FS=-20 Type: I2	P052 = 3 P051 = 40 Online
P352 FDS	**Source for overvoltage trip** 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 [%] Armature: 1% of P078.001 Field: 1% of P078.002	Ind: 4 FS=20 Type: O2	P052 = 3 P051 = 40 Online
P353 FDS	**Response threshold for phase failure monitoring** If the line voltage drops below the permissible value in operating states of ≤ o4 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. When a switch-on command is entered, 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 [%] Armature: 1% of P078.001 Field: 1% of P078.002	Ind: 4 FS=40 Type: O2	P052 = 3 P051 = 40 Online
P355 FDS	**Stall protection time** F035 is activated if the conditions for the "Stall protection" fault message are fulfilled for longer than the period set in P355. When P355=0.0, the "Drive blocked" monitoring function (F035) is deactivated and alarm A035 is likewise suppressed.	0.0 to 600.0 [s] 0.1s	Ind: 4 FS=0,5 Type: O2	P052 = 3 P051 = 40 Online
P357 FDS	**Threshold for tachometer interruption monitoring** F042 is suppressed if the actual EMF value is lower than the value set in P357. The setting is entered as a % of the ideal mean DC voltage value at α=0, i.e. as a % of P078.001 * 1.35	10 to 70 [%] 1%	Ind: 4 FS=10 Type: O2	P052 = 3 P051 = 40 Online
P360 (G180) (G181)	**Response delay for external faults and alarms** 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). i001: Delay for external fault 1 i002: Delay for external fault 2 i003: Delay for external alarm 1 i004: Delay for external alarm 2	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P361 FDS	**Delay time for the undervoltage monitoring** [SW 1.7 and later] 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! Another time which is parameterized for automatic restarting (P086) only begins after the time set here has elapsed.	0 to 60000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P362 FDS	**Delay time for the overvoltage monitoring** [SW 1.7 and later] 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! Another time which is parameterized for automatic restarting (P086) only begins after the time set here has elapsed.	0 to 60000 [ms] 1ms	Ind: 4 FS=10000 Type: O2	P052 = 3 P051 = 40 on-line
P363 FDS	**Threshold for the minimum line frequency** [SW 1.8 and later] 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. [values < 45.0 Hz can be set in SW 1.9 and later] **CAUTION** Operation in the extended frequency range between 23 Hz and 110 Hz is available on request.	23.0 to 60.0 [Hz] 0.1 Hz	Ind: 4 FS=45.0 Type: O2	P052 = 3 P051 = 40 on-line
P364 FDS	**Threshold for the maximum line frequency** [SW 1.8 and later] 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. **CAUTION** Operation in the extended frequency range between 23 Hz and 110 Hz is available on request.	50.0 to 110.0 [Hz] 0.1 Hz	Ind: 4 FS=65.0 Type: O2	P052 = 3 P051 = 40 on-line

11.17 Setting values for limit-value monitors

(see also Section 8, Sheet G187 und G188)

$n < n_{min}$ signal				
P370 FDS (G187)	**Speed threshold n_{min}** Speed threshold for $n < n_{min}$ limit-value monitor. Note: 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 [%] 0.01% of maximum speed	Ind: 4 FS=0,50 Type: O2	P052 = 3 P051 = 40 Online
P371 FDS (G187)	**Hysteresis for $n < n_{min}$ signal** This value is added to the response threshold if $n < n_{min}$ is active.	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=0,50 Type: O2	P052 = 3 P051 = 40 Online

$n < n_{comp.}$ signal				
P373 FDS (G187)	**Speed threshold $n_{comp.}$** Speed threshold for $n < n_{comp.}$ signal	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=100.00 Type: O2	P052 = 3 P051 = 40 Online
P374 FDS (G187)	**Hysteresis for $< n_{comp.}$ signal ($n < n_{comp.}$ signal)** This value is added to the response threshold if $n < n_{comp.}$ is active.	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=3.00 Type: O2	P052 = 3 P051 = 40 Online
P375 FDS (G187)	**OFF delay for $n < n_{comp.}$ signal**	0.0 to 100.0 [s] 0.1s	Ind: 4 FS=3.0 Type: O2	P052 = 3 P051 = 40 Online

Setpoint/actual value deviation 2				
P376 FDS (G187)	**Permissible setpoint/actual value deviation 2** [SW 1.9 and later]	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FD=3.00 Type: O2	P052 = 3 P051 = 40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P377 FDS (G187)	**Hysteresis for setpoint/actual value deviation 2 signal** [SW 1.9 and later] This value is added to the response threshold if a setpoint/actual value deviation signal is active	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 on-line
P378 FDS (G187)	**Response delay for setpoint/actual value deviation signal 2** [SW 1.9 and later]	0.0 to 100.0 [s] 0.1s	Ind: 4 FS=3.0 Type: O2	P052 = 3 P051 = 40 on-line
Overspeed				
P380 FDS (G188)	**Maximum speed in positive direction of rotation**	0.0 to 199.9 [%] 0.1% of maximum speed	Ind: 4 FS=120.0 Type: O2	P052 = 3 P051 = 40 Online
P381 FDS (G188)	**Maximum speed in negative direction of rotation**	-199.9 to 0.0 [%] 0.1% of maximum speed	Ind: 4 FS=-120.0 Type: I2	P052 = 3 P051 = 40 Online
Setpoint/actual value deviation 1				
P388 FDS (G187)	**Permissible deviation between setpoint and actual value 1**	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=3.00 Type: O2	P052 = 3 P051 = 40 Online
P389 FDS (G187)	**Hysteresis for setpoint/actual value deviation signal 1** This value is added to the response threshold if a setpoint/actual value deviation signal is active	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 Online
P390 FDS (G187)	**Response delay for setpoint/actual value deviation signal 1**	0.0 to 100.0 [s] 0.1s	Ind: 4 FS=3.0 Type: O2	P052 = 3 P051 = 40 Online
$I_f < I_{f\ min}$ signal				
P394 FDS (G188)	**Field current threshold $I_{f\ min}$** Field current threshold for $I_f < I_{f\ min}$ limit-value monitor. Note: 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). The $I_f < I_{f\ min}$ signal is connected to binector B0215, the actual value at field current controller input K0265 is applied as I_f. B0215 = 0 when K0265 > threshold set in P394 B0215 = 1 when K0265 < threshold set in P394 + hysteresis set in P395 0 → 1 transition takes place when K0265 < P394 1 → 0 transition takes place when K0265 > P394 + P395	0.00 to 199.99 [%] 0.01% of converter rated field DC current (r073.i02)	Ind: 4 FS=3.00 Type: O2	P052 = 3 P051 = 40 Online
P395 FDS (G188)	**Hysteresis for $I_f < I_{f\ min}$ signal** This value is added to the response threshold if $I_f < I_{f\ min}$ is active. (see also P394)	0.00 to 100.00 [%] 0.01% of converter rated field DC current (r073.i02)	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 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.				
P396 FDS (G167)	**Threshold for field current monitoring** [SW 1.9 and later]	1 to 100 [%] 0.01% of setpoint at field current controller input (K0268)	Ind: 4 FS=50 Type: O2	P052 = 3 P051 = 40 on-line
P397 FDS (G167)	**Field current monitoring time** [SW 1.9 and later]	0.02 to 60.00 [s] 0.01s	Ind: 4 FS=0.50 Type: O2	P052 = 3 P051 = 40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
$I_f < I_{f\ x}$ signal				
P398 FDS (G188)	**Field current threshold $I_{f\ x}$** Setpoint-oriented field current threshold for $I_f < I_{f\ x}$ limit-value monitor. Note: 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). 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. B0216 = 0 when K0265 > threshold set in P398 B0216 = 1 when K0265 < threshold set in P398 + hysteresis set in P399 0 → 1 transition takes place when K0265 < P398 1 → 0 transition takes place when K0265 > P398 + P399	0.00 to 199.99 [%] 0.01% of setpoint at field current controller input (K0268)	Ind: 4 FS=80.00 Type: O2	P052 = 3 P051 = 40 Online
P399 FDS (G188)	**Hysteresis for $I_f < I_{f\ x}$ signal** This value is added to the response threshold if $I_f < I_{f\ x}$ is active. (see also P398)	0.00 to 100.00 [%] 0.01% of converter rated field DC current (r073.i02)	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 Online

11.18 Settable fixed values

Function: The value set in the parameter is applied to the specified connector				
P401 FDS (G120)	**K401 fixed value** is applied to connector K0401	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P402 FDS (G120)	**K402 fixed value** is applied to connector K0402	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P403 FDS (G120)	**K403 fixed value** is applied to connector K0403	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P404 FDS (G120)	**K404 fixed value** is applied to connector K0404	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P405 FDS (G120)	**K405 fixed value** is applied to connector K0405	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P406 FDS (G120)	**K406 fixed value** is applied to connector K0406	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P407 FDS (G120)	**K407 fixed value** is applied to connector K0407	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P408 FDS (G120)	**K408 fixed value** is applied to connector K0408	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P409 FDS (G120)	**K409 fixed value** is applied to connector K0409	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P410 FDS (G120)	**K410 fixed value** is applied to connector K0410	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P411 FDS (G120)	**K411 fixed value** is applied to connector K0411	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P412 FDS (G120)	**K412 fixed value** is applied to connector K0412	-32768 to 32767 1	Ind: 4 FS=0 Type: I2	P052 = 3 P051 = 40 Online
P413 FDS (G120)	**K413 fixed value** is applied to connector K0413	-32768 to 32767 1	Ind: 4 FS=0 Type: I2	P052 = 3 P051 = 40 Online
P414 FDS (G120)	**K414 fixed value** is applied to connector K0414	-32768 to 32767 1	Ind: 4 FS=0 Type: I2	P052 = 3 P051 = 40 Online
P415 FDS (G120)	**K415 fixed value** is applied to connector K0415	-32768 to 32767 1	Ind: 4 FS=0 Type: I2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P416 FDS (G120)	**K416 fixed value** is applied to connector K0416	-32768 to 32767 1	Ind: 4 FS=0 Type: I2	P052 = 3 P051 = 40 Online

11.19 Fixed control bits

Function: The value set in the parameter is applied to the specified binector				
P421 FDS (G120)	**B421 fixed bit** is applied to binector B0421	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P422 FDS (G120)	**B422 fixed bit** is applied to binector B0422	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P423 FDS (G120)	**B423 fixed bit** is applied to binector B0423	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P424 FDS (G120)	**B424 fixed bit** is applied to binector B0424	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P425 FDS (G120)	**B425 fixed bit** is applied to binector B0425	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P426 FDS (G120)	**B426 fixed bit** is applied to binector B0426	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P427 FDS (G120)	**B427 fixed bit** is applied to binector B0427	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P428 FDS (G120)	**B428 fixed bit** is applied to binector B0428	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online

11.20 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.				
P430 * (G127)	**Source for fixed-setpoint injection** Selection of binector to control injection of the fixed setpoint ("1" state = fixed setpoint injected). 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P431 * (G127)	**Source for fixed setpoint** Selection of connector to be injected as the fixed setpoint 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P432 * (G127)	**Source for selection of ramp-function generator bypass** Selection as to whether or not ramp-function generator must be bypassed when the fixed setpoint is injected. 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 1	Ind: 8 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P433 * FDS (G127)	**Source for standard setpoint** Selection of the connector to be applied if fixed-setpoint injection is not selected 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=11 Type: L2	P052 = 3 P051 = 40 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.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P435 * (G129)	**Source for injection of inching setpoint** Selection of binector to control injection of the inching setpoint ("1" state = inching setpoint injected). 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P436 * (G129)	**Source for inching setpoint** Selection of connector to be injected as the inching setpoint 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P437 * (G129)	**Source for selection of ramp-function generator bypass** Selection as to whether or not ramp-function generator must be bypassed when the inching setpoint is injected. 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 1	Ind: 8 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P438 * FDS (G129)	**Source for standard setpoint** Selection of the connector to be applied if inching-setpoint injection is not selected 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=208 Type: L2	P052 = 3 P051 = 40 Offline

Crawling setpoint

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.

If crawling setpoint injection is not selected, the connector set in P443 is applied to K0206.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P440 * (G130)	**Source for injection of crawling setpoint** Selection of binector to control injection of the crawling setpoint. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P441 * (G130)	**Source for crawling setpoint** Selection of connector to be injected as the crawling setpoint 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P442 * (G130)	**Source for selection of ramp-function generator bypass** Selection as to whether or not ramp-function generator must be bypassed when the crawling setpoint is injected. 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 1	Ind: 8 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P443 * FDS (G130)	**Source for standard setpoint** Selection of the connector to be applied if crawling-setpoint injection is not selected 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=207 Type: L2	P052 = 3 P051 = 40 Offline
P444 * BDS (G130)	**Source for standstill command** Selection of the binector to control the standstill operation (OFF1) or resetting of crawling setpoint injection when P445=1 (log. "0" state = reset). 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P445 * (G130)	**Selection of level/edge for switch-on/crawling** 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 0 ON with log. "1" state at terminal 37 and injection of crawling setpoint with binectors selected in P440 in log. "1" state 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 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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

11.21 Position sensing with pulse encoder

See parameters P140 to P148 for pulse encoder definition and monitoring				
P450 * FDS (G145)	**Resetting of position counter** 0 Reset position counter OFF 1 Reset position counter with zero marker 2 Reset position counter with zero marker when LOW signal is applied to terminal 39 3 Reset position counter when LOW signal is applied to terminal 39 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 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P451 * FDS (G145)	**Position counter hysteresis** 0 Hysteresis for rotational direction reversal OFF 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 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P452 * BDS (G145)	**Source for "Reset position counter" command** [SW 1.9 and later] Selection of binector to control **resetting of the position counter**. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P453 ***** BDS (G145)	**Source for "Enable zero marker counter" command** [SW 1.9 and later] Selection of binector to control **enabling of the zero marker counter** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 off-line

11.22 Connector selector switches

(see also Section 8, Function Diagram Sheet G124)

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P455 ***** (G124)	**Source for inputs of connector selector switch 1** [SW 1.9 and later] Selection of connectors for the input signals for connector selector switch 1. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
P456 ***** (G124)	**Source for control of connector selector switch 1** [SW 1.9 and later] Selection of binectors to control connector selector switch 1. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
P457 ***** (G124)	**Source for inputs of connector selector switch 2** [SW 1.9 and later] Selection of connectors for the input signals for connector selector switch 2. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
P458 ***** (G124)	**Source for control of connector selector switch 2** [SW 1.9 and later] Selection of binectors to control connector selector switch 2. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

11.23 Motorized potentiometer

(see also Section 8, Sheet G126)

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P460 ***** FDS (G126)	**Control word for motorized potentiometer ramp-function generator** 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) 1 Motorized potentiometer ramp generator is active in Manual and Automatic modes	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P461 ***** FDS (G126)	**Source for setpoint in Automatic mode** Selection of the connector to be applied as the **Automatic setpoint** to the ramp-function generator in the motorized potentiometer 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P462 FDS (G126)	**Ramp-up time for motorized potentiometer**	0.01 to 300.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online
P463 FDS (G126)	**Ramp-down time for motorized potentiometer**	0.01 to 300.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P464 FDS (G126)	**Time difference for dy/dt** Setting of <u>dt</u> 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) 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. - A time difference dt of P464=2s is set. - A dy/dt of 40% appears at connector K0241 since the dy within the set dt of 2 s equals (2s/5s)*100%.	0.01 to 300.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online
P465 * FDS (G126)	**Factor of expansion for motorized potentiometer** 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. 0 Parameters P462, P463 and P464 are multiplied by a <u>factor of 1</u> 1 Parameters P462, P463 and P464 are multiplied by a <u>factor of 60</u>	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P466 * FDS (G126)	**Source for motorized potentiometer setting value** Selection of the connector to be injected as the **motorized potentiometer setting value** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P467 FDS (G126)	**Motorized potentiometer starting value** Starting value of motorized potentiometer after ON when P473 = 0	-199.9 to 199.9 [%] 0.1%	Ind: 4 FS=0.0 Type: I2	P052 = 3 P051 = 40 Online
P468 FDS (G126)	**Setpoint for "Raise motorized potentiometer"** Motorized potentiometer manual operation: Setpoint for "Raise motorized potentiometer"	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=100.00 Type: I2	P052 = 3 P051 = 40 Online
P469 FDS (G126)	**Setpoint for "Lower motorized potentiometer "** Motorized potentiometer manual operation: Setpoint for "Lower motorized potentiometer"	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=-100.00 Type: I2	P052 = 3 P051 = 40 Online
P470 * BDS (G126)	**Source for clockwise/counter-clockwise switchover** Selection of binector to control **"Clockwise/counter-clockwise switchover"** ("0" state = clockwise). 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P471 * BDS (G126)	**Source for manual/automatic switchover** Selection of binector to control **"Manual/automatic switchover"** ("0" state = manual). 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P472 * BDS (G126)	**Source for set motorized potentiometer** Selection of binector to control **"Set motorized potentiometer"** ("0" to "1" transition = set motorized potentiometer). 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P473 * FDS (G126)	**Storage of output value** 0 <u>No storage of output value:</u> The output is set to 0 in all operating states of >o5. The starting point after ON is determined by P467 (MOP starting value). 1 <u>Non-volatile storage of output value:</u> 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 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.24 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.				
P480 FDS (G128)	**Oscillation setpoint 1**	-199.9 to 199.9 [%] 0.1% of maximum speed	Ind: 4 FS=0,5 Type: I2	P052 = 3 P051 = 40 Online
P481 FDS (G128)	**Oscillation time 1**	0.1 to 300.0 [s] 0.1s	Ind: 4 FS=0.1 Type: O2	P052 = 3 P051 = 40 Online
P482 FDS (G128)	**Oscillation setpoint 2**	-199.9 to 199.9 [%] 0.1% of maximum speed	Ind: 4 FS=-0,4 Type: I2	P052 = 3 P051 = 40 Online
P483 FDS (G128)	**Oscillation time 2**	0.1 to 300.0 [s] 0.1s	Ind: 4 FS=0.1 Type: O2	P052 = 3 P051 = 40 Online
P484 * FDS (G128)	**Source for standard setpoint** Selection of connector to be injected as the output value when the "Oscillation" function is not selected 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=209 Type: L2	P052 = 3 P051 = 40 Offline
P485 * BDS (G128)	**Source for oscillation selection** Selection of binector to control activation of the "Oscillation" function (log. "1" state = oscillation active) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

11.25 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.

P490 * (G185)	**Selection of temperature sensor for analog monitoring of motor temperature** i001: Temperature sensor at terminals 22 / 23: i002: Temperature sensor at terminals 204 / 205: Settings: 0 No temperature sensor 1 KTY84 2 PTC thermistor with R=600Ω 1) 3 PTC thermistor with R=1200Ω 1) 4 PTC thermistor with R=1330Ω 1) 5 PTC thermistor with R=2660Ω 1) 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 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P491 FDS (G185)	**Analog monitoring of motor temperature: Alarm temperature** Operative only when P490.x=1.	0 to 200 [°C] 1°C	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P492 FDS (G185)	**Analog monitoring of motor temperature: Trip temperature** Operative only when P490.x=1.	0 to 200 [°C] 1°C	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P493 * FDS (G185)	**Motor temperature analog 1 (temperature sensor at terminals 22 / 23): Tripping of alarm or fault message** Motor temperature grasped with KTY84 0 Monitoring deactivated 1 Alarm (A029) at temperature > P491 2 Fault message (F029) at temperature > P492 3 Alarm (A029) at temperature > P491 and fault message (F029) at temperature > P492 Motor temperature grasped with PTC thermistor 0 Monitoring deactivated 1 Alarm message (A029) when operating point of PTC thermistor is reached 2 Fault message (F029) when operating point of PTC thermistor is reached 3 Illegal setting	0 to 3 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P494 * FDS (G185)	**Motor temperature analog 2 (temperature sensor at terminals 204 / 205): Tripping of alarm or fault message** Motor temperature grasped with KTY84 0 Monitoring deactivated 1 Alarm (A029) at temperature > P491 2 Fault message (F029) at temperature > P492 3 Alarm (A029) at temperature > P491 and fault message (F029) at temperature > P492 Motor temperature grasped with PTC thermistor 0 Monitoring deactivated 1 Alarm message (A029) when operating point of PTC thermistor is reached 2 Fault message (F029) when operating point of PTC thermistor is reached 3 Illegal setting	0 to 3 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P495 * FDS (G186)	**Brush length sensing: Tripping of alarm or fault message** 0 No brush length sensing (terminal 211 is not scanned) 1 Binary brush length sensing (terminal 211 is scanned) Alarm (A025) in response to 0 signal 2 Binary brush length sensing (terminal 211 is scanned) Fault message (F025) in response to 0 signal	0 to 2 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P496 * FDS (G186)	**Bearing condition: Tripping of alarm or fault message** 0 No bearing condition sensing (terminal 212 is not scanned) 1 Bearing condition sensing (terminal 212 is scanned) Alarm (A026) in response to 1 signal 2 Bearing condition sensing (terminal 212 is scanned) Fault message (F026) in response to 1 signal	0 to 2 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P497 * FDS (G186)	**Air flow: Tripping of alarm or fault message** 0 No air flow monitoring (terminal 213 is not scanned) 1 Air flow monitoring (terminal 213 is scanned) Alarm (A027) in response to 0 signal 2 Air flow monitoring (terminal 213 is scanned) Fault message (F027) in response to 0 signal	0 to 2 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P498 ***** FDS (G186)	**Temperature switch: Tripping of alarm or fault message** 0 No temperature switch connected (terminal 214 is not scanned) 1 Temperature switch connected (terminal 214 is scanned) Alarm (A028) in response to 0 signal 2 Temperature switch connected (terminal 214 is scanned) Fault message (F028) in response to 0 signal	0 to 2 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

11.26 Configuring of torque shell input

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P500 ***** BDS (G160)	**Source for torque setpoint for slave drive** Selection of the connector to be injected as the **torque setpoint for a slave drive** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=170 Type: L2	P052 = 3 P051 = 40 Offline
P501 ***** BDS (G160)	**Source for additional torque setpoint** Selection of connector to be injected as the **additional torque setpoint** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P502 ***** (G152)	**Source for value to be added to speed controller output** 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) 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P503 FDS (G160)	**Multiplier for torque setpoint in slave mode**	-300.00 to 300.00 [%] 0.01%	Ind: 4 FS=100.00 Type: I2	P052 = 3 P051 = 40 on-line

11.27 Speed limiting controller

(see also Section 8, Sheet G160)

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
	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.			
P509 ***** (G160)	**Source for input quantity (n-act) of speed limiting controller** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=167 Type: L2	P052 = 3 P051 = 40 Offline
P510 ***** (G160)	**Source for pos. torque limit of speed limiting controller** Selection of the connector to be injected as the **limit value for torque limitation 1** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=2 Type: L2	P052 = 3 P051 = 40 Offline
P511 ***** (G160)	**Source for neg. torque limit of speed limiting controller** Selection of the connector to be injected as the **limit value for torque limitation 2** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=4 Type: L2	P052 = 3 P051 = 40 Offline
P512 FDS (G160)	**Maximum speed in positive direction of rotation**	0.0 to 199.9 [%] 0.1% of rated speed	Ind: 4 FS=105.0 Type: O2	P052 = 3 P051 = 40 Online
P513 FDS (G160)	**Maximum speed in negative direction of rotation**	-199.9 to 0.0 [%] 0.1% of rated speed	Ind: 4 FS=-105.0 Type: I2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P515 FDS (G160)	**P gain of speed limiting controller**	0.10 to 200.00 0.01	Ind: 4 FS=3.00 Type: O2	P052 = 3 P051 = 40 Online

11.28 Friction compensation

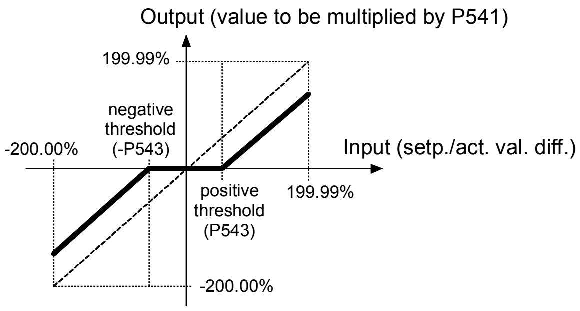
(see also Section 8, Sheet G153)

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%). 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%. 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 >100% of the maximum signal. 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.				
P519 ***** (G153)	**Source for input signal of the friction compensation** [SW 2.0 and later] Selection of the input signals that are added and led to the input of the friction compensation. i001 Input signal, with sign i002 Input signal with absolute value generator Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 179 i002: 0 Type: L2	P052 = 3 P051 = 40 offline
P520 FDS (G153)	**Friction at 0% speed** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P521 FDS (G153)	**Friction at 10% speed** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P522 FDS (G153)	**Friction at 20% speed** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P523 FDS (G153)	**Friction at 30% speed** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P524 FDS (G153)	**Friction at 40% speed** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P525 FDS (G153)	**Friction at 50% speed** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P526 FDS (G153)	**Friction at 60% speed** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P527 FDS (G153)	**Friction at 70% speed** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P528 FDS (G153)	**Friction at 80% speed** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P529 FDS (G153)	**Friction at 90% speed** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P530 FDS (G153)	**Friction at 100% speed and higher** Setting as % of converter rated DC current or rated torque	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.29 Compensation of moment of inertia (dv/dt injection)

(see also Section 8, Sheet G153)

P540 FDS (G153)	**Acceleration time** 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 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P541 FDS (G153)	**P gain of acceleration** Proportional gain for "SAD-dependent acceleration" function (see also parameter P543)	0.00 to 650.00 0.01	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P542 FDS (G136)	**Time difference for dy/dt of ramp-function generator** Ramp-function generator: 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 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. - A time difference dt of P542=2s is set. - A dy/dt of 40% appears at connector K0191 since the dy within the set dt of 2 s equals (2s/5s)*100%..	0.01 to 300.00 [s] 0.01s	Ind: 4 FS=0.01 Type: O2	P052 = 3 P051 = 40 Online
P543 FDS (G153)	**Threshold for SAD-dependent acceleration** 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). 	0.00 to 100.00 [%] 0.01% of maximum speed	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P546 FDS (G153)	**Filter time for compensation of moment of inertia**	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.30 Speed controller

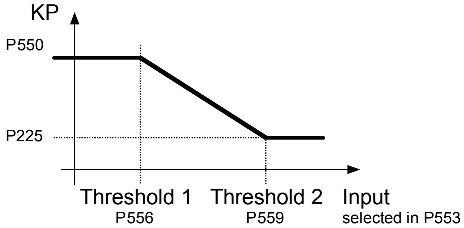
(see also Section 8, Sheet G151)

further parameters for the speed controller P200 - P236

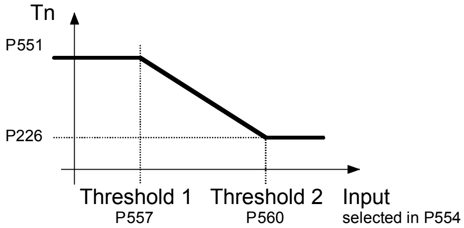
Speed controller adaptation

The parameters of the speed controller (Kp, Tn, 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.

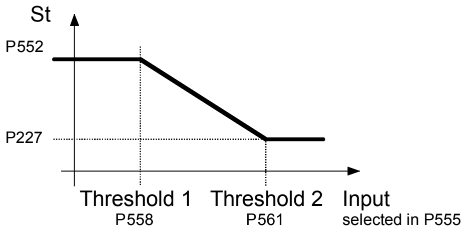
Adaptation of the P gain:



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.

P550 FDS (G151)	**P gain in the adaptation range** Value of Kp, if Influencing quantity ≤ Threshold 1	0.10 to 200.00 0.01	Ind: 4 FS=3.00 Type: O2	P052 = 3 P051 = 40 on-line
P551 FDS (G151)	**Integration time in the adaptation range** [SW 1.7 and later] Value of Tn, if Influencing quantity ≤ Threshold 1	0.010 to 10.000 [s] 0.001s	Ind: 4 FS=0.650 Type: O2	P052 = 3 P051 = 40 on-line
P552 FDS (G151)	**Droop in the adaptation range** [SW 1.7 and later] Value of droop, if Influencing quantity ≤ Threshold 1	0.0 to 10.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 on-line
P553 * FDS (G151)	**Source for the Influencing quantity of the Kp adaptation** Selection of which connector is connected at the influencing quantity for adaptation of the n controllers P gain 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P554 ***** FDS (G151)	**Source for the Influencing quantity of the Tn-adaptation** [SW 1.7 and later] Selection of which connector is connected at the influencing quantity for adaptation of the n controllers integration time 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
P555 ***** FDS (G151)	**Source for the Influencing quantity of the droop adaptation** [SW 1.7 and later] Selection of which connector is connected at the influencing quantity for adaptation of the n controllers droop 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
P556 FDS (G151)	**Adaptation n controller P gain: Threshold 1**	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 on-line
P557 FDS (G151)	**Adaptation n controller integration time: Threshold 1** [SW 1.7 and later]	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 on-line
P558 FDS (G151)	**Adaptation n controller droop: Threshold 1** [SW 1.7 and later]	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 on-line
P559 FDS (G151)	**Adaptation n controller P gain: Threshold 2**	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 on-line
P560 FDS (G151)	**Adaptation n controller integration time: Threshold 2** [SW 1.7 and later]	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 on-line
P561 FDS (G151)	**Adaptation n controller droop: Threshold 2** [SW 1.7 and later]	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 on-line

Speed controller - speed droop limitation

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P562 FDS (G151)	**Positive speed droop limitation**	0.00 to 199.99 [%] 0.01%	Ind: 4 FS=100.00 Type: O2	P052 = 3 P051 = 40 Online
P563 FDS (G151)	**Negative speed droop limitation**	-199.99 to 0.00 [%] 0.01%	Ind: 4 FS=-100.00 Type: I2	P052 = 3 P051 = 40 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).

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P565	**Base speed for frequency response recording** [SW 1.9 and later]	1.0 to 30.0 [%] 0.1%	Ind: None FS=20.0 Type: O2	P052 = 3 P051 = 40 on-line
P566	**Amplitude for frequency response recording** [SW 1.9 and later]	0.01 to 5.00 [%] 0.01%	Ind: None FS=1.00 Type: O2	P052 = 3 P051 = 40 on-line
P567	**Number of current peaks for frequency response recording** [SW 1.9 and later] 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 1	Ind: None FS=300 Type: O2	P052 = 3 P051 = 40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.31 Field reversal

(see also Section 9)

P580 ***** BDS (G200)	**Source for selection of "Direction of rotation reversal using field reversal"** Selection of binector to control the "Direction of rotation reversal using field reversal" function 0 = binector B0000 1 = binector B0001 etc. Signal 0: Positive field direction is selected (B0260 = 1, B0261 = 0), actual speed value is not inverted Signal 1: Negative field direction is selected (B0260 = 0, B0261 = 1), actual speed value is inverted	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P581 ***** BDS (G200)	**Source for selection of "Braking with field reversal"** Selection of binector to control the "Braking with field reversal" function 0 = binector B0000 1 = binector B0001 etc. Signal change 0→1: Reversal of field direction (causes braking); When n<n-min is reached, the original field direction is selected again. The drive switches to state o7.2	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P582 ***** BDS (G200)	**Source for selection of "Field reversal"** [SW 1.9 and later] Selection of binector to control "Field reversal" function 0 = binector B0000 1 = binector B0001 etc. Signal 0: Positive field direction is selected (B0260 = 1, B0261 = 0) Signal 1: Negative field direction is selected (B0260 = 0, B0261 = 1)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
P583 ***** (G200)	**Source for actual speed signal for field reversal logic** [SW 1.9 and later] Selection of connector to be used as actual speed value for the field reversal logic. 0 = binector B0000 1 = binector B0001 etc.	All connector numbers 1	Ind: None FS=167 Type: L2	P052 = 3 P051 = 40 off-line

11.32 Input quantities for signals

(see also Section 8, Sheet G187 and G188)

P590 ***** (G187)	**Source for setpoint of "nset = nact signal 1"** Setpoint/actual value deviation signal: Selection of connector to be injected as input quantity "n_{set}" for the setpoint/actual value deviation signal. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=174 Type: L2	P052 = 3 P051 = 40 Offline
P591 ***** (G187)	**Source for actual value of "n-set = n-act signal 1"** Setpoint/actual value deviation signal: Selection of connector to be injected as input quantity "n_{act}" for the setpoint/actual value deviation signal. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=167 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P592 ***** (G187)	**Source for actual value of "n < $n_{comp.}$ signal"** n < $n_{comp.}$ signal: Selection of connector to be injected as input quantity (n) for the n < $n_{comp.}$ signal. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=167 Type: L2	P052 = 3 P051 = 40 Offline
P593 ***** (G187)	**Source for actual value of "n < n_{min} signal"** n < n_{min} signal: Selection of connector to be injected as input quantity (n) for the n < n_{min} signal. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=167 Type: L2	P052 = 3 P051 = 40 Offline
P594 ***** (G188)	**Source for input quantity of "Polarity signal"** Polarity signal of speed setpoint: Selection of connector to be injected as input quantity "n_{set}" for the polarity signal of the speed setpoint. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=170 Type: L2	P052 = 3 P051 = 40 Offline
P595 ***** (G188)	**Source for actual value of "Overspeed signal"** Overspeed signal: Selection of connector to be injected as input quantity "n_{act}" for the overspeed signal. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=167 Type: L2	P052 = 3 P051 = 40 Offline
P596 ***** (G187)	**Source for setpoint of "nset = nact signal 2"** [SW 1.9 and later] Setpoint/actual value deviation signal: Selection of connector to be injected as input quantity "n_{set}" for the setpoint/actual value deviation signal. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=174 Type: L2	P052 = 3 P051 = 40 off-line
P597 ***** (G187)	**Source for actual value of "nset = nact signal 2"** [SW 1.9 and later] Setpoint/actual value deviation signal: Selection of connector to be injected as input quantity "n_{act}" for the setpoint/actual value deviation signal. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=167 Type: L2	P052 = 3 P051 = 40 off-line

11.33 Configuring of closed-loop control

Setting values for configuring of torque shell				
P600 ***** (G163)	**Source for gating unit input (armature)** i001 to i004: Selects which connectors are applied as the **gating unit input (armature)**. All four values are added. Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS= i001: 102 i002: 0 i003: 0 i004: 0 Typ: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P601 ***** (G160) (G161) (G162)	**Source for armature current controller setpoint** i001,i002 Speed limiting controller: Selection of connectors to be injected as **input quantities for the speed limiting controller**. Both values are added. i003,i004 Current limitation: Selection of connectors to be injected as **armature current controller setpoint** (before current limitation). Both values are added. i005,i006 Current control: [SW 1.8 and later] Selection of which connectors are connected as the **armature current controller setpoint** (before current controller). The two values are added. The magnitude is formed from the value selected with index 6. Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 6 FS= i001: 141 i002: 0 i003: 134 i004: 0 i005: 125 i006: 0 Type: L2	P052 = 3 P051 = 40 Offline
P602 ***** (G162)	**Source for armature current controller actual value** Selection of connector to be injected as **armature current controller actual value** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=117 Type: L2	P052 = 3 P051 = 40 Offline
P603 ***** (G161)	**Source for variable current limit in torque direction I** i001..i004 Selection of connector to be injected as <u>variable</u> current limit in torque direction I Normalization: +100% corresponds to P100*P171 i005 Selection of connector to be injected as current limit in torque direction I with <u>Fast Stop or Shutdown</u> Normalization: +100% corresponds to P100*P171 i006 Selection of connector to be injected as <u>variable</u> current limit in torque direction I Normalization: +100% corresponds to r072.002 [can be set in SW 1.9 and later] i007 Selection of connector to be injected as current limit in torque direction I with <u>Emergency Stop or Shutdown</u> Normalization: +100% corresponds to r072.002 [can be set in SW 1.9 and later] Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 7 FS= i001: 1 i002: 1 i003: 1 i004: 1 i005: 1 i006: 2 i007: 2 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P604 * (G161)	**Source for variable current limit in torque direction II** i001..i004 Selection of connector to be injected as <u>variable</u> current limit in torque direction II Normalization: -100% corresponds to P100*P172 i005 Selection of connector to be injected as current limit in torque direction II with <u>Fast Stop or Shutdown</u> Normalization: -100% corresponds to P100*P172 i006 Selection of connector to be injected as <u>variable</u> current limit in torque direction II Normalization: -100% corresponds to r072.002 [can be set in SW 1.9 and later] i007 Selection of connector to be injected as current limit in torque direction II with <u>Emergency Stop or Shutdown</u> Normalization: -100% corresponds to r072.002 [can be set in SW 1.9 and later] Settings: 0 = connector K0000 ... 8 = connector K0008 9 = value as set in parameter P603.ixx ∗ (–1) 10 = connector K0010 etc.	All connector numbers 1	Ind: 7 FS=9 Type: L2	P052 = 3 P051 = 40 Offline
P605 * (G160)	**Source for variable positive torque limit** Torque limitation: Selection of connectors to be injected as the **variable positive torque limit** i001..i004 Normalization: 100% of the connector value corresponds to the positive system torque limit according to I_a=P171 and I_f = P102 i005 Normalization: 100% of the connector value corresponds to the positive torque limit according to Ia=r072.002 and If = P102 [can be set in SW 1.9 and later] 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 5 FS=2 Type: L2	P052 = 3 P051 = 40 Offline
P606 * (G160)	**Source for variable negative torque limit** Torque limitation: Selection of connectors to be injected as the **variable negative torque limit** i001..i004 Normalization: 100% of the connector value corresponds to the negative system torque limit according to Ia=P172 and If = P102 i005 Normalization: 100% of the connector value corresponds to the negative torque limit according to Ia=r072.002 and If = P102 [can be set in SW 1.9 and later] 0 = connector K0000 ... 8 = connector K0008 9 = value as set in parameter P605 ∗ (–1) 10 = connector K0010 etc.	All connector numbers 1	Ind: 5 FS=9 Type: L2	P052 = 3 P051 = 40 Offline
P607 * BDS (G160)	**Source for torque setpoint for master drive** Torque limitation: Selection of connector to be injected as the torque setpoint for a master drive 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=148 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Speed controller				
P609 * (G152)	**Source for actual speed controller value** Selection of connector to be injected as the **actual speed controller value** when P083=4 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Setting values for configuring of closed-loop field and EMF control				
P610 * (G166)	**Source for gating unit input (field)** Selection of connector to be applied to the **gating unit input (field)** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=252 Type: L2	P052 = 3 P051 = 40 Offline
P611 * (G165)	**Source for field current controller setpoint** **Limitation at EMF controller output:** Selection of connectors to be injected as the **field current controller setpoint**. The connectors selected in the four indices are added. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS= i001: 277 i002: 0 i003: 0 i004: 0 Type: L2	P052 = 3 P051 = 40 Offline
P612 * (G166)	**Source for actual field current controller value** Selection of connector to be injected as the **actual field current controller value** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=266 Type: L2	P052 = 3 P051 = 40 Offline
P613 * (G165)	**Source for variable field current setpoint upper limit** **Limitation at EMF controller output** Selection of connector to be injected as the **variable field current setpoint upper limit** i001..i004 Normalization: 100% of the connector value corresponds to the rated excitation current of the motor (P102) i005 Normalization: 100% of the connector value corresponds to the actual converter rated DC current (field) (r073.002) [can be set in SW 1.9 and later] 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 5 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P614 * (G165)	**Source for variable field current setpoint lower limit** **Limitation at EMF controller output** Selection of connector to be injected as the **variable field current setpoint lower limit** i001..i004 Normalization: 100% of the connector value corresponds to the minimum excitation current of the motor (P103) i005 Normalization: 100% of the connector value corresponds to the actual converter rated DC current (field) (r073.002) [can be set in SW 1.9 and later] 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 5 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P615 * (G165)	**Source for EMF controller setpoint** Selection of connectors to be injected as the **EMF controller setpoint**. The connectors selected in the four indices are added. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS= i001: 289 i002: 0 i003: 0 i004: 0 Type: L2	P052 = 3 P051 = 40 Offline
P616 * (G165)	**Source for actual EMF controller value** Selection of connector to be injected as the **actual EMF controller value** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=286 Type: L2	P052 = 3 P051 = 40 Offline

Configuring of injection of acceleration value				
P619 * (G153)	**Source for acceleration injection value** Selection of connector to be applied as the **acceleration injection value** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=191 Type: L2	P052 = 3 P051 = 40 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				
P620 * (G152)	**Source for speed controller setpoint/actual value deviation** Selection of connector to be injected as the control deviation 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=165 Type: L2	P052 = 3 P051 = 40 Offline
P621 * (G152)	**Source for speed controller setpoint** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=176 Type: L2	P052 = 3 P051 = 40 Offline
P622 * (G152)	**Source for speed controller setpoint** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=174 Type: L2	P052 = 3 P051 = 40 Offline
P623 * (G152)	**Source for actual speed controller value** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=179 Type: L2	P052 = 3 P051 = 40 Offline
P624 * (G152)	**Source for actual speed controller value** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
Speed controller: Filtering of setpoint and actual value, band-stop filters				
P625 * FDS (G152)	**Source for speed controller setpoint** Selection of connector to be injected as the input signal for speed setpoint filtering 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=170 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P626 * FDS (G152)	**Source for actual speed controller value** Selection of connector to be injected as the input signal for actual speed value filtering 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=167 Type: L2	P052 = 3 P051 = 40 Offline
P627 * (G152)	**Source for input of D element** Selection of connector to be injected as the input signal for the D element 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=178 Type: L2	P052 = 3 P051 = 40 Offline
P628 * (G152)	**Source for input of band-stop filter 1** Selection of connector to be injected as the input signal for band-stop filter 1 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=179 Type: L2	P052 = 3 P051 = 40 Offline
P629 * (G152)	**Source for band-stop filter 2** Selection of connector to be injected as the input signal for band-stop filter 2 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=177 Type: L2	P052 = 3 P051 = 40 Offline
Speed controller droop				
P630 * (G151)	**Source for influencing quantity for speed droop** Selection of connector to be injected as the influencing quantity 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=162 Type: L2	P052 = 3 P051 = 40 Offline
Setting the speed controller I component 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. 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.				
P631 * (G152)	**Source for setting value for speed controller integrator** Selection of connector to be injected as the setting value for the I component 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Setting values for configuring the setpoint processing function and ramp-function generator				
Limitation at ramp-function generator output (setpoint limitation) (see also Section 8, Sheet G136) 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.				
P632 * (G136)	**Source for variable positive limitation at ramp-function generator output** Selection of connectors to be injected at the **variable positive limitation at the ramp-function generator output** (setpoint limitation). 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P633 ***** (G136)	**Source for variable negative limitation at ramp-function generator output** Selection of connectors to be injected at the **variable negative limitation at the ramp-function generator output** (setpoint limitation). 0 = connector K0000 **...** 8 = connector K0008 9 = value as set in parameter P632 ∗ (–1) 10 = connector K0010 etc.	All connector numbers 1	Ind: 4 FS=9 Type: L2	P052 = 3 P051 = 40 Offline
P634 ***** (G136)	**Source for limitation input at ramp-function generator output** Selection of connectors which must be added up to provide the **limitation input at the ramp-function generator output** (setpoint limitation). 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 190 i002: 0 Type: L2	P052 = 3 P051 = 40 Offline
P635 ***** FDS (G135)	**Source for ramp-function generator setpoint** Selection of connector to be injected as the ramp-function generator setpoint 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=194 Type: L2	P052 = 3 P051 = 40 Offline
P636 ***** (G136)	**Source for reduction signal for ramp-function generator times** Selection of connector to be injected as the **reduction signal for the ramp-function generator times** i001 acts on ramp-up and ramp-down time (P303, P304) i002 acts on lower and upper transition roundings (P305, P306) i003 acts on ramp-up time (P303) i004 acts on ramp-down time (P304) i005 acts on lower transition rounding (P305) i006 acts on upper transition rounding (P306) 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 6 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P637 ***** BDS (G136)	**Source for selection of "Ramp-function generator setting 2"** Selection of binector to control switchover to "**Ramp-function generator setting 2**". 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. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P638 ***** BDS (G136)	**Source for selection of "Ramp-function generator setting 3"** Selection of binector to control switchover to "**Ramp-function generator setting 3**". 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. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

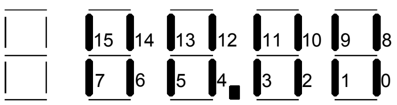
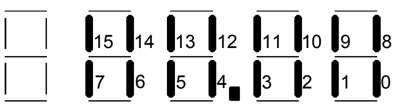
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P639 ***** (G136)	**Source for the ramp-function generator setting values** Selection of the connectors that are connected as the **ramp-function generator setting values**. i001 Setting value for the ramp-function generator output in state log. "1" of the binector selected via P640 i002 Setting value for the ramp-function generator output if the drive is not in state "Operating" (B0104=0) and the binector selected via P640 is in state log. "0" [i002 only available with SW 1.6 and later] 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 2 FS=167 Type: L2	P052 = 3 P051 = 40 ≥off-line
P640 ***** BDS (G136)	**Source for selection of "Set ramp-function generator"** Selection of binector to control the **"Set ramp-function generator"** function 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P641 ***** BDS (G136)	**Source for selection of "Bypass ramp-function generator"** Selection of binector to control the **"Bypass ramp-function generator"** function 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

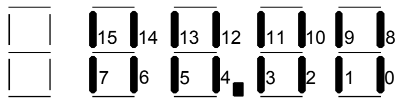
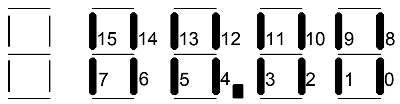
P642 ***** (G135)	**Source for variable positive limitation of main setpoint** Selection of connectors to be injected at the **variable positive limitation of the main setpoint**. The lowest value in each case of the connectors selected via the 4 indices is applied as the limit. Note: Negative values at the selected connectors result in a negative maximum value at the output of the limitation. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=2 Type: L2	P052 = 3 P051 = 40 Offline
P643 ***** (G135)	**Source for variable negative limitation of main setpoint** Selection of connectors to be injected at the **variable negative limitation of the main setpoint**. The lowest value in each case of the connectors selected via the 4 indices is applied as the limit. Note: Positive values at the selected connectors result in a positive minimum value at the output of the limitation. 0 = connector K0000 ... 8 = connector K0008 9 = value as set in parameter P642 ∗ (–1) 10 = connector K0010 etc.	All connector numbers 1	Ind: 4 FS=9 Type: L2	P052 = 3 P051 = 40 Offline
P644 ***** FDS (G135)	**Source for main setpoint** Selection of connector to be injected as the main setpoint 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=206 Type: L2	P052 = 3 P051 = 40 Offline
P645 ***** FDS (G135)	**Source for additional setpoint** Selection of connector to be injected as an additional setpoint 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P646 * BDS (G136)	**Source for enable signal for ramp-up integrator switchover** Selection of binector to control enabling of the **ramp-function integrator switchover function**. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

11.34 Control word, status word

Selection of sources of control words 1 and 2				
P648 * BDS (G180)	**Source for control word 1** Selection of connector to act as the source for control word 1. 0 = connector K0000 ... 8 = connector K0008 9 = parameters P654 to P675 are effective (every individual bit of control word 1 is input by a binector) 10 = connector K0010 etc.	All connector numbers 1	Ind: 2 FS=9 Type: L2	P052 = 3 P051 = 40 Offline
P649 * BDS (G181)	**Source for control word 2** Selection of connector to act as the source for control word 2. 0 = connector K0000 ... 8 = connector K0008 9 = parameters P676 to P691 are effective (every individual bit of control word 2 is input by a binector) 10 = connector K0010 etc.	All connector numbers 1	Ind: 2 FS=9 Type: L2	P052 = 3 P051 = 40 Offline

Display of control words 1 and 2				
r650 (G180)	**Display of control word 1** Mode of representation on operator panel (PMU):  Segments 0 to 15 correspond to bits 0 to 15 of the control word Segment ON: Corresponding bit is in log. "1" state Segment OFF: Corresponding bit is in log. "0" state		Ind: None Type: V2	P052 = 3
r651 (G181)	**Display of control word 2** Mode of representation on operator panel (PMU):  Segments 0 to 15 correspond to bits 16 to 31 of the control word Segment ON: Corresponding bit is in log. "1" state Segment OFF: Corresponding bit is in log. "0" state		Ind: None Type: V2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Display of status words 1 and 2				
r652 (G182)	**Display of status word 1** Mode of representation on operator panel (PMU):  Segments 0 to 15 correspond to bits 0 to 15 of the status word Segment ON: Corresponding bit is in log. "1" state Segment OFF: Corresponding bit is in log. "0" state		Ind: None Type: V2	P052 = 3
r653 (G183)	**Display of status word 2** Mode of representation on operator panel (PMU):  Segments 0 to 15 correspond to bits 16 to 31 of the status word Segment ON: Corresponding bit is in log. "1" state Segment OFF: Corresponding bit is in log. "0" state		Ind: None 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.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Control word 1				
P654 * BDS (G130)	**Source for control word 1, bit0** (0=OFF1, 1=ON; ANDed with terminal 37)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P655 * BDS (G180)	**1st source for control word 1, bit1** (0=OFF2; ANDed with 2nd and 3rd sources for bit1)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P656 * BDS (G180)	**2nd source for control word 1, bit1** (0=OFF2; ANDed with 1st and 3rd sources for bit1)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P657 * BDS (G180)	**3rd source for control word 1, bit1** (0=OFF2; ANDed with 1st and 2nd sources for bit1)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P658 * BDS (G180)	**1st source for control word 1, bit2** (0=OFF3=Fast stop; ANDed with 2nd and 3rd sources for bit2)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P659 * BDS (G180)	**2nd source for control word 1, bit2** (0=OFF3=Fast stop; ANDed with 1st and 3rd sources for bit2)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P660 * BDS (G180)	**3rd source for control word 1, bit2** (0=OFF3=Fast stop; ANDed with 1st and 2nd sources for bit2)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P661 * BDS (G180)	**Source for control word 1, bit3** (0=pulse disable, 1=enable; ANDed with terminal 38)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P662 * BDS (G180)	**Source for control word 1, bit4** (0=set ramp-function generator to zero, 1=enable ramp-function generator)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P663 * BDS (G180)	**Source for control word 1, bit5** (0=ramp-function generator stop, 1=ramp-function generator start)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P664 * BDS (G180)	**Source for control word 1, bit6** (0=enable setpoint, 1=disable setpoint)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P665 * BDS (G180)	**1st source for control word 1, bit7** (0→1 transition=acknowledge; ORed with 2nd and 3rd sources for bit7)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P666 * BDS (G180)	**2nd source for control word 1, bit7** (0→1 transition=acknowledge; ORed with 1st and 3rd sources for bit7)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P667 * BDS (G180)	**3rd source for control word 1, bit7** (0→1 transition=acknowledge; ORed with 1st and 2nd sources for bit7)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P668 * BDS (G180)	**Source for control word 1, bit8** (1=inching bit0)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P669 * BDS (G180)	**Source for control word 1, bit9** (1=inching bit1)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P671 * BDS (G180)	**Source for control word 1, bit11** (0=pos. direction of rotation disabled, 1=pos. direction of rotation enabled)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P672 * BDS (G180)	**Source for control word 1, bit12** (0= neg. direction of rotation disabled, 1= neg. direction of rotation enabled)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P673 * BDS (G180)	**Source for control word 1, bit13** (1=raise motorized potentiometer)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P674 * BDS (G180)	**Source for control word 1, bit14** (1=lower motorized potentiometer)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P675 * BDS (G180)	**Source for control word 1, bit15** (0=external fault, 1=no external fault)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

Control word 2				
P676 * BDS (G181)	**Source for control word 2, bit16** (select function data set bit 0)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P677 * BDS (G181)	**Source for control word 2, bit17** (select function data set bit 1)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P680 * BDS (G181)	**Source for control word 2, bit20** (select fixed setpoint 0)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P681 * BDS (G181)	**Source for control word 2, bit21** (select fixed setpoint 1)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P684 * BDS (G181)	**Source for control word 2, bit24** (0=n controller speed droop disabled, 1=enabled)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P685 * BDS (G181)	**Source for control word 2, bit25** (0=n controller disabled, 1=n controller enabled)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P686 * BDS (G181)	**Source for control word 2, bit26** (0=external fault 2, 1=no external fault 2)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P687 * BDS (G181)	**Source for control word 2, bit27** (0=master drive, speed control, 1=slave drive, torque control)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P688 * BDS (G181)	**Source for control word 2, bit28** (0=external alarm 1, 1=no external alarm 1)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P689 * BDS (G181)	**Source for control word 2, bit29** (0=external alarm 2, 1=no external alarm 2)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P690 * (G181)	**Source for control word 2, bit30** (0=select Bico data set 1, 1=select Bico data set 2)	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P691 * BDS (G181)	**Source for control word 2, Bit31** [SW 1.8 and later] Main contactor checkback signal: (0 = main contactor dropped out, 1 = main contactor picked up) This control input is intended as a means of looping an auxiliary contact of the main contactor into the device control. 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. P691 = 0: Bit 31 of control word 2 is inoperative. (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]) P691 = 1: Bit 31 of control word 2 is inoperative. (This setting of P691 is active only when control word 2 is input <u>in bit mode</u>, i.e. when P649 <> 9)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

11.35 Further configuring measures

P692 * BDS (G166)	**Source for selection of injection of standstill field** Selection of binector to control **injection of the standstill field** ("0" state = inject standstill field) Note: The delay time set in P258 is not effective when this function is active. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P693 * BDS (G165)	**Source for selection of enabling command for EMF controller** Selection of binector which is to control **enabling of the EMF controller** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P694 ***** BDS (G160)	**Source for selection of enabling command for "Torque limit switchover"** 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) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P695 ***** BDS (G152)	**Source for selection of "Set speed controller I component" function** Selection of binector to control the "Set I component" function 0 = binector B0000 1 = binector B0001 etc. 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. 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 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P696 ***** BDS (G152)	**Source for selection of "Stop speed controller I component" function** Selection of binector to control the "Stop I component" function 0 = binector B0000 1 = binector B0001 etc. When the binector selected in P696 changes to the log. "1" state, the I component of the speed controller is stopped.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P697 ***** BDS (G153)	**Source for selection of enabling of dv/dt injection** Selection of binector to control **enabling of dv/dt injection** (state "1" = enable) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P698 ***** BDS (G152)	**Source for selection of enabling command for speed controller PI / P function switchover** Selection of binector to control enabling of the PI / P controller switchover function (see also P222) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

11.36 Analog inputs (main actual value, main setpoint, selectable inputs)

(see also Section 8, Sheets G113 and G114)

Analog input terminals 4 / 5 (main setpoint)				
P700 ***** (G113)	**Signal type of "Main setpoint" analog input** 0 = Voltage input 0 to ±10 V 1 = Current input 0 to 20 mA 2 = Current input 4 to 20 mA	0 to 2 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P701 FDS (G113)	**Normalization of "Main setpoint" analog input** 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. The following generally applies: For voltage input: $P701\,[\%] = 10\,V * \frac{Y}{X}$ X .. Input voltage in volts Y .. % value which is generated for input voltage X With current input: $P701\,[\%] = 20\,mA * \frac{Y}{X}$ X .. Input current in mA Y .. % value which is generated for input current X	-1000.0 to 1000.0 [%] 0.1%	Ind: 4 FS=100.0 Type: I2	P052 = 3 P051 = 40 Online
P702 (G113)	**Offset for "Main setpoint" analog input**	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P703 * (G113)	**Mode of signal injection at "Main setpoint" analog input** 0 = Injection of signal with sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P704 * (G113)	**Source for selection of sign reversal at "Main setpoint" analog input** Selection of binector to control **sign reversal at the analog input** ("1" state = reverse sign) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P705 (G113)	**Filtering time for "Main setpoint" analog input** Note: Hardware filtering of approximately 1 ms is applied as standard.	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P706 * (G113)	**Source for enabling of "Main setpoint" analog input** Selection of binector to control **enabling of the analog input** ("1" state = enabled) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P707 ***** (G113)	**Resolution of "Main setpoint" analog input** 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". The resolution is normally specified in bits: ± 11 bits means 2 * 2048 scale divisions ± 12 bits means 2 * 4096 scale divisions ± 13 bits means 2 * 8192 scale divisions ± 14 bits means 2 * 16384 scale divisions The following applies: 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. For this reason, it is important to find a compromise between the resolution and delay period. 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 If the analog input is operating as a current input (0 to 20 mA or 4 to 20 mA), the above applies analogously.	11 to 14 [Bit] 1 bit	Ind: None FS=12 Type: O2	P052 = 3 P051 = 40 Offline
Analog input terminals 6 / 7 (analog selectable input 1)				
P710 ***** (G113)	**Signal type of "Analog selectable input 1"** 0 = Voltage input 0 to ±10 V 1 = Current input 0 to 20 mA 2 = Current input 4 to 20 mA	0 to 2 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P711 FDS (G113)	**Normalization of "Analog selectable input 1"** 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. The following generally applies: For voltage input: $P711\,[\%] = 10\,V * \frac{Y}{X}$ X .. Input voltage in volts Y .. % value which is generated for input voltage X With current input: $P711\,[\%] = 20\,mA * \frac{Y}{X}$ X .. Input current in mA Y .. % value which is generated for input current X	-1000.0 to 1000.0 [%] 0.1%	Ind: 4 FS=100.0 Type: I2	P052 = 3 P051 = 40 Online
P712 (G113)	**Offset for "Analog selectable input 1"**	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P713 ***** (G113)	**Mode of signal injection at "Analog selectable input 1"** 0 = Injection of signal with sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P714 ***** (G113)	**Source for selection of sign reversal at "Analog selectable input 1"** Selection of binector to control **sign reversal at the analog input** ("1" state = reverse sign) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P715 (G113)	**Filtering time for "Analog selectable input 1"** Note: Hardware filtering of approximately 1 ms is applied as standard.	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P716 ***** (G113)	**Source for enabling of "Analog selectable input 1"** Selection of binector to control **enabling of the analog input** ("1" state = enabled) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P717 ***** (G113)	**Resolution of "Analog selectable input 1"** See P707	10 to 14 [Bit] 1 bit	Ind: None FS=12 Type: O2	P052 = 3 P051 = 40 Offline
Analog input terminals 8 / 9 (analog selectable input 2)				
P721 FDS (G114)	**Normalization of "Analog selectable input 2"** 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. The following generally applies: For voltage input: $P721\,[\%] = 10\,V * \frac{Y}{X}$ X .. Input voltage in volts Y .. % value which is generated for input voltage X With current input: $P721\,[\%] = 20\,mA * \frac{Y}{X}$ X .. Input current in mA Y .. % value which is generated for input current X	-1000.0 to 1000.0 [%] 0.1%	Ind: 4 FS=100.0 Type: I2	P052 = 3 P051 = 40 Online
P722 (G114)	**Offset for "Analog selectable input 2"**	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P723 ***** (G114)	**Mode of signal injection at "Analog selectable input 2"** 0 = Injection of signal with sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P724 ***** (G114)	**Source for selection of sign reversal at "Analog selectable input 2"** Selection of binector to control **sign reversal at the analog input** ("1" state = reverse sign) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P725 (G114)	**Filtering time for "Analog selectable input 2"** Note: Hardware filtering of approximately 1 ms is applied as standard.	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P726 ***** (G114)	**Source for enabling of "Analog selectable input 2"** Selection of binector to control **enabling of the analog input** ("1" state = enabled) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Analog input terminals 10 / 11 (analog selectable input 3)				
P731 FDS (G114)	**Normalization of "Analog selectable input 3"** 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. The following generally applies: For voltage input: $P731\,[\%] = 10\,V * \frac{Y}{X}$ X .. Input voltage in volts Y .. % value which is generated for input voltage X With current input: $P731\,[\%] = 20\,mA * \frac{Y}{X}$ X .. Input current in mA Y .. % value which is generated for input current X	-1000.0 to 1000.0 [%] 0.1%	Ind: 4 FS=100.0 Type: I2	P052 = 3 P051 = 40 Online
P732 (G114)	**Offset for "Analog selectable input 3"**	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P733 * (G114)	**Mode of signal injection at "Analog selectable input 3"** 0 = Injection of signal with sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P734 * (G114)	**Source for selection of sign reversal at "Analog selectable input 3"** Selection of binector to control **sign reversal at the analog input** ("1" state = reverse sign) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P735 (G114)	**Filtering time for "Analog selectable input 3"** Note: Hardware filtering of approximately 1 ms is applied as standard.	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P736 * (G114)	**Source for enabling of "Analog selectable input 3"** Selection of binector to control **enabling of the analog input** ("1" state = enabled) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Analog input terminals 103 / 104 (main actual value)				
P741 FDS (G113)	**Normalization for "Main actual value"** Rated value of input voltage at n_{max} (=tachometer voltage at maximum speed) This parameter defines the maximum speed when P083=1.	-270.00 to 270.00 [V] 0.01V	Ind: 4 FS=60.00 Type: I2	P052 = 3 P051 = 40 Online
P742 (G113)	**Offset for "Main actual value" analog input**	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
P743 * (G113)	**Mode of signal injection at "Main actual value" analog input** 0 = Injection of signal with sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P744 * (G113)	**Source for selection of sign reversal at "Main actual value" analog input** Selection of binector to control **sign reversal at the analog input** ("1" state = reverse sign) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P745 (G113)	**Filtering time for "Main actual value" analog input** Note: Hardware filtering of approximately 1 ms is applied as standard.	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P746 ***** (G113)	**Source for enabling of "Main actual value" analog input** Selection of binector to control **enabling of the analog input** ("1" state = enabled) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline

11.37 Analog outputs

(see also Section 8, Sheets G115 and G116)

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Analog output terminals 12 / 13 (actual current display)				
P749 ***** (G115)	**Control word for terminal 12 (actual current display)** 0 Output with correct sign (positive voltage: Current in torque direction MI) (negative voltage: Current in torque direction MII) 1 Output of absolute value (positive voltage only) 2 Output with sign, inverted (positive voltage: Current in torque direction MII) (negative voltage: Current in torque direction MI) 3 Output of absolute value, inverted (negative voltage only)	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Analog output terminals 14 / 15				
P750 ***** (G115)	**Source for output value at analog output 1** Selection of connector whose value is to applied to the analog output 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Online
P751 ***** (G115)	**Mode of signal injection at analog output 1** 0 = Injection of signal with correct sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P752 (G115)	**Filtering time for analog output 1**	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P753 (G115)	**Normalization of analog output 1** $y[V] = x * \frac{P753}{100\,\%}$ x = Normalization input (corresponds to filtering output) y = Normalization output (corresponds to output voltage at analog output with offset = 0)	-200.00 to 199.99 [V] 0.01V	Ind: None FS=10.00 Type: I2	P052 = 3 P051 = 40 Online
P754 (G115)	**Offset for analog output 1**	-10.00 to 10.00 [V] 0.01V	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Analog output terminals 16 / 17				
P755 ***** (G115)	**Source for output value at analog output 2** Selection of connector whose value is to applied to the analog output 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Online
P756 ***** (G115)	**Mode of signal injection at analog output 2** 0 = Injection of signal with correct sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P757 (G115)	**Filtering time for analog output 2**	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P758 (G115)	**Normalization of analog output 2** $y[V] = x * \frac{P758}{100\,\%}$ x = Normalization input (corresponds to filtering output) y = Normalization output (corresponds to output voltage at analog output with offset = 0)	-200.00 to 199.99 [V] 0.01V	Ind: None FS=10.00 Type: I2	P052 = 3 P051 = 40 Online
P759 (G115)	**Offset for analog output 2**	-10.00 to 10.00 [V] 0.01V	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
Analog output terminals 18 / 19				
P760 * (G116)	**Source for output value at analog output 3** Selection of connector whose value is to applied to the analog output 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Online
P761 * (G116)	**Mode of signal injection at analog output 3** 0 = Injection of signal with correct sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P762 (G116)	**Filtering time for analog output 3**	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P763 (G116)	**Normalization of analog output 3** $y[V] = x * \frac{P763}{100\,\%}$ x = Normalization input (corresponds to filtering output) y = Normalization output (corresponds to output voltage at analog output with offset = 0)	-200.00 to 199.99 [V] 0.01V	Ind: None FS=10.00 Type: I2	P052 = 3 P051 = 40 Online
P764 (G116)	**Offset for analog output 3**	-10.00 to 10.00 [V] 0.01V	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
Analog output terminals 20 / 21				
P765 * (G116)	**Source for output value at analog output 4** Selection of connector whose value is to applied to the analog output 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Online
P766 * (G116)	**Mode of signal injection at analog output 4** 0 = Injection of signal with correct sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P767 (G116)	**Filtering time for analog output 4**	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P768 (G116)	**Normalization of analog output 4** $y[V] = x * \frac{P768}{100\,\%}$ x = Normalization input (corresponds to filtering output) y = Normalization output (corresponds to output voltage at analog output with offset = 0)	-200.00 to 199.99 [V] 0.01V	Ind: None FS=10.00 Type: I2	P052 = 3 P051 = 40 Online
P769 (G116)	**Offset for analog output 4**	-10.00 to 10.00 [V] 0.01V	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.38 Binary outputs

(see also Section 8, Sheet G112)

P770 ***** (G112) (G200)	**Control word for binary selectable outputs** i001: 0 Binary selectable output at terminal 46 is not inverted 1 Binary selectable output at terminal 46 is inverted i002: 0 Binary selectable output at terminal 48 is not inverted 1 Binary selectable output at terminal 48 is inverted i003: 0 Binary selectable output at terminal 50 is not inverted 1 Binary selectable output at terminal 50 is inverted i004: 0 Binary selectable output at terminal 52 is not inverted 1 Binary selectable output at terminal 52 is inverted	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P771 ***** (G112) (G200)	**Source for output value at binary output 1** Selection of binector to be injected at binary selectable output, terminal 46 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Online
P772 ***** (G112) (G200)	**Source for output value at binary output 2** Selection of binector to be injected at binary selectable output, terminal 48 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Online
P773 ***** (G112)	**Source for output value at binary output 3** Selection of binector to be injected at binary selectable output, terminal 50 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Online
P774 ***** (G112)	**Source for output value at binary output 4** Selection of binector to be injected at binary selectable output, terminal 52 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Online
P775 (G112) (G200)	**Delay for output value at binary output 1** 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 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P776 (G112) (G200)	**Delay for output value at binary output 2** 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 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P777 (G112)	**Delay for output value at binary output 3** 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 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P778 (G112)	**Delay for output value at binary output 4** 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 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.39 Configuration of serial interfaces on basic converter

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
G-SST 1 (RS485 / RS232 on X300) (see also Section 8, Sheet G170 and Section 9)				
P780 * (G170)	**Selection of protocol for G-SST1 basic converter interface** 0 Setting has no function 2 USS protocol 8 for factory purposes 9 For internal factory test purposes	0, 2, 8, 9 1	Ind: None FS=2 Type: O2	P052 = 3 P051 = 40 Offline
P781 * (G170)	**Number of process data for G-SST1** When P780 = 0 or 9 is selected: Parameter is irrelevant When USS protocol (P780=2) is selected: Number of **PZD elements** 0 No process data are expected or sent in the USS protocol 1...16 Number of process data words in USS protocol (same number applies to transmission and receipt) 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. The PZD elements to be transmitted (1 to max. 16) are selected in parameters P784.01 to P784.16.	0 to 16 1	Ind: None FS=2 Type: O2	P052 = 3 P051 = 40 Offline
P782 * (G170)	**Length of parameter jobs for G-SST1** This parameter is effective only when P780=2 (USS protocol). 0 No PKW data are expected or sent in the USS protocol. 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). 127 Number of PKWs is determined by the telegram length	0, 3, 4, 127 1	Ind: None FS=127 Type: O2	P052 = 3 P051 = 40 Offline
P783 * (G170)	**Baud rate for G-SST1** 1 300 baud 2 600 baud 3 1200 baud 4 2400 baud 5 4800 baud 6 9600 baud 7 19200 baud 8 38400 baud 9 56700 baud 11 93750 baud 13 187500 baud	1 to 13 1	Ind: None FS=6 Type: O2	P052 = 3 P051 = 40 Offline
P784 * (G170)	**Source for transmit data for G-SST1** Selection of connectors to be transferred as transmit data to the USS master via USS interface 1. i001: Selection for word 1 i002: Selection for word 2 **...** i016: Selection for word 16 Applicable settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 16 FS= i001: 32 i002: 167 i003: 0 i004: 33 i005-i016: 0 Type: L2	P052 = 3 P051 = 40 Offline
P785 (G170)	**Options for G-SST1** i001: 0 = Bus terminator OFF 1 = Bus terminator ON i002: 0 = Bit 10 of the 1st receive word does not function as "Control by PLC". 1 = Bit 10 of the 1st receive word does function as "Control by PLC“, i.e. when bit 10 = 0, all other bits of the 1st receive word, as well as receive words 2 to 16, are not written to connectors K2001 to K2016, or to binectors B2100 to B2915. All these connectors and binectors retain their old values.	0 to 1 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P786 * (G170)	**USS bus address for G-SST1** 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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P787 (G170)	**Telegram failure time for G-SST1** The failure time set in this parameter is valid when setting P780=2 (USS protocol) is selected. 0.000 No time monitoring 0.001...65.000 Time which may elapse between the receipt of two telegrams addressed to the unit before a fault message is activated. Fault message F011 is activated if no valid telegram is received within this time period. Note: The telegram monitoring function is active • from the receipt of the first error-free telegram after connection of the electronics power supply • from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout).	0.000 to 65.000 [s] 0.001s	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
P788 * (G170)	**Source for activation of F011** Selection of binector which will activate fault message F011 when it switches to log. "1" 2030 = binector B2030 2031 = binector B2031	2030, 2031	Ind: None FS=2030 Type: L2	P052 = 3 P051 = 40 Offline
r789 (G170)	**Diagnostic information for G-SST1** Free-running counter, overflow at 65535 i001: Number of error-free telegrams i002: Number of errored telegrams: Byte frame, parity, overrun or BCC error i003: Number of byte frame errors i004: Number of overrun errors i005: Parity error i006: STX error: Start interval before STX not observed, telegram residual transfer time not observed, delay time of LGE character too long, erroneous STX, i.e. ≠ 02 i007: Violation of telegram residual transfer time i008: Block check error i009: Incorrect telegram length: With P782=3 or 4 only: The length of the received telegram is ≠ P781 + P782 (Note: If the received values are correct, they will be processed even when this error has been detected) i010: Timeout error: 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 Type: O2	P052 = 3

G-SST 2 (RS485 on X172) (see also Section 8, Sheets G171 and G173 and Section 9)				
P790 * (G171) (G173)	**Selection of protocol for G-SST2 basic converter interface** 0 Setting has no function 2 USS protocol 5 "Peer-to-peer" communication 9 For internal factory test purposes	0, 2, 5, 9 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P791 ***** (G171) (G173)	**Number of process data for G-SST2** When P790 = 0 or 9 is selected: Parameter is irrelevant When USS protocol (P790=2) is selected: Number of **PZD elements** 0 No process data are expected or sent in the USS protocol 1...16 Number of process data words in USS protocol (same number applies to transmission and receipt) 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. The PZD elements to be transmitted (1 to max. 16) are selected in parameters P794.01 to P794.16. When peer-to-peer (P790= 5) is selected: Number of **transferred words** 0 Illegal setting 1...5 Number of transferred words 6...16 Illegal setting	0 to 16 1	Ind: None FS=2 Type: O2	P052 = 3 P051 = 40 Offline
P792 ***** (G171)	**Length of parameter jobs for G-SST2** This parameter is effective only when P790=2 (USS protocol). 0 No PKW data are expected or sent in the USS protocol. 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). 127 Number of PKWs is determined by the telegram length	0, 3, 4, 127 1	Ind: None FS=127 Type: O2	P052 = 3 P051 = 40 Offline
P793 ***** (G171) (G173)	**Baud rate for G-SST2** 1 300 baud 2 600 baud 3 1200 baud 4 2400 baud 5 4800 baud 6 9600 baud 7 19200 baud 8 38400 baud 9 56700 baud 11 93750 baud 13 187500 baud	1 to 13 1	Ind: None FS=6 Type: O2	P052 = 3 P051 = 40 Offline
P794 ***** (G171) (G173)	**Source for transmit data for G-SST2** Selection of connectors to be transferred as transmit data via basic converter interface 2 When USS protocol (P790=2) is selected: i001: Selection for word 1 i002: Selection for word 2 ... i016: Selection for word 16 When peer-to-peer (P790=5) is selected: i001: Selection for word 1 i002: Selection for word 2 ... i005: Selection for word 5 i006: Not used ... i016: Not used Applicable settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 16 FS= i001: 32 i002: 167 i003: 0 i004: 33 i005-i016: 0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P795 (G171) (G173)	**Options for G-SST2** i001: 0 = Bus terminator OFF 1 = Bus terminator ON i002: 0 = Bit 10 of the 1st receive word does <u>not</u> function as "Control by PLC". 1 = Bit 10 of the 1st receive word does function as "Control by PLC", i.e. when bit 10 = 0, all other bits of the 1st 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 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P796 * (G171)	**USS bus address for G-SST2** 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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P797 (G171) (G173)	**Telegram failure time for G-SST2** The failure time set in this parameter is valid when setting P790=2 (USS protocol) or P790=5 (peer-to-peer) is selected. 0.000 No time monitoring 0.001...65.000 Time which may elapse between the receipt of two telegrams addressed to the unit before a fault message is activated. Fault message F012 is activated if no valid telegram is received within this time period. Note: The telegram monitoring function is active • from the receipt of the first error-free telegram after connection of the electronics power supply • from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout). Since the telegram transfer time is dependent on the set baud rate, the following minimum setting values for P797 are recommended: Baud rate as set in P793: Recommended minimum value for P797: 300 baud 0.520s 600 baud 0.260s 1200 baud 0.140s 2400 baud 0.080s ≥ 4800 baud 0.040s Note: 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 [s] 0.001s	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
P798 * (G171) (G173)	**Source for activation of F012** Selection of binector which will activate fault message F012 when it switches to log. "1" 6030 = binector B6030 6031 = binector B6031	6030, 6031	Ind: None FS=6030 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r799 (G171) (G173)	**Diagnostic information for G-SST2** Free-running counter, overflow at 65535 i001: Number of error-free telegrams i002: Number of errored telegrams: Byte frame, parity, overrun or BCC error i003: Number of byte frame errors i004: Number of overrun errors i005: Parity error i006: STX error: Start interval before STX not observed, telegram residual transfer time not observed, delay time of LGE character too long, erroneous STX, i.e. ≠ 02 i007: Violation of telegram residual transfer time (USS prot. only) i008: Block check error i009: Incorrect telegram length: With P792=3 or 4 only: The length of the received telegram is ≠ P791 + P792 (Note: If the received values are correct, they will be processed even when this error has been detected) i010: Timeout error: No valid telegram has been received for a period exceeding the setting in P797. After the occurrence of a timeout error, this counter is not activated again until the next valid telegram is received.		Ind: 10 Type: O2	P052 = 3

G-SST 3 (RS485 on X162) (see also Section 8, Sheets G172 and G174 and Section 9)				
P800 * (G172) (G174)	**Selection of protocol for G-SST3 basic converter interface** 0 Setting has no function 2 USS protocol 5 ”Peer-to-peer” communication 9 For internal factory test purposes	0, 2, 5, 9 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P801 * (G172) (G174)	**Number of process data for G-SST3** When P800 = 0 or 9 is selected: Parameter is irrelevant When USS protocol (P800=2) is selected: Number of **PZD elements** 0 No process data are expected or sent in the USS protocol 1...16 Number of process data words in USS protocol (same number applies to transmission and receipt) 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. The PZD elements to be transmitted (1 to max. 16) are selected in parameters P804.01 to P804.16. When peer-to-peer (P800= 5) is selected: Number of **transferred words** 0 Illegal setting 1...5 Number of transferred words 6...16 Illegal setting	0 to 16 1	Ind: None FS=2 Type: O2	P052 = 3 P051 = 40 Offline
P802 * (G172)	**Length of parameter jobs for G-SST3** This parameter is effective only when P800=2 (USS protocol). 0 No PKW data are expected or sent in the USS protocol. 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). 127 Number of PKWs is determined by the telegram length	0, 3, 4, 127 1	Ind: None FS=127 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P803 * (G172) (G174)	**Baud rate for G-SST3** 1 300 baud 2 600 baud 3 1200 baud 4 2400 baud 5 4800 baud 6 9600 baud 7 19200 baud 8 38400 baud 9 56700 baud 11 93750 baud 13 187500 baud	1 to 13 1	Ind: None FS=13 Type: O2	P052 = 3 P051 = 40 Offline
P804 * (G172) (G174)	**Source for transmit data for G-SST3** Selection of connectors to be transferred as transmit data via basic converter interface 3 When USS protocol (P800=2) is selected: i001: Selection for word 1 i002: Selection for word 2 ... i016: Selection for word 16 When peer-to-peer (P800=5) is selected: i001: Selection for word 1 i002: Selection for word 2 ... i005: Selection for word 5 i006: Not used ... i016: Not used Applicable settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 16 FS= i001: 32 i002: 167 i003: 0 i004: 33 i005-i016: 0 Type: L2	P052 = 3 P051 = 40 Offline
P805 (G172) (G174)	**Options for G-SST3** i001: 0 = Bus terminator OFF 1 = Bus terminator ON i002: 0 = Bit 10 of the 1st receive word does not function as "Control by PLC". 1 = Bit 10 of the 1st receive word does function as "Control by PLC“, i.e. when bit 10 = 0, all other bits of the 1st receive word, as well as receive words 2 to 16, are not written to connectors K9001 to K9016, or to binectors B9100 to B9915. All these connectors and binectors retain their old values.	0 to 1 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P806 * (G172)	**USS bus address for G-SST3** 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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P807 (G172) (G174)	**Telegram failure time for G-SST3** The failure time set in this parameter is valid when setting P800=2 (USS protocol) or P800=5 (peer-to-peer) is selected. 0.000 No time monitoring 0.001...65.000 Time which may elapse between the receipt of two telegrams addressed to the unit before a fault message is activated. Fault message F013 is activated if no valid telegram is received within this time period. Note: The telegram monitoring function is active • from the receipt of the first error-free telegram after connection of the electronics power supply • from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout). Since the telegram transfer time is dependent on the set baud rate, the following minimum setting values for P807 are recommended: Baud rate as set in P803: Recommended minimum value for P807: 300 baud 0.520s 600 baud 0.260s 1200 baud 0.140s 2400 baud 0.080s ≥ 4800 baud 0.040s Note: 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 [s] 0.001s	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
P808 * (G172) (G174)	**Source for activation of F013** Selection of binector which will activate fault message F013 when it switches to log. "1" 9030 = binector B9030 9031 = binector B9031	9030, 9031	Ind: None FS=9030 Type: L2	P052 = 3 P051 = 40 Offline
r809 (G172) (G174)	**Diagnostic information for G-SST3** Free-running counter, overflow at 65535 i001: Number of error-free telegrams i002: Number of errored telegrams: Byte frame, parity, overrun or BCC error i003: Number of byte frame errors i004: Number of overrun errors i005: Parity error i006: STX error: Start interval before STX not observed, telegram residual transfer time not observed, delay time of LGE character too long, erroneous STX, i.e. ≠ 02 i007: Violation of telegram residual transfer time (USS prot. only) i008: Block check error i009: Incorrect telegram length: With PP802=3 or 4 only: The length of the received telegram is ≠ P801 + P802 (Note: If the received values are correct, they will be processed even when this error has been detected) i010: Timeout error: 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 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r810 (G170)	**Receive data on G-SST1** Display of data received via **USS interface 1** i001: Display process data word 1 ... i016 Display process data word 16 i017: Display parameter data word 1 ... i020: Display parameter data word 4		Ind: 20 Type: L2	P052 = 3
r811 (G170)	**Transmit data on G-SST1** Display of the data to be transmitted via **USS interface 1** i001: Display process data word 1 ... i016 Display process data word 16 i017: Display parameter data word 1 ... i020: Display parameter data word 4		Ind: 20 Type: L2	P052 = 3
r812 (G171) (G173)	**Receive data on G-SST2** <u>When USS protocol (P790=2) is selected:</u> Display of data received via **USS interface 2** i001: Display process data word 1 ... i016 Display process data word 16 i017: Display parameter data word 1 ... i020: Display parameter data word 4 <u>When peer-to-peer (P790=5) is selected:</u> Display of data received via **peer-to-peer interface 2** i001: Receive data word 1 ... i005 Receive data word 5 i006: Not used ... i020 Not used		Ind: 20 Type: L2	P052 = 3
r813 (G171) (G173)	**Transmit data on G-SST2** <u>When USS protocol (P790=2) is selected:</u> Display of the data to be transmitted via **USS interface 2** i001: Display process data word 1 ... i016 Display process data word 16 i017: Display parameter data word 1 ... i020: Display parameter data word 4 <u>When peer-to-peer (P790=5) is selected:</u> Display of the data to be transmitted via **peer-to-peer interface 2** i001: Transmit data word 1 ... i005 Transmit data word 5 i006: Not used ... i020 Not used		Ind: 20 Type: L2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r814 (G172) (G174)	**Receive data on G-SST3** When USS protocol (P800=2) is selected: Display of data received via **USS interface 3** i001: Display process data word 1 ... i016 Display process data word 16 i017: Display parameter data word 1 ... i020: Display parameter data word 4 When peer-to-peer (P800=5) is selected: Display of data received via **peer-to-peer interface 3** i001: Receive data word 1 ... i005 Receive data word 5 i006: Not used ... i020 Not used		Ind: 20 Type: L2	P052 = 3
r815 (G172) (G174)	**Transmit data on G-SST3** When USS protocol (P800=2) is selected: Display of the data to be transmitted via **USS interface 3** i001: Display process data word 1 ... i016 Display process data word 16 i017: Display parameter data word 1 ... i020: Display parameter data word 4 When peer-to-peer (P800=5) is selected: Display of the data to be transmitted via **peer-to-peer interface 3** i001: Transmit data word 1 ... i005 Transmit data word 5 i006: Not used ... i020 Not used		Ind: 20 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.

P816 (G173)	**Peer-to-peer 2: Source for data reception enabling command** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P817 (G173)	**Peer-to-peer 2: Source for data transmission enabling command** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P818 (G174)	**Peer-to-peer 3: Source for data reception enabling command** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P819 (G174)	**Peer-to-peer 3: Source for data transmission enabling command** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.40 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!

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P820 *	**Deactivation of fault messages** 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. Factory setting: i001 = 7 (overvoltage) i002 = 18 (short circuit at binary outputs) i003 = 31 (monitoring of speed controller) i004 = 35 (drive blocked) i005 = 36 (armature current cannot flow) i006 = 37 (I^2t motor monitoring function has responded) i007 to i099 = 0	0 to 147 1	Ind: 99 FS= see column on left Type: O2	P052 = 3 P051 = 40 Online
P821 *	**Deactivation of alarms** 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 1	Ind: 99 FS= 0 Type: O2	P052 = 3 P051 = 40 Online

11.41 Compensation values

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r824	**A7006 compensation values** These data contain compensation values for the analog section of electronics board A7006	0 to 65535 1	Ind: 10 Type: O2	P052 = 3
P825	**Offset compensation for actual field current channel** 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 1	Ind: 3 FS=19139 Type: O2	P052 = 3 P051 = 40 Online
P826 (G163)	**Correction of natural commutation timing** 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). 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. 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). Caution: 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 [µs] 1.333µs	Ind: 6 FS=0 Type: I2	P052 = 3 P051 = 40 Online
r827	**Internal diagnosis** i001: Number of write access operations to EEPROM i002: Number of Page-Write access operations to EEPROM i003: Counter for DUAL-PORT RAM timeouts	0 to 65535 1	Ind: 3 Type: O2	P052 = 3
r828	**MLFB data** These data contain details about the power section design (model)	0 to 65535 1	Ind: 16 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r829	**A7001 compensation values** These data contain compensation values for the analog section of electronics board A7001	0 to 65535 1	Ind: 68 Type: O2	P052 = 3

11.42 Thyristor diagnosis

P830 *****	**Control word for thyristor diagnosis** 0 Thyristor check function deactivated 1 Thyristors are checked on initial SWITCH-ON or INCHING command after connection of the electronics supply voltage. 2 Thyristors are checked on every SWITCH-ON or INCHING command. 3 Thyristors will be checked on the next SWITCH-ON or INCHING command. Parameter P830 is set to 0 if no fault is detected. Note: The thyristor check function may not be activated (setting P830=0 must be selected) – when the "Enable a torque direction for torque direction change by parallel drive" function is in use (see also parameter P165) or – when the converter is used to supply large inductances (e.g. field supply from armature terminals, supply of lifting solenoids, etc.).	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

11.43 Parameters for DriveMonitor and OP1S

P831 **to** **r849**	**Parameters for the Trace function of DriveMonitor** These parameters are settings for the data exchange between DriveMonitor and the SIMOREG converter. They must not be changed!			P052 = 3
r850 **to** **P899**	**Parameters for the OP1S** These parameters are settings for the data exchange between OP1S and the SIMOREG converter. They must not be changed!			P052 = 3

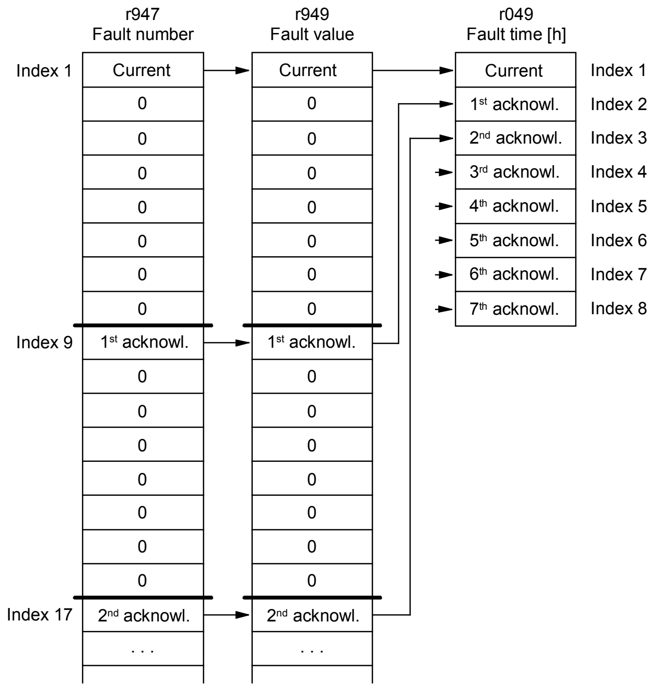
11.44 Profile parameters

P918 (Z110) (Z111)	**CB bus address** Protocol-dependent bus address for communication boards Note: 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 1	Ind: 2 FS=3 Type: O2	P052 = 3 P051 = 40 Offline
P927 ***** (G170) (G171) (G172) (Z110) (Z111)	**Parameterization enable** Enabling of interfaces for parameterization. A parameter value can only be altered via an enabled interface. 0: None 1: Communications board (CB) 2: Parameterizing unit (PMU) 4: G-SST1 serial interface and OP1S 8: Reserved 16: Technology board (TB) 32: G-SST2 serial interface 64: G-SST3 serial interface Setting information: Every interface has a numeric code. 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. Example: Factory setting value 6 (=4+2) means that the PMU and G-SST1 interfaces are enabled for parameterization purposes.	0 to 127 1	Ind: None FS=6 Type: V2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.45 Fault memory

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r947 (G189)	**Fault memory** Display of fault messages generated in response to recent faults. A fault value and fault time is assigned to each fault number (see Section 10 for details of fault numbers and fault values).The interrelationship between the associated parameters is shown in the diagram below. The fault numbers 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 6RA70, only indices 1, 9, 17, 25, 33, 41, 49 and 57 are relevant. A fault value is assigned to each fault number in the corresponding index of parameter r949. This provides further information about the nature of the fault. In addition, the fault time (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.		Ind: 64 Type: O2	P052 = 3

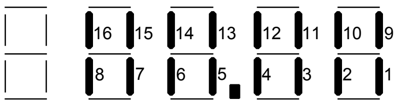
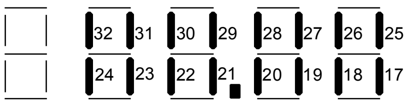
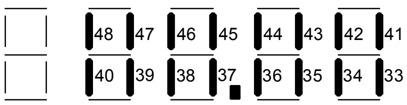
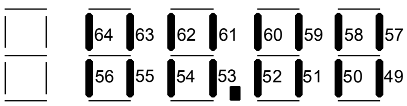
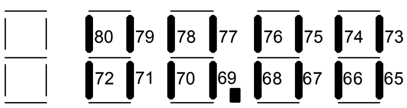


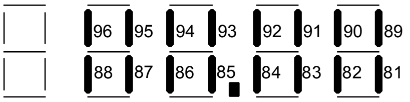
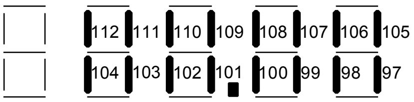
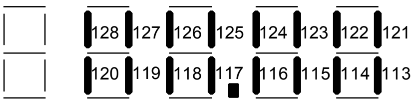
Plaintext information about the fault numbers is available under the corresponding index of parameter r951.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r949 (G189)	**Fault value** 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.		Ind: 64 Type: O2	P052 = 3
r951	**Fault text**	0 to 65535 1	Ind: 101 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P952	**Number of faults** Settings: 0 Deletes the entire fault memory (r947, r949 and r049) by resetting to 0 Note: P952 cannot be reset while a fault is pending >0 Display of the faults stored in the fault memory (r947, r949 and r049)	0 to 65535 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

11.46 Visualization parameters: Alarms

r953	**Alarm parameter 1** Display of active alarms in bit-coded form (A001 to A016). If one of the alarms between 1 and 16 is generated, the corresponding segment in the display lights up.  See Section 10.2 for meaning of individual alarms.		Ind: None Type: V2	P052 = 3
r954	**Alarm parameter 2** Display of active alarms in bit-coded form (A017 to A032). If one of the alarms between 17 and 32 is generated, the corresponding segment in the display lights up.  See Section 10.2 for meaning of individual alarms		Ind: None Type: V2	P052 = 3
r955	**Alarm parameter 3** Parameter alarms 3 If one of the alarms between 33 and 48 is generated, the corresponding segment in the display lights up. 		Ind: None Type: V2	P052 = 3
r956	**Alarm parameter 4** Parameter alarms 4 If one of the alarms between 49 and 64 is generated, the corresponding segment in the display lights up. 		Ind: None Type: V2	P052 = 3
r957	**Alarm parameter 5** Parameter alarms 5 If one of the alarms between 65 and 80 is generated, the corresponding segment in the display lights up.. 		Ind: None Type: V2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r958	**Alarm parameter 6** Parameter alarms 6 (CB alarms) If one of the alarms between 81 and 96 is generated, the corresponding segment in the display lights up. 		Ind: None Type: V2	P052 = 3
r959	**Alarm parameter 7** Parameter alarms 7 (TB alarms 1) If one of the alarms between 97 and 112 is generated, the corresponding segment in the display lights up. 		Ind: None Type: V2	P052 = 3
r960	**Alarm parameter 8** Parameter alarms 8 (TB alarms 2) If one of the alarms between 113 and 128 is generated, the corresponding segment in the display lights up. 		Ind: None Type: V2	P052 = 3

11.47 Device identification

PNU	Description	Value range	No. indices	See
r964	**Parameters for device identification on the PROFIBUS** [SW 2.0 and later] Display parameters to support overview and diagnosis of all nodes on the PROFIBUS-DP during and after commissioning (coding according to PROFIBUS profile V3) i001: Display of the manufacturer of the SIMOREG DC Master 6RA70 : SIEMENS = 42 i002: Display of device type: SIMOREG DC Master 6RA70 = 4110 i003: Display of the software version of the SIMOREG DC Master 6RA70 (see r060.001) i004: Display of year of generation of the software of the SIMOREG DC Master 6RA70: y y y y (see r061.001) i005: Display of the month and day of generation of the software of the SIMOREG DC Master 6RA70: d d m m (see r061.003 and r061.002) i006: Display of the controlled axes of the SIMOREG DC Master 6RA70: 1	0 to 65535 1	Ind: 6 Type: O2	P052 = 1

11.48 Visualization parameters: Control and status word

PNU	Description	Value range	No. indices	See
r967	**Display of control word 1** Visualization parameter for control word 1 (bits 0-15) Identical to r650 (control word 1)		Ind: None Type: V2	P052 = 3
r968	**Display of status word 1** Visualization parameter for status word 1 (bits 0 - 15) Identical to r652 (status word 1)		Ind: None Type: V2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.49 Resetting and storing parameters, list of existing and modified P and r parameters

P970 *	**Restore factory setting** Reset parameters to factory setting (default) 0: Parameter reset: All parameters are reset to their original values (factory setting). This parameter is then automatically reset to 1. 1: No parameter reset Note: Function can also be selected by setting P051=21.	0 to 1 1	Ind: None FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P971 *	**EEPROM transfer** Transfer of parameter values from RAM to EERPROM on switchover from 0 to 1. It takes approximately 15s to process all values. The PMU remains in value mode for this period.	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
r980	**List of existing parameter numbers, start** 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. Repetition of a number over several indices means that there are no further parameter numbers in the 0 to 999 range. The list is continued at the parameter whose number is displayed under index 101. See also r989		Ind: 101 Type: O2	P052 = 3
r981	**List of existing parameter numbers, continuation** See r980.		Ind: 101 Type: O2	P052 = 3
r982	**List of existing parameter numbers, continuation** See r980.		Ind: 101 Type: O2	P052 = 3
r983	**List of existing parameter numbers, continuation** See r980.		Ind: 101 Type: O2	P052 = 3
r984	**List of existing parameter numbers, continuation** See r980.		Ind: 101 Type: O2	P052 = 3
r985	**List of existing parameter numbers, continuation** See r980.		Ind: 101 Type: O2	P052 = 3
r986	**List of existing parameter numbers, continuation** See r980.		Ind: 101 Type: O2	P052 = 3
r987	**List of existing parameter numbers, continuation** See r980.		Ind: 101 Type: O2	P052 = 3
r988	**List of existing parameter numbers, continuation** See r980.		Ind: 101 Type: O2	P052 = 3
r989	**List of existing parameter numbers, continuation** Continuation of the list can be found under index 101. Please note: 860 = r860 (TECH BOARD installed) 2980 = n980 See also r980.		Ind: 101 Type: O2	P052 = 3
r990	**List of modified parameter numbers, start** 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. Repetition of a number over several indices means that there are no further modified parameters in the 0 to 999 range. The list is continued at the parameter whose number is displayed under index 101. See also r999.		Ind: 101 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r991	**List of modified parameter numbers, continuation** See r990.		Ind: 101 Type: O2	P052 = 3
r992	**List of modified parameter numbers, continuation** See r990.		Ind: 101 Type: O2	P052 = 3
r993	**List of modified parameter numbers, continuation** See r990.		Ind: 101 Type: O2	P052 = 3
r994	**List of modified parameter numbers, continuation** See r990.		Ind: 101 Type: O2	P052 = 3
r995	**List of modified parameter numbers, continuation** See r990.		Ind: 101 Type: O2	P052 = 3
r996	**List of modified parameter numbers, continuation** See r990.		Ind: 101 Type: O2	P052 = 3
r997	**List of modified parameter numbers, continuation** See r990.		Ind: 101 Type: O2	P052 = 3
r998	**List of modified parameter numbers, continuation** See r990.		Ind: 101 Type: O2	P052 = 3
r999	**List of modified parameter numbers, continuation** Continuation of the list can be found under index 101. Please note: 2990 = n990 See also r990.		Ind: 101 Type: O2	P052 = 3

11.50 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) U006.2 = 0	U005.1 = 0 (factory setting) U005.2 = 0	The key and lock are parameterized identically, all parameters are accessible
U006.1 = 12345 U006.2 = 54321	U005.1 = 0 U005.2 = 0	The key and lock are parameterized differently, only the visualization parameters, the parameters that can be altered with P051=0, and the "user parameters" are accessible
U006.1 = 12345 U006.2 = 54321	U005.1 = 12345 U005.2 = 54321	The key and lock are parameterized identically, 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).

U005 (2005) *	**Key** [SW 1.7 and later] Parameter for entering the keys for the key/lock mechanism	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 0 on-line

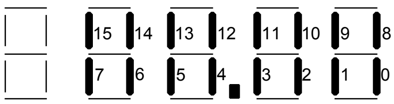
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U006 (2006) *	**Lock** [SW 1.7 and later] Parameter for entering the password for the key/lock mechanism	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 on-line
U007 (2007) *	**Numbers of the user parameters** [SW 1.7 and later] Parameters for entering the numbers of those parameters that are to be accessible if the key and lock are set differently. NOTE: Parameters U000 to U999 must be entered as 2000 to 2999	0 to 999 2000 to 2005 2008 to 2999 1	Ind: 100 FS=0 Type: O2	P052 = 3 P051 = 40 on-line

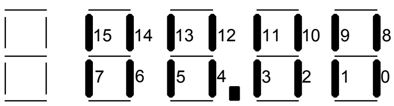
11.51 Processor utilization

n009 (2009)	**Processor utilization** 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). i001: Current total processor utilization i002: Extrapolated total processor utilization for maximum line frequency i003: Current total processor utilization by programs in time slice 10 i004: Current total processor utilization by programs in time slice 4 i005: Current total processor utilization by programs in time slice 2 i006: Current total processor utilization by programs in time slice 1	0.0 to 100.0 [%] 0.1%	Ind: 6 Type: O2	P052 = 3

11.52 Display parameters for technology functions with S00

Only active with optional technology software S00

Connector/binector converters				
n010 (2010) S00 (B120)	**Connector/binector converter 1** (bit field 1) **FB 10** Displays the status of the bits in the bit field on the bars of the 7-segment display  Segment ON: Bit (binector) = log. "1" state Segment OFF: Bit (binector) = log. "0" state		Ind: None Type: V2	P052 = 3
n011 (2011) S00 (B120)	**Connector/binector converter 2** (bit field 2) **FB 11** As for n010		Ind: None Type: V2	P052 = 3
n012 (2012) S00 (B120)	**Connector/binector converter 3** (bit field 3) **FB 12** As for n010		Ind: None Type: V2	P052 = 3

Binector/connector converters				
n013 (2013) S00 (B121)	**Binector/connector converter 1** (bit field 4) **FB 13** Displays the status of the bits in the bit field on the bars of the 7-segment display  Segment ON: Bit = log. "1" state Segment OFF: Bit = log. "0" state		Ind: None Type: V2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n014 (2014) S00 (B121)	**Binector/connector converter 2** (bit field 5) **FB 14** As for n013		Ind: None Type: V2	P052 = 3
n015 (2015) S00 (B121)	**Binector/connector converter 3** (bit field 6) **FB 15** As for n013		Ind: None Type: V2	P052 = 3

Technology controller				
n016 (2016) S00 (B170)	**Actual value display** **FB 260**	-200.0 to 199.9 [%] 0.1	Ind: None Type: I2	P052 = 3
n017 (2017) S00 (B170)	**Setpoint display** **FB 260**	-200.0 to 199.9 [%] 0.1	Ind: None Type: I2	P052 = 3
n018 (2018) S00 (B170)	**Display of effective Kp factor** **FB 260**	0.00 to 30.00 0.01	Ind: None Type: O2	P052 = 3
n019 (2019) S00 (B170)	**Display of technology controller output** **FB 260**	-200.0 to 199.9 [%] 0.1	Ind: None Type: I2	P052 = 3

Velocity/speed calculator				
n020 (2020) S00 (B190)	**Display of actual speed** **FB 261**	-200.0 to 199.9 [%] 0.1	Ind: None Type: I2	P052 = 3
n021 (2021) S00 (B190)	**Display of actual velocity** **FB 261**	-32.768 to 32767 [m/s] 0.001	Ind: None Type: I2	P052 = 3
n022 (2022) S00 (B190)	**Display of setpoint velocity** **FB 261**	-32.768 to 32767 [m/s] 0.001	Ind: None Type: I2	P052 = 3
n023 (2023) S00 (B190)	**Display of setpoint speed** **FB 261**	-200.0 to 199.9 [%] 0.1	Ind: None Type: I2	P052 = 3

11.53 Miscellaneous

n024 (2024)	**Display of the speed actual value in rpm** [SW 2.0 and later] i001: Display of the speed actual value from the pulse generator input of basic device X173 i002: Display of speed actual value from tacho module SBP	-32768 to 32767 [rpm] 1	Ind: 2 Type: I2	P052 = 2

U040 to U041	**Reserved for later use** [SW 2.0 and later] These parameters must not be changed by the user!			P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n042 (2042)	**Warning memory** [SW 2.0 and later] Warning memory for flagging warnings that have occurred since the electronics supply voltage was last switched on. The contents of the warning memory are lost when the electronics supply voltage is switched off and can be deleted with U043. The warnings are displayed in bit code as for r953 to r960 i001: Display of warnings 1 to 16 i002: Display of warnings 17 to 32 i003: Display of warnings 33 to 48 i004: Display of warnings 49 to 64 i005: Display of warnings 65 to 80 i006: Display of warnings 81 to 96 i007: Display of warnings 97 to 112 i008: Display of warnings 113 to 128 See Section 10.2 for the meaning of the individual warnings		Ind: 8 Type: V2	P052 = 2
U043 * (2043)	**Deleting the warning memory** [SW 2.0 and later] Settings: 0 Deletes the entire warning memory n042 by resetting it to 0. Subsequently the parameter is automatically set back to value 1. 1 Not active	0 to 1 1	Ind: none FS=1 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U044 * (2044)	**Connector display, decimal** [SW 2.0 and later] Selects those connectors whose value is to be displayed as a decimal with n045 i001: Selects the connector to be displayed with n045.01 i002: Selects the connector to be displayed with n045.02 i003: Selects the connector to be displayed with n045.03 i004: Selects the connector to be displayed with n045.04 i005: Selects the connector to be displayed with n045.05	All connector numbers 1	Ind: 5 FS=0 Type: L2	P052 = 3 P051 =40 online
n045 (2045)	**Connector display, decimal** [SW 2.0 and later] 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. i001: Display of the connector selected with U044.01 i002: Display of the connector selected with U044.02 i003: Display of the connector selected with U044.03 i004: Display of the connector selected with U044.04 i005: Display of the connector selected with U044.05	-32768 to 32767 1	Ind:5 Type: I2	P052 = 3
U046 * (2046)	**Connector display, hexadecimal** [SW 2.0 and later] Selection of connectors whose value is to be displayed as a hexadecimal value with n047l i001: Selection of the connector to be displayed with n047.01 i002: Selection of the connector to be displayed with n047.02 i003: Selection of the connector to be displayed with n047.03 i004: Selection of the connector to be displayed with n047.04 i005: Selection of the connector to be displayed with n047.05	All connector numbers 1	Ind: 5 FS=0 Type: L2	P052 = 3 P051 =40 online
n047 (2047)	**Connector display, hexadecimal** [SW 2.0 and later] Hexadecimal display of values of connectors selected with U046. In the case of double-word connectors the H word is displayed. i001: Display of the connector selected with U046.01 i002: Display of the connector selected with U046.02 i003: Display of the connector selected with U046.03 i004: Display of the connector selected with U046.04 i005: Display of the connector selected with U046.05	0000h to FFFFh 1	Ind:5 Type: L2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U049 (2049)	**OP1S operating display** [SW 1.9 and later] Function parameter for selecting parameters whose values must be included in the operating display of the optional OP1S convenience operator panel. i001: 1st line on left i002: 1st line on right i003: 2nd line (actual value), visualization parameter only i004: 3rd line (setpoint) i005: 4th line	0 to 3999 1	Ind:5 FS= i001: 19 i002: 38 i003: 25 i004: 28 i005: 59 Type: O2	P052 = 3 P051 =40 on-line

Connector type converters 2 connectors are converted into one double word connector.				
U098 (2098) * S00 (B151)	**Operands for 1st connector type converter** (result = K9498) **FB 298** **Operands for 2nd connector type converter** (result = K9499) **FB 299** [SW 1.9 and later] i001: Source for the low word of output connector K9498 i002: Source for the high word of output connector K9498 i003: Source for the low word of output connector K9499 i004: Source for the high word of output connector K9499 Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

11.54 Settable fixed values

Only active with optional technology software S00

U099 (2099) S00 (B110)	**Fixed value** [SW 1.8 and later] The values set in Index .001 to .100 are connected to connectors K9501 to K9600	-199.99 to 199.99 [%] 0.01%	Ind: 100 FS=0.00 Type: I2	P052 = 3 P051 = 40 on-line

11.55 Activation of fault messages and alarm messages

Only active with optional technology software S00

U100 (2100) * S00 (B115)	**Source for the activation of F023 and F019** **FB 2, FB 286** Selection of the binectors that activate fault messages F023 or F019 on log. "1" 0 = Binector B0000 1 = Binector B0001 etc. Up to SW 1.7: F023 (without fault value) if binector = 1 (FB 2) SW 1.8 and later: i001: F023 with fault value 1 (FB 2) i002: F023 with fault value 2 i003: F023 with fault value 3 i004: F023 with fault value 4 i005: F019 with fault value 1 (FB 286) i006: F019 with fault value 2 i007: F019 with fault value 3 i008: F019 with fault value 4	All binector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U101 (2101) * S00 (B115)	**Source for the activation of F024 and F020** **FB 3, FB 287** Selection of the binectors that activate fault messages F024 or F020 on log. "1" 0 = Binector B0000 1 = Binector B0001 etc. Up to SW 1.7: F024 (without fault value) if binector = 1 (FB 3) SW 1.8 and later: i001: F024 with fault value 1 (FB 3) i002: F024 with fault value 2 i003: F024 with fault value 3 i004: F024 with fault value 4 i005: F020 with fault value 1 (FB 287) i006: F020 with fault value 2 i007: F020 with fault value 3 i008: F020 with fault value 4	All binector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U102 (2102) * S00 (B115)	**Source for the activation of F033 and F053** **FB 4, FB 288** Selection of the binectors that activate fault messages F033 or F053 on log. "1" 0 = Binector B0000 1 = Binector B0001 etc. Up to SW 1.7: F033 (without fault value) if binector = 1 (FB 4) SW 1.8 and later: i001: F033 with fault value 1 (FB 4) i002: F033 with fault value 2 i003: F033 with fault value 3 i004: F033 with fault value 4 i005: F053 with fault value 1 (FB 288) i006: F053 with fault value 2 i007: F053 with fault value 3 i008: F053 with fault value 4	All binector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U103 (2103) * S00 (B115)	**Source for the activation of F034 and F054** **FB 5, FB 289** Selection of the binectors that activate fault messages F034 or F054 on log. "1" 0 = Binector B0000 1 = Binector B0001 etc. Up to SW 1.7: F034 (without Fault value) if binector = 1 (FB 5) SW 1.8 and later: i001: F034 with fault value 1 (FB 5) i002: F034 with fault value 2 i003: F034 with fault value 3 i004: F034 with fault value 4 i005: F054 with fault value 1 (FB 289) i006: F054 with fault value 2 i007: F054 with fault value 3 i008: F054 with fault value 4	All binector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U104 (2104) * S00 (B115)	**Source for the activation of A023 and A019** **FB 6, FB 256** Selection of the binectors that activate alarm A023 or A019 on log. "1" 0 = Binector B0000 1 = Binector B0001 etc. Up to SW 1.7: A023 (FB 6) SW 1.8 and later: i001: A023 (FB 6) i002: A019 (FB 256)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U105 (2105) * S00 (B115)	**Source for the activation of A024 and A020** **FB 7, FB 257** Selection of the binectors that activate alarm A024 or A020 on log. "1" 0 = Binector B0000 1 = Binector B0001 etc. Up to SW 1.7: A024 (FB 7) SW 1.8 and later: i001: A024 (FB 7) i002: A020 (FB 257)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U106 (2106) * S00 (B115)	**Source for the activation of A033 and A053** **FB 8, FB 258** Selection of the binectors that activate alarm A033 or A053 on log. "1" 0 = Binector B0000 1 = Binector B0001 etc. Up to SW 1.7: A033 (FB 8) SW 1.8 and later: i001: A033 (FB 8) i002: A053 (FB 258)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U107 (2107) * S00 (B115)	**Source for the activation of A034 and A054** **FB 9, FB 259** Selection of the binectors that activate alarm A034 or A054 on log. "1" 0 = Binector B0000 1 = Binector B0001 etc. Up to SW 1.7: A034 (FB 9) SW 1.8 and later: i001: A034 (FB 9) i002: A054 (FB 259)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

11.56 Connector/binector converters, binector/connector converters

Only active with optional technology software S00

PNU	Description	Value range	No. indices	See
U110 (2110) * S00 (B120)	**Source for connector/binector converter 1** **FB 10** Connector which must be converted to binectors B9052 (bit 0) to B9067 (bit 15) 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U111 (2111) * S00 (B120)	**Source for connector/binector converter 2** **FB 11** Connector which must be converted to binectors B9068 (bit 0) to B9083 (bit 15) 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U112 (2112) * S00 (B120)	**Source for connector/binector converter 3** **FB 12** Connector which must be converted to binectors B9084 (bit 0) to B9099 (bit 15) 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U113 (2113) * S00 (B121)	**Source for binector/connector converter 1** **FB 13** Binectors which must be converted to connector K9113 i001: 1st binector (bit 0) i002: 2nd binector (bit 1) ... i016: 16th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U114 (2114) * S00 (B121)	**Source for binector/connector converter 2** **FB 14** Binectors which must be converted to connector K9114 i001: 1st binector (bit 0) i002: 2nd binector (bit 1) ... i016: 16th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U115 (2115) * S00 (B121)	**Source for binector/connector converter 3** **FB 15** Binectors which must be converted to connector K9115 i001: 1st binector (bit 0) i002: 2nd binector (bit 1) ... i016: 16th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

11.57 Binector/connector converter for serial interfaces

U116 (2116) * (G170)	**Source for binector/connector converter for GSST1** [SW1.4 and later] Binectors which must be converted to connector K2020 i001: 1st binector (bit 0) i002: 2nd binector (bit 1) ... i016: 16th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U117 (2117) * (G171) (G173)	**Source for binector/connector converter for GSST2** [SW1.4 and later] Binectors which must be converted to connector K6020 i001: 1st binector (bit 0) i002: 2nd binector (bit 1) ... i016: 16th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U118 (2118) * (G172) (G174)	**Source for binector/connector converter for GSST3** [SW1.4 and later] Binectors which must be converted to connector K9020 i001: 1st binector (bit 0) i002: 2nd binector (bit 1) ... i016: 16th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

U119 (2119) *	**Parameters for the Trace function of DriveMonitor** [SW1.4 and later] This parameter is a setting for the exchange of process data between DriveMonitor and the SIMOREG converter. It must not be changed!			

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.58 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.				
U120 (2120) * S00 (B125)	**Operands for 1st adder / subtractor** (result = K9120) **FB 20** **Operands for 13th adder / subtractor** (result = K9132) **FB 32** (SW 1.8 and later) 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 6 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U121 (2121) * S00 (B125)	**Operands for 2nd adder / subtractor** (result = K9121) **FB 21** **Operands for 14th adder / subtractor** (result = K9133) **FB 33** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 6 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U122 (2122) * S00 (B125)	**Operands for 3rd adder / subtractor** (result = K9122) **FB 22** **Operands for 14th adder / subtractor** (result = K9134) **FB 34** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 6 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U123 (2123) * S00 (B125)	**Operands for 4th adder / subtracter** (result = K9123) **FB 23** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U124 (2124) * S00 (B125)	**Operands for 5th adder / subtracter** (result = K9124) **FB 24** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U125 (2125) * S00 (B125)	**Operands for 6th adder / subtracter** (result = K9125) **FB 25** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U126 (2126) * S00 (B125)	**Operands for 7th adder / subtracter** (result = K9126) **FB 26** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U127 (2127) * S00 (B125)	**Operands for 8th adder / subtracter** (result = K9127) **FB 27** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U128 (2128) * S00 (B125)	**Operands for 9th adder / subtracter** (result = K9128) **FB 28** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U129 (2129) * S00 (B125)	**Operands for 10th adder / subtracter** (result = K9129) **FB 29** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U130 (2130) * S00 (B125)	**Operands for 11th adder / subtracter** (result = K9130) **FB 30** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U131 (2131) * S00 (B125)	**Operands for 12th adder / subtracter** (result = K9131) **FB 31** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Adders / subtracters 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 limited to -200.00 to +199.99% and switched through to the specified connector.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U132 (2132) * S00 (B151)	**Operands for 1st adder / subtracter (result** = K9490) **FB 48** **Operands for 2nd adder / subtracter (result** = K9491) **FB 49** [SW 1.9 and later] i001: Addition value for 1st adder/subtracter i002: Addition value for 1st adder/subtracter i003: Subtraction value for 1st adder/subtracter i004: Addition value for 2nd adder/subtracter i005: Addition value for 2nd adder/subtracter i006: Subtraction value for 2nd adder/subtracter Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 6 FS=0 Type: L2	P052 = 3 P051 = 40 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.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U135 (2135) * S00 (B125)	**Source for 1st sign inverter** (result = K9135) **FB 35** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U136 (2136) * S00 (B125)	**Source for 2nd sign inverter** (result = K9136) **FB 36** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U137 (2137) * S00 (B125)	**Source for 3rd sign inverter** (result = K9137) **FB 37** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U138 (2138) * S00 (B125)	**Source for 4th sign inverter** (result = K9138) **FB 38** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 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.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U140 (2140) * S00 (B125)	**Source for 1st switchable sign inverter** **FB 40** Result = K9140 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U141 (2141) * S00 (B125)	**Control bit for 1st switchable sign inverter** **FB 40** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U142 (2142) * S00 (B125)	**Source for 2nd switchable sign inverter** **FB 41** Result = K9141 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U143 (2143) * S00 (B125)	**Control bit for 2nd switchable sign inverter** **FB 41** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 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]

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.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U145 (2145) * S00 (B131)	**Operands for 1st divider** (result = K9145) **FB 45** **Operands for 4th divider** (result = K9142) **FB 42** 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
U146 (2146) * S00 (B131)	**Operands for 2nd divider** (result = K9146) **FB 46** **Operands for 5th divider** (result = K9143) **FB 43** 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
U147 (2147) * S00 (B131)	**Operands for 3rd divider** (result = K9147) **FB 47** **Operands for 6th divider** (result = K9144) **FB 44** 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=1 Type: L2	P052 = 3 P051 = 40 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]

Formula: $y = \frac{x1 * x2}{100\%}$

y is limited to -200.00 to +199.99% and applied to the connector stated.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U150 (2150) * S00 (B130)	**Operands for 1st multiplier** (result = K9150) **FB 50** **Operands for 5th multiplier** (result = K9430) **FB 290** **Operands for 9th multiplier** (result = K9431) **FB 291** 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 6 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U151 (2151) * S00 (B130)	**Operands for 2nd multiplier** (result = K9151) **FB 51** **Operands for 6th multiplier** (result = K9432) **FB 292** **Operands for 10th multiplier** (result = K9433) **FB 293** 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 6 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U152 (2152) * S00 (B130)	**Operands for 3rd multiplier** (result = K9152) **FB 52** **Operands for 7thmultiplier** (result = K9434) **FB 294** **Operands for 11th multiplier** (result = K9435) **FB 295** 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 6 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U153 (2153) * S00 (B130)	**Operands for 4th multiplier** (result = K9153) **FB 53** **Operands for 8the multiplier** (result = K9436) **FB 296** **Operands for 12th multiplier** (result = K9437) **FB 297** 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 6 FS=0 Type: L2	P052 = 3 P051 = 40 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 Equations: $x4(32bit) = x1 * x2$, $y = \frac{x4}{x3} = \frac{x1 * x2}{x3}$ 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.				
U155 (2155) * S00 (B131)	**Operands for 1st multiplier/divider** (result = K9155) **FB 55** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U156 (2156) * S00 (B131)	**Operands for 2nd multiplier/divider** (result = K9156) **FB 56** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U157 (2157) * S00 (B131)	**Operands for 3rd multiplier/divider** (result = K9157) **FB 57** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

Absolute-value generators with filtering				
U160 (2160) * S00 (B135)	**Source for input quantity for 1st abs.-value generator with filter** **FB 60** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U161 (2161) * S00 (B135)	**Signal injection mode for 1st abs.-value generator with filter** **FB 60** 0 Injection of signal with correct sign 1 Injection of absolute value of signal 2 Injection of signal with sign, inverted 3 Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U162 (2162) S00 (B135)	**Filter time for 1st abs.-value generator with filter** **FB 60**	0 to 10000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

U163 (2163) * S00 (B135)	**Source for input quantity for 2nd abs.-value generator with filter** **FB 61** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U164 (2164) * S00 (B135)	**Signal injection mode for 2nd abs.-value generator with filter** **FB 61** 0 Injection of signal with correct sign 1 Injection of absolute value of signal 2 Injection of signal with sign, inverted 3 Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U165 (2165) S00 (B135)	**Filter time for 2nd abs.-value generator with filter** **FB 61**	0 to 10000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

U166 (2166) * S00 (B135)	**Source for input quantity for 3rd abs.-value generator with filter** **FB 62** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U167 (2167) * S00 (B135)	**Signal injection mode for 3rd abs.-value generator with filter FB 62** 0 Injection of signal with correct sign 1 Injection of absolute value of signal 2 Injection of signal with sign, inverted 3 Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U168 (2168) S00 (B135)	**Filter time for 3rd abs.-value generator with filter FB 62**	0 to 10000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

U169 (2169) * S00 (B135)	**Source for input quantity for 4th abs.-value generator with filter FB 63** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U170 (2170) * S00 (B135)	**Signal injection mode for 4th abs.-value generator with filter FB 63** 0 Injection of signal with correct sign 1 Injection of absolute value of signal 2 Injection of signal with sign, inverted 3 Injection of absolute value of signal, inverted	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U171 (2171) S00 (B135)	**Filter time for 4th abs.-value generator with filter FB 63**	0 to 10000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

11.59 Processing of connectors

Only active with optional technology software S00

Averager [SW 1.8 and later]	**FB 16, FB 17, FB 18, FB 19**			
U172 (2172) * S00 (B139)	**Source for input signal** [SW 1.8 and later] i001: 1st averager (FB 16) i002: 2nd averager (FB 17) i003: 3rd averager (FB 18) i004: 4. averager (FB 19) Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U173 (2173) S00 (B139)	**Number of sampling cycles** [SW 1.8 and later] i001: 1st averager (FB 16) i002: 2nd averager (FB 17) i003: 3rd averager (FB 18) i004: 4. averager (FB 19)	1 to 100 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.60 Limiters, limit-value monitors

Only active with optional technology software S00

Limiters

The input variable selected with index i001 or i004 of the 1st 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.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U175 (2175) * S00 (B134) (B135)	**Source for input signal and limits for limiter 1** **FB 65** Output = connector K9167 i001: Input signal i002: Upper limiting value (L+) i003: Lower limiting value (L-) **Source for input signal and limits for limiter 4** **FB 212** [SW2.0 and later] Output = connector K9176 i004: Input signal i005: Upper limiting value (L+) i006: Lower limiting value (L-) Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 6 FS= i001: 0 i002: 9165 i003: 9166 i004: 0 i005: 9174 i006: 9175 Type: L2	P052 = 3 P051 = 40 Offline
U176 (2176) S00 (B134) (B135)	**Limit value for limiter** **FB 65, FB212** i001: Applied to connector K9165 (FB 65) i002: Applied to connector K9174 (FB 212) [SW2.0 and later]	-199.99 to 199.99 [%] 0.01%	Ind: 2 FS=100.00 Type: I2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U177 (2177) * S00 (B134) (B135)	**Source for input signal and limits for limiter 2** **FB 66** Output = connector K9170 i001: Input signal i002: Upper limiting value (L+) i003: Lower limiting value (L-) **Source for input signal and limits for limiter 5** **FB 213** [SW2.0 and later] Output = connector K9179 i004: Input signal i005: Upper limiting value (L+) i006: Lower limiting value (L-) Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 6 FS= i001: 0 i002: 9168 i003: 9169 i004: 0 i005: 9177 i006: 9178 Type: L2	P052 = 3 P051 = 40 Offline
U178 (2178) S00 (B134) (B135)	**Limit value for limiter** **FB 66, FB213** i001: Applied to connector K9168 (FB 66) i002: Applied to connector K9177 (FB 213) [SW2.0 and later]	-199.99 to 199.99 [%] 0.01%	Ind: 2 FS=100.00 Type: I2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U179 (2179) * S00 (B134) (B135)	**Source for input signal and limits for limiter 3** **FB 67** Output = connector K9173 i001: Input signal i002: Upper limiting value (L+) i003: Lower limiting value (L-) **Source for input signal and limits for limiter 6** **FB 214** [SW2.0 and later] Output = connector K9262 i004: Input signal i005: Upper limiting value (L+) i006: Lower limiting value (L-) Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 6 FS= i001: 0 i002: 9171 i003: 9172 i004: 0 i005: 9260 i006: 9261 Type: L2	P052 = 3 P051 = 40 Offline
U180 (2180) S00 (B134) (B135)	**Limit value for limiter** **FB 67, FB214** i001: Applied to connector K9171 (FB 67) i002: Applied to connector K9260 (FB 214) [SW2.0 and later]	-199.99 to 199.99 [%] 0.01%	Ind: 2 FS=100.00 Type: I2	P052 = 3 P051 = 40 Offline

Limit-value monitors for double word connectors				
U181 (2181) * S00 (B151)	**Source for input signal (A) and operating threshold (B)** **for 1st limit-value monitor for double word connectors** **FB 68** **for 2nd limit-value monitor for double word connectors** **FB 69** [SW 1.9 and later] i001: Input signal for 1st limit-value monitor i002: Operating threshold for 1st limit-value monitor i003: Input signal for 2nd limit-value monitor i004: Operating threshold for 2nd limit-value monitor Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U182 (2182) S00 (B151)	**Hysteresis for 1st limit-value monitor for double word connectorsFB 68** **Hysteresis for 2nd limit-value monitor for double word connectorsFB69** [SW 1.9 and later] i001: Hysteresis for 1st limit-value monitor i002: Hysteresis for 2nd limit-value monitor	0.00 to 100.00 [%] 0.01%	Ind: 2 FS=0.00 Type: O2	P052 = 3 P051 = 40 off-line

Limit-value monitors with filtering				
U185 (2185) * S00 (B136)	**Source for input signal (A) and operating point (B) for 1st limit-value monitor with filtering** **FB 70** i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9181 Type: L2	P052 = 3 P051 = 40 Offline
U186 (2186) S00 (B136)	**Settable operating point for limit-value monitor** **FB 70** Applied to connector K9181	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U187 (2187) S00 (B136)	**Filter time for 1st limit-value monitor with filtering** **FB 70**	0 to 10000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U188 (2188) S00 (B136)	**Hysteresis for 1st limit-value monitor with filtering** **FB 70**	0.00 to 100.00 [%] 0.01%	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U189 (2189) * S00 (B136)	**Source for input signal (A) and operating point (B) for 2nd limit-value monitor with filtering** **FB 71** i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9183 Type: L2	P052 = 3 P051 = 40 Offline
U190 (2190) S00 (B136)	**Settable operating point for limit-value monitor** **FB 71** Applied to connector K9183	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U191 (2191) S00 (B136)	**Filter time for 2nd limit-value monitor with filtering** **FB 71**	0 to 10000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U192 (2192) S00 (B136)	**Hysteresis for 2nd limit-value monitor with filtering** **FB 71**	0.00 to 100.00 [%] 0.01%	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

U193 (2193) * S00 (B136)	**Source for input signal (A) and operating point (B) for 3rd limit-value monitor with filtering** **FB 72** i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9185 Type: L2	P052 = 3 P051 = 40 Offline
U194 (2194) S00 (B136)	**Settable operating point for limit-value monitor** **FB 72** Applied to connector K9185	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U195 (2195) S00 (B136)	**Filter time for 3rd limit-value monitor with filtering** **FB 72**	0 to 10000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U196 (2196) S00 (B136)	**Hysteresis for 3rd limit-value monitor with filtering** **FB 72**	0.00 to 100.00 [%] 0.01%	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

Limit-value monitors without filtering				
U197 (2197) * S00 (B137)	**Source for input signal (A) and operating point (B) for 1st limit-value monitor without filtering** **FB 73** i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9186 Type: L2	P052 = 3 P051 = 40 Offline
U198 (2198) S00 (B137)	**Settable operating point for limit-value monitor** **FB 73** Applied to connector K9186	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U199 (2199) S00 (B137)	**Hysteresis for 1st limit-value monitor without filtering** **FB 73**	0.00 to 100.00 [%] 0.01%	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U200 (2200) * S00 (B137)	**Source for input signal (A) and operating point (B) for 2nd limit-value monitor without filtering** **FB 74** i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9187 Type: L2	P052 = 3 P051 = 40 Offline
U201 (2201) S00 (B137)	**Settable operating point for limit-value monitor** **FB 74** Applied to connector K9187	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U202 (2202) S00 (B137)	**Hysteresis for 2nd limit-value monitor without filtering** **FB 74**	0.00 to 100.00 [%] 0.01%	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U203 (2203) * S00 (B137)	**Source for input signal (A) and operating point (B) for 3rd limit-value monitor without filtering** **FB 75** i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9188 Type: L2	P052 = 3 P051 = 40 Offline
U204 (2204) S00 (B137)	**Settable operating point for limit-value monitor** **FB 75** Applied to connector K9188	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U205 (2205) S00 (B137)	**Hysteresis for 3rd limit-value monitor without filtering** **FB 75**	0.00 to 100.00 [%] 0.01%	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U206 (2206) * S00 (B137)	**Source for input signal (A) and operating point (B) for 4th limit-value monitor without filtering** **FB 76** i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9189 Type: L2	P052 = 3 P051 = 40 Offline
U207 (2207) S00 (B137)	**Settable operating point for limit-value monitor** **FB 76** Applied to connector K9189	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U208 (2208) S00 (B137)	**Hysteresis for 4th limit-value monitor without filtering** **FB 76**	0.00 to 100.00 [%] 0.01%	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U210 (2210) * S00 (B138)	**Source for input signal (A) and operating point (B) for 5th limit-value monitor without filtering** **FB 77** i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9190 Type: L2	P052 = 3 P051 = 40 Offline
U211 (2211) S00 (B138)	**Settable operating point for limit-value monitor** **FB 77** Applied to connector K9190	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U212 (2212) S00 (B138)	**Hysteresis for 5th limit-value monitor without filtering** **FB 77**	0.00 to 100.00 [%] 0.01%	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U213 (2213) * S00 (B138)	**Source for input signal (A) and operating point (B) for 6th limit-value monitor without filtering** **FB 78** i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9191 Type: L2	P052 = 3 P051 = 40 Offline
U214 (2214) S00 (B138)	**Settable operating point for limit-value monitor** **FB 78** Applied to connector K9191	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U215 (2215) S00 (B138)	**Hysteresis for 6th limit-value monitor without filtering** **FB 78**	0.00 to 100.00 [%] 0.01%	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U216 (2216) * S00 (B138)	**Source for input signal (A) and operating point (B) for 7th limit-value monitor without filtering** **FB 79** i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9192 Type: L2	P052 = 3 P051 = 40 Offline
U217 (2217) S00 (B138)	**Settable operating point for limit-value monitor** **FB 79** Applied to connector K9192	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U218 (2218) S00 (B138)	**Hysteresis for 7th limit-value monitor without filtering** **FB 79**	0.00 to 100.00 [%] 0.01%	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

11.61 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.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U220 (2220) * S00 (B140)	**Source for maximum selection** 0 = Connector K0000 1 = Connector K0001 etc. i001: x1 Maximum selection 1 (FB 80, Output = K9193) i002: x2 Maximum selection 1 i003: x3 Maximum selection 1 SW 1.8 and later: i004: x1 Maximum selection 2 (FB 174, Output = K9460) i005: x2 Maximum selection 2 i006: x3 Maximum selection 2 i007: x1 Maximum selection 3 (FB 175, Output = K9461) i008: x2 Maximum selection 3 i009: x3 Maximum selection 3 i010: x1 Maximum selection 4 (FB 176, Output = K9462) i011: x2 Maximum selection 4 i012: x3 Maximum selection 4	All connector numbers 1	Ind: 12 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
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 (2221) * S00 (B140)	**Source for minimum selection** 0 = Connector K0000 1 = Connector K0001 etc. i001: x1 Minimum selection 1 (FB 81, Output = K9194) i002: x2 Minimum selection 1 i003: x3 Minimum selection 1 SW 1.8 and later: i004: x1 Minimum selection 2 (FB 177, Output = K9463) i005: x2 Minimum selection 2 i006: x3 Minimum selection 2 i007: x1 Minimum selection 3 (FB 178, Output = K9464) i008: x2 Minimum selection 3 i009: x3 Minimum selection 3 i010: x1 Minimum selection 4 (FB 179, Output = K9465) i011: x2 Minimum selection 4 i012: x3 Minimum selection 4	All connector numbers 1	Ind: 12 FS=0 Type: L2	P052 = 3 P051 = 40 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Tracking/storage element 1				
U222 (2222) * S00 (B145)	**Source for input quantity (x)** **FB 82** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U223 (2223) * S00 (B145)	**Source for control signals RESET, TRACK and STORE** **FB 82** i001: TRACK i002: STORE i003: RESET Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U224 (2224) * S00 (B145)	**Control word for Power On Mode** **FB 82** 0 Volatile storage: Zero appears at output when voltage recovers 1 Non-volatile storage: 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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
Tracking/storage element 2				
U225 (2225) * S00 (B145)	**Source for input quantity (x)** **FB 83** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U226 (2226) * S00 (B145)	**Source for control signals RESET, TRACK and STORE** **FB 83** i001: TRACK i002: STORE i003: RESET Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U227 (2227) * S00 (B145)	**Control word for Power On Mode** **FB 83** 0 Volatile storage: Zero appears at output when voltage recovers 1 Non-volatile storage: 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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U228 (2228) * S00 (B145)	**Source for input quantity (x)** **FB 84** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U229 (2229) * S00 (B145)	**Source for control signal SET** **FB 84** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Connector memory 2

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U230 (2230) * S00 (B145)	**Source for input quantity (x)** **FB 85** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U231 (2231) * S00 (B145)	**Source for control signal SET** **FB 85** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 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)

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U240 (2240) * S00 (B150)	**Source for input quantities** **FB 90** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U241 (2241) * S00 (B150)	**Source for control signal** **FB 90** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Connector changeover switch 2 (output = K9211)				
U242 (2242) * S00 (B150)	**Source for input quantities** **FB 91** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U243 (2243) * S00 (B150)	**Source for control signal** **FB 91** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
Connector changeover switch 3 (output = K9212)				
U244 (2244) * S00 (B150)	**Source for input quantities** **FB 92** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U245 (2245) * S00 (B150)	**Source for control signal** **FB 92** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
Connector changeover switch 4 (output = K9213)				
U246 (2246) * S00 (B150)	**Source for input quantities** **FB 93** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U247 (2247) * S00 (B150)	**Source for control signal** **FB 93** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
Connector changeover switch 5 (output = K9214)				
U248 (2248) * S00 (B150)	**Source for input quantities** **FB 94** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U249 (2249) * S00 (B150)	**Source for control signal** **FB 94** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
Connector changeover switches 6 and 11				
U250 (2250) * S00 (B150)	**Source for input quantities** **FB 95 and FB 196** Output 6 = Connector K9215 i001: 1st input signal i002: 2nd input signal Output 11 = Connector K9265 [SW2.0 and later] i003: 1st input signal i004: 2nd input signal Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U251 (2251) * S00 (B150)	**Source for control signal** **FB 95 and FB 196** i001: Switchover for output 6 i002: Switchover for output 11 [SW2.0 and later] Settings: 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Connector changeover switches 7 and 12				
U252 (2252) * S00 (B150)	**Source for input quantities** **FB 96 and FB 197** Output 7 = Connector K9216 i001: 1st input signal i002: 2nd input signal Output 12 = Connector K9266 [SW2.0 and later] i003: 1st input signal i004: 2nd input signal Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U253 (2253) * S00 (B150)	**Source for control signal** **FB 96 and FB 197** i001: Switchover for output 7 i002: Switchover for output 12 [SW2.0 and later] Settings: 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Connector changeover switches 8 and 13				
U254 (2254) * S00 (B150)	**Source for input quantities** **FB 97 and FB 198** Output 8 = Connector K9217 i001: 1st input signal i002: 2nd input signal Output 13 = Connector K9267 [SW2.0 and later] i003: 1st input signal i004: 2nd input signal Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U255 (2255) * S00 (B150)	**Source for control signal** **FB 97 and FB 198** i001: Switchover for output 8 i002: Switchover for output 13 [SW2.0 and later] Settings: 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Connector changeover switches 9 and 14				
U256 (2256) * S00 (B150)	**Source for input quantities** **FB 98 and FB 199** Output 9 = Connector K9218 i001: 1st input signal i002: 2nd input signal Output 14 = Connector K9268 [SW2.0 and later] i003: 1st input signal i004: 2nd input signal Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U257 (2257) * S00 (B150)	**Source for control signal** **FB 98 and FB 199** i001: Switchover for output 9 i002: Switchover for output 14 [SW2.0 and later] Settings: 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Connector changeover switches 10 and 15				
U258 (2258) * S00 (B150)	**Source for input quantities** **FB 99 and FB 229** Output 10 = Connector K9219 i001: 1st input signal i002: 2nd input signal Output 15 = Connector K9269 [SW2.0 and later] i003: 1st input signal i004: 2nd input signal Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U259 (2259) * S00 (B150)	**Source for control signal** **FB 99 and FB 229** i001: Switchover for output 10 i002: Switchover for output 15 [SW2.0 and later] Settings: 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

11.62 Integrators, DT1 elements, characteristics, dead zones, setpoint branching

Only active with optional technology software S00

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Integrator 1 (output = K9220)				
U260 (2260) * S00 (B155)	**Source for input quantity** **FB 100** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U261 (2261) S00 (B155)	**Integral-action time** **FB 100**	10 to 65000 [ms] 1	Ind: None FS=10 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U262 (2262) * S00 (B155)	**Source for control signals** **FB 100** i001 Source for "Stop integrator" signal (integrator is stopped when binector reaches log. "1" state) i002 Source for "Set integrator" signal (when binector reaches log. "1" state, the integrator is set to the value entered in parameter U263) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U263 (2263) * S00 (B155)	**Source for setting value** **FB 100** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
Integrator 2 (output = K9221)				
U264 (2264) * S00 (B155)	**Source for input quantity** **FB 101** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U265 (2265) S00 (B155)	**Integral-action time** **FB 101**	10 to 65000 [ms] 1	Ind: None FS=10 Type: O2	P052 = 3 P051 = 40 Online
U266 (2266) * S00 (B155)	**Source for control signals** **FB 101** i001 Source for "Stop integrator" signal (integrator is stopped when binector reaches log. "1" state) i002 Source for "Set integrator" signal (when binector reaches log. "1" state, the integrator is set to the value entered in parameter U267) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U267 (2267) * S00 (B155)	**Source for setting value** **FB 101** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
Integrator 3 (output = K9222)				
U268 (2268) * S00 (B155)	**Source for input quantity** **FB 102** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U269 (2269) S00 (B155)	**Integral-action time** **FB 102**	10 to 65000 [ms] 1	Ind: None FS=10 Type: O2	P052 = 3 P051 = 40 Online
U270 (2270) * S00 (B155)	**Source for control signals** **FB 102** i001 Source for "Stop integrator" signal (integrator is stopped when binector reaches log. "1" state) i002 Source for "Set integrator" signal (when binector reaches log. "1" state, the integrator is set to the value entered in parameter U271) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U271 (2271) * S00 (B155)	**Source for setting value** **FB 102** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

DT1 element 1 (output = K9223, inverted: K9224)				
U272 (2272) * S00 (B155)	**Source for input quantity** **FB 103** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U273 (2273) S00 (B155)	**Derivative-action time** **FB 103**	0 to 1000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
U274 (2274) S00 (B155)	**Filter time** **FB 103**	0 to 1000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online

DT1 element 2 (output = K9225, inverted: K9226)				
U275 (2275) * S00 (B155)	**Source for input quantity** **FB 104** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U276 (2276) S00 (B155)	**Derivative-action time** **FB 104**	0 to 1000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
U277 (2277) S00 (B155)	**Filter time** **FB 104**	0 to 1000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online

DT1 element 3 (output = K9227, inverted: K9228)				
U278 (2278) * S00 (B155)	**Source for input quantity** **FB 105** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U279 (2279) S00 (B155)	**Derivative-action time** **FB 105**	0 to 1000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
U280 (2280) S00 (B155)	**Filter time** **FB 105**	0 to 1000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online

<table>
<tr><th>PNU</th><th>Description</th><th>Value range
[Unit]
Steps</th><th>No. indices
Factory setting
Type</th><th>See
Change
(Access /
Status)</th></tr>
<tr><td colspan="5">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

SW1.8 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.</td></tr>
<tr><td colspan="5">Characteristic block 1 (output = K9229) FB 106
Characteristic block 4 (output = K9410) [SW1.8 and later] FB 280
Characteristic block 5 (output = K9411) [SW1.8 and later] FB 281</td></tr>
<tr><td>U281
(2281)
*
S00

(B160)</td><td>Source for input quantity

0 = Connector K0000
1 = Connector K0001
etc.

Up to SW 1.7:
Selected connector = input quantity for FB106

SW 1.8 and later:
i001 Input quantity for FB106
i002 Input quantity for FB280
i003 Input quantity for FB281</td><td>All connector numbers
1</td><td>Ind: 3
FS=0
Type: L2</td><td>P052 = 3
P051 = 40
off-line</td></tr>
<tr><td>U282
(2282)

S00

(B160)</td><td>x values

i001 1st characteristic point for FB106
i002 2nd characteristic point for FB106
...
i010 10th characteristic point for FB106

SW 1.8 and later:
i011 1st characteristic point for FB280
i012 2nd characteristic point for FB280
...
i020 10th characteristic point for FB280

i021 1st characteristic point for FB281
i022 2nd characteristic point for FB281
...
i030 10th characteristic point for FB281</td><td>-200.00 to 199.99
[%]
0.01</td><td>Ind:30
FS=0.00
Type: I2</td><td>P052 = 3
P051 = 40
on-line</td></tr>
<tr><td>U283
(2283)

S00

(B160)</td><td>y values

i001 1st characteristic point for FB106
i002 2nd characteristic point for FB106
...
i010 10th characteristic point for FB106

SW 1.8 and later:
i011 1st characteristic point for FB280
i012 2nd characteristic point for FB280
...
i020 10th characteristic point for FB280

i021 1st characteristic point for FB281
i022 2nd characteristic point for FB281
...
i030 10th characteristic point for FB281</td><td>-200.00 to 199.99
[%]
0.01</td><td>Ind: 30
FS=0.00
Type: I2</td><td>P052 = 3
P051 = 40
on-line</td></tr>
</table>

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Characteristic block 2 (output = K9230) **Characteristic block 6** (output = K9412) [SW1.8 and later] **Characteristic block 7** (output = K9413) [SW1.8 and later]				**FB 107** **FB 282** **FB 283**
U284 (2284) * S00 (B160)	**Source for input quantity** 0 = Connector K0000 1 = Connector K0001 etc. up to SW 1.7: Selected connector = input quantity for FB107 SW 1.8 and later: i001 input quantity for FB107 i002 input quantity for FB282 i003 input quantity for FB283	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U285 (2285) S00 (B160)	**x values** i001 1st characteristic point for FB107 i002 2nd characteristic point for FB107 ... i010 10th characteristic point for FB107 SW 1.8 and later: i011 1st characteristic point for FB282 i012 2nd characteristic point for FB282 ... i020 10th characteristic point for FB282 i021 1st characteristic point for FB283 i022 2nd characteristic point for FB283 ... i030 10th characteristic point for FB283	-200.00 to 199.99 [%] 0.01	Ind: 30 FS=0.00 Type: I2	P052 = 3 P051 = 40 on-line
U286 (2286) S00 (B160)	**y values** i001 1st characteristic point for FB107 i002 2nd characteristic point for FB107 ... i010 10th characteristic point for FB107 SW 1.8 and later: i011 1st characteristic point for FB282 i012 2nd characteristic point for FB282 ... i020 10th characteristic point for FB282 i021 1st characteristic point for FB283 i022 2nd characteristic point for FB283 ... i030 10th characteristic point for FB283	-200.00 to 199.99 [%] 0.01	Ind: 30 FS=0.00 Type: I2	P052 = 3 P051 = 40 on-line

Characteristic block 3 (Output = K9231) **Characteristic block 8** (Output = K9414) [SW1.8 and later] **Characteristic block 9** (Output = K9415) [SW1.8 and later]				**FB 108** **FB 284** **FB 285**
U287 (2287) * S00 (B160)	**Source for input quantity** 0 = Connector K0000 1 = Connector K0001 etc. up to SW 1.7: Selected connector = input quantity for FB108 SW 1.8 and later: i001 Input quantity for FB108 i002 Input quantity for FB284 i003 Input quantity for FB285	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U288 (2288) S00 (B160)	**x values** i001 1st characteristic point for FB108 i002 2nd characteristic point for FB108 ... i010 10th characteristic point for FB108 SW 1.8 and later: i011 1st characteristic point for FB284 i012 2nd characteristic point for FB284 ... i020 10th characteristic point for FB284 i021 1st characteristic point for FB285 i022 2nd characteristic point for FB285 ... i030 10th characteristic point for FB285	-200.00 to 199.99 [%] 0.01	Ind: 30 FS=0.00 Type: I2	P052 = 3 P051 = 40 on-line
U289 (2289) S00 (B160)	**y values** i001 1st characteristic point for FB108 i002 2nd characteristic point for FB108 ... i010 10th characteristic point for FB108 SW 1.8 and later: i011 1st characteristic point for FB284 i012 2nd characteristic point for FB284 ... i020 10th characteristic point for FB284 i021 1st characteristic point for FB285 i022 2nd characteristic point for FB285 ... i030 10th characteristic point for FB285	-200.00 to 199.99 [%] 0.01	Ind: 30 FS=0.00 Type: I2	P052 = 3 P051 = 40 on-line

Dead zones

The component of the input quantity (x) whose absolute value exceeds the threshold for the dead zone is applied to the output (y).

Dead zone 1 (output = K9232)

U290 (2290) * S00 (B161)	**Source for input quantity** **FB 109** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U291 (2291) S00 (B161)	**Dead zone** **FB 109**	0.00 to 100.00 [%] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

Dead zone 2 (output = K9233)

U292 (2292) * S00 (B161)	**Source for input quantity** **FB 110** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U293 (2293) S00 (B161)	**Dead zone** **FB 110**	0.00 to 100.00 [%] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

Dead zone 3 (output = K9234)

U294 (2294) * S00 (B161)	**Source for input quantity** **FB 111** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U295 (2295) S00 (B161)	**Dead zone** **FB 111**	0.00 to 100.00 [%] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Setpoint branching (output = K9234) The input quantity is weighted with 2 parameters: Parameter U297 determines the output value with an input = 0% Parameter U298 determines the output value with an input = +100% -U297 and -U298 apply in the case of negative input values. The hysteresis set in parameter U299 is applied for transitions from negative to positive input values and vice versa				
U296 (2296) * S00 (B161)	**Source for input quantity** **FB 112** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U297 (2297) S00 (B161)	**Minimum speed** **FB 112**	0.00 to 200.00 [%] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
U298 (2298) S00 (B161)	**Maximum speed** **FB 112**	0.00 to 200.00 [%] 0.01	Ind: None FS=100.00 Type: O2	P052 = 3 P051 = 40 Online
U299 (2299) S00 (B161)	**Hysteresis** **FB 112**	0.00 to 100.00 [%] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

11.63 Simple ramp-function generator

Only active with optional technology software S00

Please note: The output (y) = 0 is set in response to "Set simple ramp-function generator to zero" and POWER ON The output (y) is frozen at the current value in response to "Stop simple ramp-function generator" The ramp-up and ramp-down times are set to zero in response to "Bypass simple ramp-function generator" Ramp-up integrator: 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.				
U300 (2300) * S00 (B165)	**Source for input quantity** **FB 113** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U301 (2301) * S00 (B165)	**Source for control signals** **FB 113** i001 Source for "Bypass simple ramp-function generator" signal i002 Source for "Stop simple ramp-function generator" signal i003 Source for "Reset / enable simple ramp-function generator" signal (0 = reset to zero, 1 = enable) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 3 FS= i001: 0 i002: 0 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline
U302 (2302) S00 (B165)	**Ramp-up time** **FB 113**	0.00 to 300.00 [s] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
U303 (2303) S00 (B165)	**Ramp-down time** **FB 113**	0.00 to 300.00 [s] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.64 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U310 (2310) * S00 (B195)	**Source for control bits for the multiplexer** [SW 1.8 and later] 0 = Binector B0000 1 = Binector B0001 etc. i001: Control bit B1 for 1st multiplexer i002: Control bit B2 i003: Control bit B3 i004: Control bit B1 for 2nd multiplexer i005: Control bit B2 i006: Control bit B3 i007: Control bit B1 for 3rd multiplexer i008: Control bit B2 i009: Control bit B3	All binector numbers 1	Ind: 9 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U311 (2311) * S00 (B195)	**Source for input quantities for 1st multiplexer** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc. i001 Input quantity X0 i002 Input quantity X1 i003 Input quantity X2 i004 Input quantity X3 i005 Input quantity X4 i006 Input quantity X5 i007 Input quantity X6 i008 Input quantity X7	All connector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U312 (2312) * S00 (B195)	**Source for input quantities for 2nd multiplexer** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc. i001 Input quantity X0 i002 Input quantity X1 i003 Input quantity X2 i004 Input quantity X3 i005 Input quantity X4 i006 Input quantity X5 i007 Input quantity X6 i008 Input quantity X7	All connector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U313 (2313) * S00 (B195)	**Source for input quantities for 3rd multiplexer** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc. i001 Input quantity X0 i002 Input quantity X1 i003 Input quantity X2 i004 Input quantity X3 i005 Input quantity X4 i006 Input quantity X5 i007 Input quantity X6 i008 Input quantity X7	All connector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

11.65 Counters

Only active with optional technology software S00

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Software counter				**FB 89**
n314 (2314) S00 (B196)	**Display of output of software counter** **FB 89** [SW 1.9 and later]	0 to 65535	Ind: None Type: O2	P052 = 3
U315 (2315) * S00 (B196)	**Fixed values for setting/limiting inputs of software counter** **FB 89** [SW 1.9 and later] i001: Minimum value i002: Maximum value i003: Setting value i004: Start value	0 to 65535 1	Ind: 4 FS= i001: 0 i002: 65535 i003: 0 i004: 0 Type: O2	P052 = 3 P051 = 40 off-line
U316 (2316) * S00 (B196)	**Source for setting/limiting inputs of software counter** **FB 89** [SW 1.9 and later] i001: Minimum value i002: Maximum value i003: Setting value i004: Start value Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS= i001: 9441 i002: 9442 i003: 9443 i004: 9444 Type: L2	P052 = 3 P051 = 40 off-line
U317 (2317) * S00 (B196)	**Source for control signals of software counter** **FB 89** [SW 1.9 and later] i001: Positive edge: Count up i002: Positive edge: Count down i003: Stop counter i004: Set counter i005: Enable counter Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 5 FS= i001: 0 i002: 0 i003: 0 i004: 0 i005: 1 Type: L2	P052 = 3 P051 = 40 off-line

11.66 Logic functions

Only active with optional technology software S00

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Decoders/demultiplexers, binary to 1 of 8				
U318 (2318) * S00 (B200)	**Source for input signals for decoder/demultiplexer 1** **FB 118** i001 Source for input signal, bit 0 i002 Source for input signal, bit 1 i003 Source for input signal, bit 2 Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U319 (2319) * S00 (B200)	**Source for input signals for decoder/demultiplexer 2** **FB 119** i001 Source for input signal, bit 0 i002 Source for input signal, bit 1 i003 Source for input signal, bit 2 Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 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.				
U320 (2320) * S00 (B205)	**Source for input signals, AND element 1** (output = B9350) **FB 120** i001 Source for input 1 i002 Source for input 2 i003 Source for input 3 Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U321 (2321) * S00 (B205)	**Source for input signals, AND element 2** (output = B9351) **FB 121** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U322 (2322) * S00 (B205)	**Source for input signals, AND element 3** (output = B9352) **FB 122** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U323 (2323) * S00 (B205)	**Source for input signals, AND element 4** (output = B9353) **FB 123** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U324 (2324) * S00 (B205)	**Source for input signals, AND element 5** (output = B9354) **FB 124** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U325 (2325) * S00 (B205)	**Source for input signals, AND element 6** (output = B9355) **FB 125** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U326 (2326) * S00 (B205)	**Source for input signals, AND element 7** (output = B9356) **FB 126** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U327 (2327) * S00 (B205)	**Source for input signals, AND element 8** (output = B9357) **FB 127** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U328 (2328) * S00 (B205)	**Source for input signals, AND element 9** (output = B9358) **FB 128** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U329 (2329) * S00 (B205)	**Source for input signals, AND element 10** (output = B9359) **FB 129** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U330 (2330) * S00 (B205)	**Source for input signals, AND element 11** (output = B9360) **FB 130** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U331 (2331) * S00 (B205)	**Source for input signals, AND element 12** (output = B9361) **FB 131** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U332 (2332) * S00 (B205)	**Source for input signals, AND element 13** (output = B9362) **FB 132** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U333 (2333) * S00 (B205)	**Source for input signals, AND element 14** (output = B9363) **FB 133** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U334 (2334) * S00 (B205)	**Source for input signals, AND element 15** (output = B9364) **FB 134** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U335 (2335) * S00 (B205)	**Source for input signals, AND element 16** (output = B9365) **FB 135** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U336 (2336) * S00 (B205)	**Source for input signals, AND element 17** (output = B9366) **FB 136** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U337 (2337) * S00 (B205)	**Source for input signals, AND element 18** (output = B9367) **FB 137** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U338 (2338) * S00 (B205)	**Source for input signals, AND element 19** (output = B9368) **FB 138** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U339 (2339) * S00 (B205)	**Source for input signals, AND element 20** (output = B9369) **FB 139** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U340 (2340) * S00 (B205)	**Source for input signals, AND element 21** (output = B9370) **FB 140** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U341 (2341) * S00 (B205)	**Source for input signals, AND element 22** (output = B9371) **FB 141** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U342 (2342) * S00 (B205)	**Source for input signals, AND element 23** (output = B9372) **FB 142** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U343 (2343) * S00 (B205)	**Source for input signals, AND element 24** (output = B9373) **FB 143** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U344 (2344) * S00 (B205)	**Source for input signals, AND element 25** (output = B9374) **FB 144** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U345 (2345) * S00 (B205)	**Source for input signals, AND element 26** (output = B9375) **FB 145** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U346 (2346) * S00 (B205)	**Source for input signals, AND element 27** (output = B9376) **FB 146** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U347 (2347) * S00 (B205)	**Source for input signals, AND element 28** (output = B9377) **FB 147** As for U320	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 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.				
U350 (2350) * S00 (B206)	**Source for input signals, OR element 1** (output = B9380) **FB 150** i001 Source for input 1 i002 Source for input 2 i003 Source for input 3 Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U351 (2351) * S00 (B206)	**Source for input signals, OR element 2** (output = B9381) **FB 151** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U352 (2352) * S00 (B206)	**Source for input signals, OR element 3** (output = B9382) **FB 152** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U353 (2353) * S00 (B206)	**Source for input signals, OR element 4** (output = B9383) **FB 153** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U354 (2354) * S00 (B206)	**Source for input signals, OR element 5** (output = B9384) **FB 154** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U355 (2355) * S00 (B206)	**Source for input signals, OR element 6** (output = B9385) **FB 155** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U356 (2356) * S00 (B206)	**Source for input signals, OR element 7** (output = B9386) **FB 156** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U357 (2357) * S00 (B206)	**Source for input signals, OR element 8** (output = B9387) **FB 157** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U358 (2358) * S00 (B206)	**Source for input signals, OR element 9** (output = B9388) **FB 158** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U359 (2359) * S00 (B206)	**Source for input signals, OR element 10** (output = B9389) **FB 159** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U360 (2360) * S00 (B206)	**Source for input signals, OR element 11** (output = B9390) **FB 160** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U361 (2361) * S00 (B206)	**Source for input signals, OR element 12** (output = B9391) **FB 161** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U362 (2362) * S00 (B206)	**Source for input signals, OR element 13** (output = B9392) **FB 162** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U363 (2363) * S00 (B206)	**Source for input signals, OR element 14** (output = B9393) **FB 163** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U364 (2364) * S00 (B206)	**Source for input signals, OR element 15** (output = B9394) **FB 164** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U365 (2365) * S00 (B206)	**Source for input signals, OR element 16** (output = B9395) **FB 165** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U366 (2366) * S00 (B206)	**Source for input signals, OR element 17** (output = B9396) **FB 166** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U367 (2367) * S00 (B206)	**Source for input signals, OR element 18** (output = B9397) **FB 167** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U368 (2368) * S00 (B206)	**Source for input signals, OR element 19** (output = B9398) **FB 168** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U369 (2369) * S00 (B206)	**Source for input signals, OR element 20** (output = B9399) **FB 169** As for U350	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 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.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U370 (2370) * S00 (B206)	**Source for input signals, XOR element 1** (output = B9195) **FB 170** i001 Source for input 1 i002 Source for input 2 Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U371 (2371) * S00 (B206)	**Source for input signals, XOR element 2** (output = B9196) **FB 171** As for U370	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U372 (2372) * S00 (B206)	**Source for input signals, XOR element 3** (output = B9197) **FB 172** As for U370	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U373 (2373) * S00 (B206)	**Source for input signals, XOR element 4** (output = B9198) **FB 173** As for U370	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Inverters

The input signal is inverted and the result applied to the specified binector.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U380 (2380) * S00 (B207)	**Source for input signal, inverter 1** (output = B9450) **FB 180** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U381 (2381) * S00 (B207)	**Source for input signal, inverter 2** (output = B9451) **FB 181** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U382 (2382) * S00 (B207)	**Source for input signal, inverter 3** (output = B9452) **FB 182** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U383 (2383) * S00 (B207)	**Source for input signal, inverter 4** (output = B9453) **FB 183** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U384 (2384) * S00 (B207)	**Source for input signal, inverter 5** (output = B9454) **FB 184** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U385 (2385) * S00 (B207)	**Source for input signal, inverter 6** (output = B9455) **FB 185** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U386 (2386) * S00 (B207)	**Source for input signal, inverter 7** (output = B9456) **FB 186** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U387 (2387) * S00 (B207)	**Source for input signal, inverter 8** (output = B9457) **FB 187** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U388 (2388) * S00 (B207)	**Source for input signal, inverter 9** (output = B9458) **FB 188** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U389 (2389) * S00 (B207)	**Source for input signal, inverter 10** (output = B9459) **FB 189** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U390 (2390) * S00 (B207)	**Source for input signal, inverter 11** (output = B9460) **FB 190** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U391 (2391) * S00 (B207)	**Source for input signal, inverter 12** (output = B9461) **FB 191** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U392 (2392) * S00 (B207)	**Source for input signal, inverter 13** (output = B9462) **FB 192** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U393 (2393) * S00 (B207)	**Source for input signal, inverter 14** (output = B9463) **FB 193** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U394 (2394) * S00 (B207)	**Source for input signal, inverter 15** (output = B9464) **FB 194** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U395 (2395) * S00 (B207)	**Source for input signal, inverter 16** (output = B9465) **FB 195** As for U380	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 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.

U400 (2400) * S00 (B207)	**Source for input signals, NAND element 1** (output = B9470) **FB 200** i001 Source for input 1 i002 Source for input 2 i003 Source for input 3 Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U401 (2401) * S00 (B207)	**Source for input signals, NAND element 2** (output = B9471) **FB 201** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U402 (2402) * S00 (B207)	**Source for input signals, NAND element 3** (output = B9472) **FB 202** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U403 (2403) * S00 (B207)	**Source for input signals, NAND element 4** (output = B9473) **FB 203** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U404 (2404) * S00 (B207)	**Source for input signals, NAND element 5** (output = B9474) **FB 204** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U405 (2405) * S00 (B207)	**Source for input signals, NAND element 6** (output = B9475) **FB 205** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U406 (2406) * S00 (B207)	**Source for input signals, NAND element 7** (output = B9476) **FB 206** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U407 (2407) * S00 (B207)	**Source for input signals, NAND element 8** (output = B9477) **FB 207** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U408 (2408) * S00 (B207)	**Source for input signals, NAND element 9** (output = B9478) **FB 208** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U409 (2409) * S00 (B207)	**Source for input signals, NAND element 10** (output = B9479) **FB 209** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U410 (2410) * S00 (B207)	**Source for input signals, NAND element 11** (output = B9480) **FB 210** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U411 (2411) * S00 (B207)	**Source for input signals, NAND element 12** (output = B9481) **FB 211** As for U400	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

11.67 Storage elements, timers and binary signal selector switches

Only active with optional technology software S00

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
RS flipflops RS flipflops with SET (Q=1) and RESET (Q=0) (priority: 1st RESET, 2nd SET). RESET setting is enabled on POWER ON.				
U415 (2415) * S00 (B210)	**Source for SET and RESET for RS flipflop 1** **FB 215** (Outputs: Q = B9550, /Q = B9551) i001 Source for SET i002 Source for RESET Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U416 (2416) * S00 (B210)	**Source for SET and RESET for RS flipflop 2** **FB 216** (outputs: Q = B9552, /Q = B9553) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U417 (2417) * S00 (B210)	**Source for SET and RESET for RS flipflop 3** **FB 217** (outputs: Q = B9554, /Q = B9555) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U418 (2418) * S00 (B210)	**Source for SET and RESET for RS flipflop 4** **FB 218** (outputs: Q = B9556, /Q = B9557) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U419 (2419) * S00 (B210)	**Source for SET and RESET for RS flipflop 5** **FB 219** (outputs: Q = B9558, /Q = B9559) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U420 (2420) * S00 (B210)	**Source for SET and RESET for RS flipflop 6** **FB 220** (outputs: Q = B9560, /Q = B9561) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U421 (2421) * S00 (B210)	**Source for SET and RESET for RS flipflop 7** **FB 221** (outputs: Q = B9562, /Q = B9563) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U422 (2422) * S00 (B210)	**Source for SET and RESET for RS flipflop 8** **FB 222** (outputs: Q = B9564, /Q = B9565) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U423 (2423) * S00 (B210)	**Source for SET and RESET for RS flipflop 9** **FB 223** (outputs: Q = B9566, /Q = B9567) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U424 (2424) * S00 (B210)	**Source for SET and RESET for RS flipflop 10** **FB 224** (outputs: Q = B9568, /Q = B9569) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U425 (2425) * S00 (B210)	**Source for SET and RESET for RS flipflop 11** **FB 225** (outputs: Q = B9570, /Q = B9571) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U426 (2426) * S00 (B210)	**Source for SET and RESET for RS flipflop 12** **FB 226** (outputs: Q = B9572, /Q = B9573) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U427 (2427) * S00 (B210)	**Source for SET and RESET for RS flipflop 13** **FB 227** (outputs: Q = B9574, /Q = B9575) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U428 (2428) * S00 (B210)	**Source for SET and RESET for RS flipflop 14** **FB 228** (outputs: Q = B9576, /Q = B9577) As for U415	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

D flipflops

D flipflops with RESET (Q=0), SET (Q=1) and STORE (Q=D on transition from 0 to 1) (priority: 1st RESET, 2nd SET, 3rd STORE). RESET setting is enabled on POWER ON.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U430 (2430) * S00 (B211)	**Source for SET, D, STORE and RESET for D flipflop 1** **FB 230** (outputs: Q = B9490, /Q = B9491) i001 Source for SET i002 Source for D i003 Source for STORE i004 Source for RESET Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U431 (2431) * S00 (B211)	**Source for SET, D, STORE and RESET for D flipflop 2** **FB 231** (outputs: Q = B9492, /Q = B9493) As for U430	All binector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U432 (2432) * S00 (B211)	**Source for SET, D, STORE and RESET for D flipflop 3** **FB 232** (outputs: Q = B9494, /Q = B9495) As for U430	All binector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U433 (2433) * S00 (B211)	**Source for SET, D, STORE and RESET for D flipflop 4** **FB 233** (outputs: Q = B9496, /Q = B9497) As for U430	All binector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Timer 1 (0.000 to 60.000s) (output = B9580, inverted: B9581)				
U440 (2440) * S00 (B215)	**Source for input signal and reset signal for timer element 1** **FB 240** i001 Source for input signal i002 Source for reset signal for the pulse generator (if U442=3) (in state "1", the pulse generator is set to "0") Settings: 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U441 (2441) S00 (B215)	**Time for timer 1** **FB 240**	0.000 to 60.000 [s] 0.001	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
U442 (2442) * S00 (B215)	**Mode for timer 1** **FB 240** 0 ON delay 1 OFF delay 2 ON / OFF delay 3 Pulse generator with positive edge triggering	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Timer 2 (0.000 to 60.000s) (output = B9582, inverted: B9583)				
U443 (2443) * S00 (B215)	**Source for input signal and reset signal for timer element 2** **FB 241** As for U440	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U444 (2444) S00 (B215)	**Time for timer 2** **FB 241**	0.000 to 60.000 [s] 0.001	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
U445 (2445) * S00 (B215)	**Mode for timer 2** **FB 241** As for U442	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Timer 3 (0.000 to 60.000s) (output = B9584, inverted: B9585)				
U443 (2443) * S00 (B215)	**Source for input signal and reset signal for timer element 3** **FB 242** As for U440	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U444 (2444) S00 (B215)	**Time for timer 3** **FB 242**	0.000 to 60.000 [s] 0.001	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
U445 (2445) * S00 (B215)	**Mode for timer 3** **FB 242** As for U442	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Timer 4 (0.000 to 60.000s) (output = B9586, inverted: B9587)				
U449 (2449) * S00 (B215)	**Source for input signal and reset signal for timer element 4** **FB 243** As for U440	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U450 (2450) S00 (B215)	**Time for timer 4** **FB 243**	0.000 to 60.000 [s] 0.001	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U451 (2451) * S00 (B215)	**Mode for timer 4** **FB 243** As for U442	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Timer 5 (0.000 to 60.000s) (output = B9588, inverted: B9589)				
U452 (2452) * S00 (B215)	**Source for input signal and reset signal for timer element 5** **FB 244** As for U440	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U453 (2453) S00 (B215)	**Time for timer 5** **FB 244**	0.000 to 60.000 [s] 0.001	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
U454 (2454) * S00 (B215)	**Mode for timer 5** **FB 244** As for U442	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Timer 6 (0.000 to 60.000s) (output = B9590, inverted: B9591)				
U455 (2455) * S00 (B215)	**Source for input signal and reset signal for timer element 6** **FB 245** As for U440	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U456 (2456) S00 (B215)	**Time for timer 6** **FB 245**	0.000 to 60.000 [s] 0.001	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
U457 (2457) * S00 (B215)	**Mode for timer 6** **FB 245** As for U442	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Timer 7 (0.00 to 600.00s) (output = B9592, inverted: B9593)				
U458 (2458) * S00 (B216)	**Source for input signal and reset signal for timer element 7** **FB 246** As for U440	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U459 (2459) S00 (B216)	**Time for timer 7** **FB 246**	0.00 to 600.00 [s] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline
U460 (2460) * S00 (B216)	**Mode for timer 7** **FB 246** As for U442	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Timer 8 (0.00 to 600.00s) (output = B9594, inverted: B9595)				
U461 (2461) * S00 (B216)	**Source for input signal and reset signal for timer element 8** **FB 247** As for U440	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U462 (2462) S00 (B216)	**Time for timer 8** **FB 247**	0.00 to 600.00 [s] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U463 (2463) * S00 (B216)	**Mode for timer 8** **FB 247** As for U442	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Timer 9 (0.00 to 600.00s) (output = B9596, inverted: B9597)				
U464 (2464) * S00 (B216)	**Source for input signal and reset signal for timer element 9** **FB 248** As for U440	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U465 (2465) S00 (B216)	**Time for timer 9** **FB 248**	0.00 to 600.00 [s] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline
U466 (2466) * S00 (B216)	**Mode for timer 9** **FB 248** As for U442	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Timer 10 (0.00 to 600.00s) (output = B9598, inverted: B9599)				
U467 (2467) * S00 (B216)	**Source for input signal and reset signal for timer element 10** **FB 249** As for U440	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U468 (2468) S00 (B216)	**Time for timer 10** **FB 249**	0.00 to 600.00 [s] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline
U469 (2469) * S00 (B216)	**Mode for timer 10** **FB 249** As for U442	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Binary signal selector switches The control signal (binector) is selected via index i001 of the parameter. Control signal = 0: Binector as set in index i002 is applied to the output Control signal = 1: Binector as set in index i003 is applied to the output				
U470 (2470) * S00 (B216)	**Source for input signals for binary signal selector switch 1** **FB 250** (output = B9482) i001 Source for control signal i002 Source for output signal when control signal = 0 i003 Source for output signal when control signal = 1 Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U471 (2471) * S00 (B216)	**Source for input signals for binary signal selector switch 2** **FB 251** (output = B9483) As for U470	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U472 (2472) * S00 (B216)	**Source for input signals for binary signal selector switch 3** **FB 252** (output = B9484) As for U470	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U473 (2473) * S00 (B216)	**Source for input signals for binary signal selector switch 4** **FB 253** (output = B9485) As for U470	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U474 (2474) * S00 (B216)	**Source for input signals for binary signal selector switch 5 FB 254** (output = B9486) As for U470	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

11.68 Technology controller

Only active with optional technology software S00

Technology controller: Actual value				
U480 (2480) * S00 (B170)	**Source for actual value FB 114** Selection of connectors to be added as the actual value 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U481 (2481) S00 FDS (B170)	**Filter time for actual value FB 114**	0.00 to 600.00 [s] 0.01	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
U482 (2482) S00 FDS (B170)	**Derivative-action time for actual value (D component) FB 114** 0.000 = D component deactivated See also U483	0.000 to 30.000 [s] 0.001	Ind: 4 FS=0.000 Type: O2	P052 = 3 P051 = 40 Online
U483 (2483) * S00 FDS (B170)	**Factor for derivative-action time FB 114** 0 Derivative-action time = U482 * 1 1 Derivative-action time = U482 * 1000	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Technology controller: Setpoint				
U484 (2484) * S00 (B170)	**Source for setpoint FB 114** Selection of connectors to be added as the setpoint 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U485 (2485) S00 FDS (B170)	**Injectable additional setpoint FB 114** This parameter setting is added to the setpoint when the binector selected in U486 changes to the log. "1" state	-200.00 to 199.99 [%] 0.01	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
U486 (2486) * S00 (B170)	**Source for control bit for injection of additional setpoint FB 114** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U487 (2487) S00 FDS (B170)	**Filter time for setpoint FB 114**	0.00 to 600.00 [s] 0.01	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

Technology controller: Controller parameters				
U488 (2488) S00 FDS (B170)	**P gain FB 114**	0.10 to 200.00 0.01	Ind: 4 FS=3.00 Type: O2	P052 = 3 P051 = 40 Online
U489 (2489) * S00 (B170)	**Source for input quantity (x) for Kp adaptation FB 114** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U490 (2490) S00 FDS (B170)	**Characteristic for Kp adaptation: Threshold 1 (x1)** **FB 114**	0.00 to 200.00 [%] 0.01	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
U491 (2491) S00 FDS (B170)	**Characteristic for Kp adaptation: Threshold 2 (x2)** **FB 114**	0.00 to 200.00 [%] 0.01	Ind: 4 FS=100.00 Type: O2	P052 = 3 P051 = 40 Online
U492 (2492) S00 FDS (B170)	**Characteristic for Kp adaptation: Minimum value (y1)** **FB 114** Minimum value of Kp factor (y) when x ≤ x1	0.10 to 30.00 0.01	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 Online
U493 (2493) S00 FDS (B170)	**Characteristic for Kp adaptation: Maximum value (y2)** **FB 114** Maximum value of Kp factor (y) when x ≥ x2	0.10 to 30.00 0.01	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 Online
U494 (2494) S00 FDS (B170)	**Reset time** **FB 114** See also U495	0.000 to 60.000 [s] 0.001	Ind: 4 FS=3.000 Type: O2	P052 = 3 P051 = 40 Online
U495 (2495) * S00 FDS (B170)	**Factor for reset time** **FB 114** 0 Reset time = U494 * 1 1 Reset time = U494 * 1000	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 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).

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U496 (2496) * S00 (B170)	**Source for control bit for speed droop injection** **FB 114** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U497 (2497) S00 FDS (B170)	**Speed droop** **FB 114** Example: 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 [%] 0.1	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
U498 (2498) S00 FDS (B170)	**Positive limit for speed droop** **FB 114**	0.00 to 199.99 [%] 0.01	Ind: 4 FS=100.00 Type: O2	P052 = 3 P051 = 40 Online
U499 (2499) S00 FDS (B170)	**Negative limit for speed droop** **FB 114**	-200.00 to 0.00 [%] 0.01	Ind: 4 FS=-100.00 Type: I2	P052 = 3 P051 = 40 Online

Technology controller: Control bits

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U500 (2500) * S00 (B170)	**Source for technology controller enabling command** **FB 114** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U502 (2502) * S00 FDS (B170)	**PI/PID controller switchover** **FB 114** 0 PI controller (D component is applied only in actual-value channel) 1 PID controller (D component is applied for control deviation)	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U503 (2503) * S00 FDS (B170)	**Set P component to zero** **FB 114** 0 Set controller P component to zero (i.e. to obtain pure I controller) 1 Controller P component is active	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
U504 (2504) * S00 FDS (B170)	**Set I component to zero** **FB 114** 0 Set controller I component to zero (i.e. to obtain pure P controller) 1 Controller I component is active	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 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.				
U505 (2505) * S00 (B170)	**Source for setting value for I component** **FB 114** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U506 (2506) * S00 (B170)	**Source for control bit "Set I component"** **FB 114** 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Technology controller: Output, limitation				
U507 (2507) * S00 (B170)	**Source for variable positive limit** **FB 114** After multiplication with U508, the contents of the selected connector act as a positive limit for the technology controller output. 0 = connector K0000 1 = connector K0001 etc. Note: If the selected connector contains a negative value, a negative maximum value is applied to the output of this limiter stage.	All connector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U508 (2508) S00 FDS (B170)	**Positive limit for output of technology controller** **FB 114** See also U507	0.0 to 199.9 [%] 0.1	Ind: 4 FS=100.0 Type: O2	P052 = 3 P051 = 40 Online
U509 (2509) * S00 (B170)	**Source for variable negative limit** **FB 114** After multiplication with U510, the contents of the selected connector act as a negative limit for the technology controller output. 0 = connector K0000 1 = connector K0001 etc. Note: If the selected connector contains a positive value, a positive minimum value is applied to the output of this limiter stage. Note: 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 1	Ind: None FS=9252 Type: L2	P052 = 3 P051 = 40 Offline
U510 (2510) S00 FDS (B170)	**Negative limit for output of technology controller** **FB 114** See also U509	0.0 to 199.9 [%] 0.1	Ind: 4 FS=100.0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U511 (2511) * S00 (B170)	**Source for variable weighting factor for output** **FB 114** After multiplication with U512, the contents of the selected connector act as a weighting factor for the technology controller output. 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U512 (2512) S00 FDS (B170)	**Weighting factor for output** **FB 114** See also U511	-100.0 to 100.0 [%] 0.1	Ind: 4 FS=100.0 Type: I2	P052 = 3 P051 = 40 Online

11.69 Velocity/speed calculators

Only active with optional technology software S00

Speed/velocity calculator

Function: $v\_act = \frac{D * \pi * n\_rated}{i} * \frac{n\_act}{100\%}$

v_act	Actual velocity	(n021, U521, K9256)
D	Diameter	(U517, U518)
n_rated	Rated speed	(U520)
i	Gear ratio	(U519)
n_act	Actual speed	(U515)

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U515 (2515) * S00 (B190)	**Source for actual speed** **FB 115** 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Velocity/speed calculator

Function: $n\_set = \frac{v\_set * i}{D * \pi * n\_rated} * 100\%$

n_set	Setpoint speed	(n023, K9257)
D	Diameter	(U517, U518, U523)
n_rated	Rated speed	(U520)
i	Gear ratio	(U519)
v_set	Setpoint velocity	(U516)

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U516 (2516) * S00 (B190)	**Source for set velocity** **FB 115** A value of 16384 in the selected connector is equivalent to the set velocity set in U522 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U517 (2517) * S00 (B190)	**Source for diameter** **FB 115** A value of 16384 in the selected connector is equivalent to the diameter set in U523 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U518 (2518) S00 FDS (B190)	**Minimum diameter** **FB 115** Lower limit for diameter set in U517	10.0 to 6553,5 [mm] 0.1	Ind: 4 FS=6500.0 Type: O2	P052 = 3 P051 = 40 Online
U519 (2519) S00 FDS (B190)	**Gear ratio (i)** **FB 115**	1.00 to 300.00 0.01	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U520 (2520) S00 FDS (B190)	**Rated speed (n_rated)** **FB 115**	600 to 4000 [rev/m] 1	Ind: 4 FS=1450 Type: O2	P052 = 3 P051 = 40 Online
U521 (2521) S00 (B190)	**Normalization for actual velocity** [SW 1.8 and later] 16384 in K9256 correspond to the actual velocity set here	0.01 to 327,67 [m/s] 0.01	Ind: None FS=16,38 Type: O2	P052 = 3 P051 = 40 on-line
U522 (2522) S00 (B190)	**Normalization for set velocity** [SW 1.8 and later] See parameter U516	0.01 to 327,67 [m/s] 0.01	Ind: None FS=16,38 Type: O2	P052 = 3 P051 = 40 on-line
U523 (2523) S00 (B190)	**Normalization for diameter** [SW 1.8 and later] See parameter U517	10 to 60000 [mm] 1	Ind: None FS=1638 Type: O2	P052 = 3 P051 = 40 on-line

11.70 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_V	Variable moment of inertia
D	Diameter
$D_{Hülse}$	Diameter of the sleeve
D_{max}	Maximum diameter
K	Constant

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U525 (2525) * S00 (B191)	**Source for input quantities** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc. i001 Diameter (16384 are equivalent to set diameter U526) i002 Diameter of the sleeve (16384 are equivalent to set diameter U527) i003 Maximum diameter (16384 are equivalent to set diameter U528) i004 Constant (16384 are equivalent to set factor U529)	All connector numbers 1	Ind: 4 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
U526 (2526) S00 (B191)	**Normalization for diameter** [SW 1.8 and later] See parameter U525	10 to 60000 [mm] 1	Ind: None FS=10000 Type: O2	P052 = 3 P051 = 40 on-line
U527 (2527) S00 (B191)	**Normalization for diameter of the sleeve** [SW 1.8 and later] See parameter U525	10 to 60000 [mm] 1	Ind: None FS=10000 Type: O2	P052 = 3 P051 = 40 on-line
U528 (2528) S00 (B191)	**Normalization for maximum diameter** [SW 1.8 and later] See parameter U525	10 to 60000 [mm] 1	Ind: None FS=10000 Type: O2	P052 = 3 P051 = 40 on-line
U529 (2529) S00 (B191)	**Normalization for constant K** [SW 1.8 and later] See parameter U525	0.01 to 100.00 0.01	Ind: None FS=1.00 Type: O2	P052 = 3 P051 = 40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.71 PI controller

Only active with optional technology software S00

PI controller 1 = FB260 PI controller 2 = FB261 PI controller 3 = FB262 PI controller 4 = FB263 PI controller 5 = FB264 PI controller 6 = FB265 PI controller 7 = FB266 PI controller 8 = FB267 PI controller 9 = FB268 PI controller 10 = FB269				
U530 (2530) * S00 (B180... B189)	**Source for input quantity** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc. i001: input quantity PI controller 1 i002: input quantity PI controller 2 ... i010: input quantity PI controller 10	All connector numbers 1	Ind: 10 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

Enable and setting of the PI controllers				
U531 (2531) * S00 (B180... B189)	**Source for control signals (enable PI controller)** [SW 1.8 and later] 0 = Binector B0000 1 = Binector B0001 etc. i001: 0 = Disable controller PI controller 1 i002: 0 = Disable controller PI controller 2 ... i010: 0 = Disable controller PI controller 10 i011: 1 = Freeze I component PI controller 1 i012: 1 = Freeze I component PI controller 2 ... i020: 1 = Freeze I component PI controller 10 i021: 1 = Freeze output PI controller 1 i022: 1 = Freeze output PI controller 2 ... i030: 1 = Freeze output PI controller 10 i031: 1 = Freeze I component in pos.direction PI controller 1 i032: 1 = Freeze I component in pos.direction PI controller 2 ... i040: 1 = Freeze I component in pos.direction PI controller 10 i041: 1 = Freeze I component in neg.direction PI controller 1 i042: 1 = Freeze I component in neg.direction PI controller 2 ... i050: 1 = Stop I component in neg.direction PI controller 10	All binector numbers 1	Ind: 50 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U532 (2532) * S00 (B180... B189)	**Source for control signals (set PI controller)** [SW 1.8 and later] 0 = Binector B0000 1 = Binector B0001 etc. i001: 0 = Set I component PI controller 1 i002: 0 = Set I component PI controller 2 ... i010: 0 = Set I component PI controller 10 i011: 0 = Set output PI controller 1 i012: 0 = Set output PI controller 2 ... i020: 0 = Set output PI controller 10	All binector numbers 1	Ind: 20 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U533 (2533) * S00 (B180... B189)	**Source for Setting values** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc. i001: Setting value for I component PI controller 1 i002: Setting value for I component PI controller 2 ... i010: Setting value for I component PI controller 10 i011: Setting value for Output PI controller 1 i012: Setting value for Output PI controller 2 ... i020: Setting value for Output PI controller 10	All connector numbers 1	Ind: 20 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
Filtering of the input signals				
U534 (2534) * S00 (B180... B189)	**Source for variable filtering time for the input signal** [SW 1.8 and later] The content of the selected connector acts as filtering time for the PI controller after multiplication with U535. 0 = Connector K0000 1 = Connector K0001 etc. i001: variable filtering time PI controller 1 i002: variable filtering time PI controller 2 ... i010: variable filtering time PI controller 10	All connector numbers 1	Ind: 10 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
U535 (2535) S00 (B180... B189)	**Filtering time for the input signal** [SW 1.8 and later] i001: filtering time PI controller 1 i002: filtering time PI controller 2 ... i010: filtering time PI controller 10	0 to 10000 [ms] 1	Ind: 10 FS=0 Type: O2	P052 = 3 P051 = 40 on-line
Controller parameters				
U536 (2536) * S00 (B180... B189)	**Source for variable P gain** [SW 1.8 and later] The content of the selected connector acts as the P gain for the PI controller after multiplication with U537. 0 = Connector K0000 1 = Connector K0001 etc. i001: variable P gain PI controller 1 i002: variable P gain PI controller 2 ... i010: variable P gain PI controller 10	All connector numbers 1	Ind: 10 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
U537 (2537) S00 (B180... B189)	**PI controller P gain** [SW 1.8 and later] i001: P gain PI controller 1 i002: P gain PI controller 2 ... i010: P gain PI controller 10	0.10 to 200.00 0.01	Ind: 10 FS=3.00 Type: O2	P052 = 3 P051 = 40 on-line
U538 (2538) * S00 (B180... B189)	**Source for variable Integration time** [SW 1.8 and later] The content of the selected connector acts as the integration time for the PI controller after multiplication with U539. 0 = Connector K0000 1 = Connector K0001 etc. i001: variable Integration time PI controller 1 i002: variable Integration time PI controller 2 ... i010: variable Integration time PI controller 10	All connector numbers 1	Ind: 10 FS=1 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U539 (2539) S00 (B180... B189)	**PI controller integration time** [SW 1.8 and later] i001: Integration time PI controller 1 i002: Integration time PI controller 2 ... i010: Integration time PI controller 10	0.010 to 10.000 [s] 0.001	Ind: 10 FS=3.000 Type: O2	P052 = 3 P051 = 40 on-line
Control bits				
U540 (2540) * S00 (B180... B189)	**Freeze P component** [SW 1.8 and later] 0 Controller P component frozen (i.e. pure I controller) 1 Controller P component active i001: PI controller 1 i002: PI controller 2 ... i010: PI controller 10	0 to 1 1	Ind: 10 FS=1 Type: O2	P052 = 3 P051 = 40 off-line
U541 (2541) * S00 (B180... B189)	**Freeze I component** [SW 1.8 and later] 0 Controller I component frozen (i.e. pure P controller) 1 Controller I component active i001: PI controller 1 i002: PI controller 2 ... i010: PI controller 10	0 to 1 1	Ind: 10 FS=1 Type: O2	P052 = 3 P051 = 40 off-line
Output, Limitation				
U542 (2542) * S00 (B180... B189)	**Source for variable positive limit** [SW 1.8 and later] The content of the selected connector acts as the positive limit for the output of the PI controller after multiplication with U543. 0 = Connector K0000 1 = Connector K0001 etc. i001: PI controller 1 i002: PI controller 2 ... i010: PI controller 10 Note: If the content of the selected connector has a negative value, this causes a negative maximum value at the output of this limiter stage.	All connector numbers 1	Ind: 10 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
U543 (2543) S00 (B180... B189)	**Positive limit for the output of the PI controller** [SW 1.8 and later] See also U542	0.0 to 199.9 [%] 0.1	Ind: 10 FS=100.0 Type: O2	P052 = 3 P051 = 40 on-line
U544 (2544) * S00 (B180... B189)	**Source for variable negative Limit** [SW 1.8 and later] The content of the selected connector acts as the negative limit for the output of the technology controller after multiplication with U510. 0 = Connector K0000 1 = Connector K0001 etc. i001: PI controller 1 i002: PI controller 2 ... i010: PI controller 10 Note: If the content of the selected connector has a positive value, this causes a positive minimum value at the output of this limiter stage. Note: 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.	All connector numbers 1	Ind: 10 FS= i001: 9306 i002: 9316 i003: 9326 i004: 9336 i005: 9346 i006: 9356 i007: 9366 i008: 9376 i009: 9386 i010: 9396 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U545 (2545) S00 (B180... B189)	**Negative limit for the output of the PI controller** [SW 1.8 and later] See also U544	0.0 to 199.9 [%] 0.1	Ind: 10 FS=100.0 Type: O2	P052 = 3 P051 = 40 on-line

11.72 Closed-loop control elements

Only active with optional technology software S00

Derivative / delay elements SW 1.8 and later				**FB 270 to FB 279**
U550 (2550) * S00 (B156) (B157) (B158)	**Source for input quantity** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc. i001: Input quantity derivative/delay element 1 (FB 270) i002: Input quantity derivative/delay element 2 (FB 271) i003: Input quantity derivative/delay element 3 (FB 272) i004: Input quantity derivative/delay element 4 (FB 273) i005: Input quantity derivative/delay element 5 (FB 274) i006: Input quantity derivative/delay element 6 (FB 275) i007: Input quantity derivative/delay element 7 (FB 276) i008: Input quantity derivative/delay element 8 (FB 277) i009: Input quantity derivative/delay element 9 (FB 278) i010: Input quantity derivative/delay element 10 (FB 279)	All connector numbers 1	Ind: 10 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U551 (2551) * S00 (B156) (B157) (B158)	**Source for multiplier for derivative-action time** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc. i001: Multiplier derivative/delay element 1 (FB 270) i002: Multiplier derivative/delay element 2 (FB 271) I003: Multiplier derivative/delay element 3 (FB 272) i004: Multiplier derivative/delay element 4 (FB 273) i005: Multiplier derivative/delay element 5 (FB 274) i006: Multiplier derivative/delay element 6 (FB 275) i007: Multiplier derivative/delay element 7 (FB 276) i008: Multiplier derivative/delay element 8 (FB 277) i009: Multiplier derivative/delay element 9 (FB 278) i010: Multiplier derivative/delay element 10 (FB 279)	All connector numbers 1	Ind: 10 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
U552 (2552) S00 (B156) (B157) (B158)	**Derivative-action time** [SW 1.8 and later] i001: Der.-act.time deriv./delay element 1 (FB 270) i002: Der.-act.time deriv./delay element 2 (FB 271) i003: Der.-act.time deriv./delay element 3 (FB 272) i004: Der.-act.time deriv./delay element 4 (FB 273) i005: Der.-act.time deriv./delay element 5 (FB 274) i006: Der.-act.time deriv./delay element 7 (FB 276) i008: Der.-act.time deriv./delay element 8 (FB 277) i009: Der.-act.time deriv./delay element 9 (FB 278) i010: Der.-act.time deriv./delay element 10 (FB 279)	0 to 10000 [ms] 1	Ind: 10 FS=100 Type: O2	P052 = 3 P051 = 40 on-line
U553 (2553) * S00 (B156) (B157) (B158)	**Source for multiplier for filtering time** [SW 1.8 and later] 0 = Connector K0000 1 = Connector K0001 etc. i001: Multiplier derivative/delay element 1 (FB 270) i002: Multiplier derivative/delay element 2 (FB 271) i003: Multiplier derivative/delay element 3 (FB 272) i004: Multiplier derivative/delay element 4 (FB 273) i005: Multiplier derivative/delay element 5 (FB 274) i006: Multiplier derivative/delay element 6 (FB 275) i007: Multiplier derivative/delay element 7 (FB 276) i008: Multiplier derivative/delay element 8 (FB 277) i009: Multiplier derivative/delay element 9 (FB 278) i010: Multiplier derivative/delay element 10 (FB 279)	All connector numbers 1	Ind: 10 FS=1 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U554 (2554) S00 (B156) (B157) (B158)	**Filtering time** [SW 1.8 and later] i001: Filtering time derivative/delay element 1 (FB 270) i002: Filtering time derivative/delay element 2 (FB 271) i003: Filtering time derivative/delay element 3 (FB 272) i004: Filtering time derivative/delay element 4 (FB 273) i005: Filtering time derivative/delay element 5 (FB 274) 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)	0 to 10000 [ms] 1	Ind: 10 FS=100 Type: O2	P052 = 3 P051 = 40 on-line

11.73 Setpoint reduction

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U607 (2607) * BDS (G135)	**Source for activation of the setpoint reduction** [SW 1.6 and later] 0 = Binector B0000 1 = Binector B0001 etc. 0 Setpoint reduction active The Setpoint (before the ramp-function generator) is multiplied by the factor set in parameter U608 1 No setpoint reduction	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 off-line
U608 (2608) FDS (G135)	**Multiplier for speed setpoint on activation of the setpoint reduction** [SW 1.6 and later]	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=15.00 Type: O2	P052 = 3 P051 = 40 on-line

11.74 Definition of the function of inputs and outputs

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U616 (2616) (G117)	**Control word for input "E stop" (term. 105 to 108)** [SW 2.0 and later] 0 = E stop has same effect as OFF2 1 = E stop immediately cancels the firing pulse chain (without waiting for I = 0 and without outputting α_w)	0 to 1 1	Ind: none FS=0 Type: O2	P052 = 3 P051 = 40 online

11.75 Definition of the function of the relay output at terminals 109 / 110

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U619 (2619) * BDS (G117)	**Source for the relay output "line contactor ON" (terminals 109 / 110)** [SW 1.7 and later] 0 = Binector B0000 1 = Binector B0001 etc. 124 = Main contactor ON	All binector numbers 1	Ind: 2 FS=124 Type: L2	P052 = 3 P051 = 40 off-line

11.76 Starting pulse – Speed controller

(See also Chapter 8 Function Diagram Sheet G150)

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U651 (2651) FDS (G150)	**Starting pulse** (integrator setting value for the speed controller) [SW 1.7 and later]	-100.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 on-line
U652 (2652) FDS (G150)	**Multiplier for starting pulse with neg. setpoint** [SW 1.7 and later] if the starting pulse acc. to U651 is also used for pos. setpoint	0.00 to 200.00 [%] 0.01%	Ind: 4 FS=50.00 Type: O2	P052 = 3 P051 = 40 on-line
U653 (2653) FDS (G150)	**Starting pulse with neg. setpoint** [SW 1.7 and later]	-100.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 on-line
U655 (2655) * (G150)	**Source for Starting pulse** [SW 1.7 and later] 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: None FS=451 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U656 (2656) * (G150)	**Source for starting pulse with neg. setpoint** [SW 1.7 and later] 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: None FS=452 Type: L2	P052 = 3 P051 = 40 off-line
U657 (2657) * BDS (G150)	**Source for switchover starting pulse for pos./neg. setp.** [SW 1.7 and later] 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

11.77 Evaluation of a 4-step master switch for cranes

(See also Chapter 8 Function Diagram Sheet G125)

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U660 (2660) * (G125)	**Source for travel command 1** [SW 1.7 and later] 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U661 (2661) * (G125)	**Source for travel command 2** [SW 1.7 and later] 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U662 (2662) * (G125)	**Source for switchover to setpoint step S2** [SW 1.7 and later] 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U663 (2663) * (G125)	**Source for switchover to setpoint step S3** [SW 1.7 and later] 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U664 (2664) * (G125)	**Source for switchover to setpoint step S4** [SW 1.7 and later] 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U665 (2665) (G125)	**Setpoint for setpoint step S1** [SW 1.7 and later]	0.00 to 110.00 [%] 0.01%	Ind: None FS=10.00 Type: O2	P052 = 3 P051 = 40 on-line
U666 (2666) (G125)	**Setpoint for setpoint step S2** [SW 1.7 and later]	0.00 to 110.00 [%] 0.01%	Ind: None FS=25.00 Type: O2	P052 = 3 P051 = 40 on-line
U667 (2667) (G125)	**Setpoint for setpoint step S3** [SW 1.7 and later]	0.00 to 110.00 [%] 0.01%	Ind: None FS=40.00 Type: O2	P052 = 3 P051 = 40 on-line
U668 (2668) (G125)	**Setpoint for setpoint step S4** [SW 1.7 and later]	0.00 to 110.00 [%] 0.01%	Ind: None FS=100.00 Type: O2	P052 = 3 P051 = 40 on-line

11.78 Position/positional deviation acquisition

Only active with optional technology software S00

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U670 (2670) * S00 (B152)	**Source for actual position values** **FB 54** [SW 2.0 and later] Selection of connector whose values are to be used as actual position values. i001: Actual position value 1 i002: Actual position value 2 Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 46 i002: 0 Type: L2	P052 = 2 P051 = 40 offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U671 (2671) * S00 (B152)	**Source for setting/resetting signal for position acquisition** **FB 54** [SW 2.0 and later] Selection of binector whose value is to be used as the setting or resetting signals. i001: Reset actual position value 1 i002: Set actual position value 1 i003: Reset actual position value 2 i004: Set actual position value 2 i005: Reset positional deviation i006: Set positional deviation Settings: 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: 6 FS=0 Type: L2	P052 = 2 P051 = 40 offline
U672 (2672) * S00 (B152)	**Source for setting values** **FB 54** [SW 2.0 and later] Selection of connectors whose values are to be used as setting values i001: Setting value for position 1 i002: Setting value for position 2 i003: Setting value for positional deviation Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 3 FS= i001: 9471 i002: 9472 i003: 9473 Type: L2	P052 = 2 P051 = 40 offline
U673 (2673) * S00 (B152)	**Numerator of transformation ratio** **FB 54** **for actual position value 2** [SW 2.0 and later] U673 must be less than or equal to U674, otherwise F058 is output with fault value 14	-32766 to 32766 1	Ind: none FS=10000 Type: I2	P052 = 2 P051 = 40 off-line
U674 (2674) * S00 (B152)	**Denominator of transformation ratio** **FB 54** **for actual position value 2** [SW 2.0 and later]	1 to 32767 1	Ind: none FS=10000 Type: O2	P052 = 2 P051 = 40 offline
U675 (2675) * S00 (B152)	**Source for connecting the positional deviation offset** **FB 54** [SW 2.0 and later] Selection of the binector whose value connects the offset of the positional deviation Settings: 0 = Binector B0000 1 = Binector B0001 etc.	All binector numbers 1	Ind: none FS=0 Type: L2	P052 = 2 P051 = 40 offline
U676 (2676) * S00 (B152)	**Source for positional deviation offset** **FB 54** [SW 2.0 and later] Selection of the connector whose value is to be used as the offset of the positional deviation Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: none FS=9474 Type: L2	P052 = 2 P051 = 40 offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U677 (2677) * S00 (B152)	**Source for the fixed values for position acquisition** **FB 54** [SW 2.0 and later] Selection of connectors whose values are to be used as fixed values for position acquisition i001: LOW word of double-word connector KK9471 i002: HIGH word of double-word connector KK9471 i003: LOW word of double-word connector KK9472 i004: HIGH word of double-word connector KK9472 i005: LOW word of double-word connector KK9473 i006: HIGH word of double-word connector KK9473 i007: LOW word of double-word connector KK9474 i008: HIGH word of double-word connector KK9474 Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 2 P051 = 40 offline

11.79 Root extractor

Only active with optional technology software S00

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U680 (2680) * S00 (B153)	**Source for the input of the root extractor** **FB 58** [SW 2.0 and later] Selection of the connector whose value is to be used for the root extractor input. Settings: 0 = Connector K0000 1 = Connector K0001 etc.	All connector numbers 1	Ind: none FS=9483 Type: L2	P052 = 2 P051 = 40 offline
U681 (2681) S00 (B153)	**Operating point for limit monitoring indicator of the root extractor** **FB 58** [SW 2.0 and later] applied to connector KK9483	1 to 65535 1	Ind: none FS=1 Type: O2	P052 = 2 P051 = 40 online
U682 (2682) S00 (B153)	**Hysteresis for limit monitoring indicator of the root extractor** **FB 58** [SW 2.0 and later]	1 to 65535 1	Ind: none FS=1 Type: O2	P052 = 2 P051 = 40 online
U683 (2683) S00 (B153)	**x value for root function and gradient** **FB 58** [SW 2.0 and later] Definition of input values i001: Distance between input value of root function and fictitious passage through zero for y value U684.001 i002: x value of gradient for y value U684.002	1 to 65535 1	Ind: 2 FS=1000 Type: O2	P052 = 2 P051 = 40 online
U684 (2684) S00 (B153)	**y value for root function and gradient** **FB 58** [SW 2.0 and later] Definition of output values i001: y value of root function for distance U683.001 i002: y value of gradient for x value U683.002	0.01 to 199.99 [%] 0.01	Ind: 2 FS=100.00 Type: O2	P052 = 2 P051 = 40 online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.80 Configuration of SCB1 with SCI

U690 (2690) (Z150) (Z151)	**Configuration of analog inputs of SCI1** [SW 1.9 and later] Definition of type of input signals Parameter value — Terminals X428/3, 6, 9 — Terminals 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 Notes: - Only one signal can be processed per input. Voltage or current signals can be evaluated. - Voltage and current signals must be connected to different terminals. - Only unipolar signals are permitted with settings 1 and 2, i.e. the internal process quantities are also unipolar. - When setting 2 is selected, an input current of< 2 mA causes shutdown on faults (open-circuit monitoring) - The offset compensation for the analog inputs is set in parameter U692. i001: Slave 1, analog input 1 i002: Slave 1, analog input 2 i003: Slave 1, analog input 3 i004: Slave 2, analog input 1 i005: Slave 2, analog input 2 i006: Slave 2, analog input 3	0 to 2 1	Ind:6 FS= 0 Type O2	P052 = 3 P051 =40 on-line
U691 (2691) (Z150) (Z151)	**Smoothing time constant for analog inputs of SCI1** [SW 1.9 and later] Formula: T = 2ms * 2 to the power of U691 i001: Slave 1, analog input 1 i002: Slave 1, analog input 2 i003: Slave 1, analog input 3 i004: Slave 2, analog input 1 i005: Slave 2, analog input 2 i006: Slave 2, analog input 3	0 to 15 1	Ind:6 FS= 2 Type O2	P052 = 3 P051 =40 on-line
U692 (2692) (Z150) (Z151)	**Offset compensation for analog inputs of SCI1** [SW 1.9 and later] Setting instructions, see Operating Instructions for SCI1 i001: Slave 1, analog input 1 i002: Slave 1, analog input 2 i003: Slave 1, analog input 3 i004: Slave 2, analog input 1 i005: Slave 2, analog input 2 i006: Slave 2, analog input 3	-20.00 to 20.00 0.01V	Ind:6 FS= 0 Type I2	P052 = 3 P051 =40 on-line
U693 (2693) (Z155) (Z156)	**Actual value output via analog outputs of SCI1** [SW 1.9 and later] Selection of connectors whose values are to be output (for details, see Operating Instructions for SCI1) i001: Slave 1, analog input 1 i002: Slave 1, analog input 2 i003: Slave 1, analog input 3 i004: Slave 2, analog input 1 i005: Slave 2, analog input 2 i006: Slave 2, analog input 3	All connector numbers 1	Ind:6 FS= 0 Type L2	P052 = 3 P051 =40 on-line
U694 (2694) (Z155) (Z156)	**Gain for analog outputs of SCI1** [SW 1.9 and later] Setting instructions, see Operating Instructions for SCI1 i001: Slave 1, analog output 1 i002: Slave 1, analog output 2 i003: Slave 1, analog output 3 i004: Slave 2, analog output 1 i005: Slave 2, analog output 2 i006: Slave 2, analog output 3	-320.00 to 320.00 0.01V	Ind:6 FS= 10.00 Type I2	P052 = 3 P051 =40 on-line

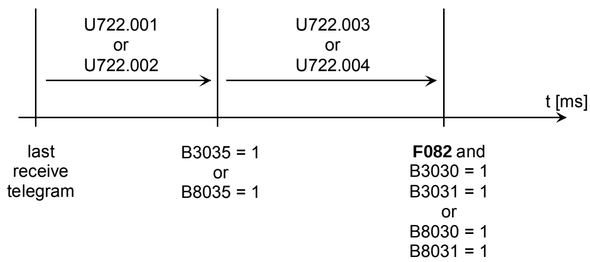
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U695 (2695) (Z155) (Z156)	**Offset compensation for analog outputs of SCI1** [SW 1.9 and later] Setting instructions, see Operating Instructions for SCI1 i001: Slave 1, analog output 1 i002: Slave 1, analog output 2 i003: Slave 1, analog output 3 i004: Slave 2, analog output 1 i005: Slave 2, analog output 2 i006: Slave 2, analog output 3	-100.00 to 100.00 0.01V	Ind:6 FS= 0 Type I2	P052 = 3 P051 =40 on-line
U696 (2696)	**Telegram failure time for SCB1** [SW 1.9 and later] Fault message F079 is displayed if no process data are exchanged with the supplementary board within this delay period. 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. Settings: 0 No time monitoring 1...65000 Permissible time interval between two process data exchange operations before a fault message is output. Note: The telegram monitoring function is active • from the receipt of the first error-free telegram after connection of the electronics power supply • from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout).	0 to 65000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 =40 Online
n697 (2697)	**Diagnostic information of SCB1** [SW 1.9 and later] Visualization parameter for displaying diagnostic info relating to SCB1. The displayed values overflow at "255“ (e.g. the number of telegrams begins at "0" again after "255"). i001: Number of error-free telegrams i002: Number of error-free telegrams i003: Number of voltage failures on slaves i004: Number of interruptions in fiber-optic connection i005: Number of missing response telegrams i006: Number of search telegrams for slave location i007: ETX error i008: Number of configuration telegrams i009: Highest terminal numbers needed according to PZD connection ( ) (parameterization of connectors or binectors) i010: Analog inputs/outputs required according to PZD connection of setpoint channel and actual value output via SCI ( ) (parameterization of appropriate connectors) i011: Reserved i012: Reserved i013: SCB1 alarm word i014: Setting defining whether slave no. 1 is needed and type if applicable 0: No slave required 1: SCI1 2: SCI2 i015: Setting defining whether slave no. 2 is needed and type if applicable 0: No slave required 1: SCI1 2: SCI2 i016: SCI board: Initialization error i017: SCB1 generation: Year i018: SCB1 generation: Day and month i019: SCI slave1: Software version i020: SCI slave1: Year of generation i021: SCI slave1: Day and month of generation i022: SCI slave2: Software version i023: SCI slave2: Year of generation i024: SCI slave2: Day and month of generation		Ind:24 Type O2	P052 = 3 P051 =40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U698 (2698) (Z135) (Z136) (Z145) (Z146)	**Binector selection for binary outputs of SCI1** [SW 1.9 and later] Selection of binectors whose states are output via the binary outputs of the SCIs i001: Binector selection for SCI slave1, binary output 1 i002: Binector selection for SCI slave1, binary output 2 i003: Binector selection for SCI slave1, binary output 3 i004: Binector selection for SCI slave1, binary output 4 i005: Binector selection for SCI slave1, binary output 5 i006: Binector selection for SCI slave1, binary output 6 i007: Binector selection for SCI slave1, binary output 7 i008: Binector selection for SCI slave1, binary output 8 i009: Binector selection for SCI slave1, binary output 9 i010: Binector selection for SCI slave1, binary output 10 i011: Binector selection for SCI slave1, binary output 11 i012: Binector selection for SCI slave1, binary output12 i013: Binector selection for SCI slave2, binary output 1 i014: Binector selection for SCI slave2, binary output 2 i015: Binector selection for SCI slave2, binary output 3 i016: Binector selection for SCI slave2, binary output 4 i017: Binector selection for SCI slave2, binary output 5 i018: Binector selection for SCI slave2, binary output 6 i019: Binector selection for SCI slave2, binary output 7 i020: Binector selection for SCI slave2, binary output 8 i021: Binector selection for SCI slave2, binary output 9 i022: Binector selection for SCI slave2, binary output 10 i023: Binector selection for SCI slave2, binary output 11 i024: Binector selection for SCI slave2, binary output12	All binector numbers 1	Ind:24 FS= 0 Type L2	P052 = 3 P051 =40 on-line
n699 (2699) (Z130) (Z131) (Z135) (Z136) (Z140) (Z141) (Z145) (Z146) (Z150) (Z151) (Z155) (Z156)	**Display of SCB1/SCI process data** [SW 1.9 and later] All values in hexadecimal representation i001: SCI slave1, binary inputs i002: SCI slave1, analog input1 i003: SCI slave1, analog input2 i004: SCI slave1, analog input3 i005: SCI slave2, binary inputs i006: SCI slave2, analog input1 i007: SCI slave2, analog input2 i008: SCI slave2, analog input3 i009: SCI slave1, binary outputs i010: SCI slave1, analog output1 i011: SCI slave1, analog output2 i012: SCI slave1, analog output3 i013: SCI slave2, binary outputs i014: SCI slave2, binary outputs i015: SCI slave2, analog output2 i016: SCI slave2, analog output3		Ind:16 Type L2	P052 = 3 P051 =40 on-line

11.81 Configuration of supplementary boards in board locations 2 and 3

U710 (2710) * (Z110) (Z111)	**Initialize link to supplementary boards** i001 Initialization of 1st communications board (in slot with lower ID letter) i002 Initialization of 2nd communications board (in slot with higher ID letter Settings: 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. The parameter is then set automatically to 1. Note: Data transmission is interrupted while initialization is in progress. 1 Deactivated	0 to 1 1	Ind: 2 FS=1 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U711 (2711) * (Z110) (Z111)	**Communications board parameter 1 (CB parameter 1)** See documentation for installed COM BOARD. 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 Index 1 is used to parameterize the 1st CB (including CB behind TB) and index 2 to parameterize the 2nd CB.	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U712 (2712) * (Z110) (Z111)	**Communications board parameter 2 (CB parameter 2)** See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U713 (2713) * (Z110) (Z111)	**Communications board parameter 3 (CB parameter 3)** See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U714 (2714) * (Z110) (Z111)	**Communications board parameter 4 (CB parameter 4)** See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U715 (2715) * (Z110) (Z111)	**Communications board parameter 5 (CB parameter 5)** See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U716 (2716) * (Z110) (Z111)	**Communications board parameter 6 (CB parameter 6)** See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U717 (2717) * (Z110) (Z111)	**Communications board parameter 7 (CB parameter 7)** See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U718 (2718) * (Z110) (Z111)	**Communication Board Parameter 8 (CB-Parameter 8)** See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U719 (2719) * (Z110) (Z111)	**Communications board parameter 9 (CB parameter 9)** See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U720 (2720) * (Z110) (Z111)	**Communications board parameter 10 (CB parameter 10)** See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U721 (2721) * (Z110) (Z111)	**Communications board parameter 11 (CB parameter 11)** See U711	0 to 65535 1	Ind: 10 FS=0 Type: O2	P052 = 3 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U722 (2722) * (Z110) (Z111)	**Telegram failure time for CB and TB** i001: Telegram failure time for board location 2 i002: Telegram failure time for board location 3 i003: Fault delay time for 1st CB or TB i004: Fault delay time for 2nd CB Settings for telegram failure time: 0 No time monitoring; must be parameterized for sporadic (acyclic) telegrams 1...65500 Maximum permissible time interval between 2 data exchanges before fault message F082 can be output Settings for fault delay time: 0 Instantaneous activation of F082 1...65499 Fault delay time before F082 is activated. 65500 F082 is never activated 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. Monitoring takes place in a 20 ms cycle. For this reason, it is only meaningful to set values that are multiples of 20 ms.  Note: The telegram monitoring function is active • from the receipt of the first error-free telegram after connection of the electronics power supply • from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout).	0 to 65000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 Online
U728 (2728) * (Z110)	**Source for binector/connector converter for 1st CB/TB** [SW 1.9 and later] Binectors to be converted to connector K3020 i001: 1st binector (bit 0) i002: 2nd binector (bit 1) ... i016: 16th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS=0 Type: L2	P052 = 3 P051 = 40 off-line
U729 (2729) * (Z111)	**Source for binector/connector converter for 2nd CB** [SW 1.9 and later] Binectors to be converted to connector K8020 i001: 1st binector (bit 0) i002: 2nd binector (bit 1) ... i016: 16th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS=0 Type: L2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n732 (2732) (Z110) (Z111)	**CB/TB diagnostics** Diagnostic information about an installed communications board (CB) or technology board (TB). i001 - i032: 1. CB/TB (lower slot ID letter) i033 - i064: 2. CB (higher slot ID letter) i065, i066: 1. CB/TB (internal diagnostic data) i067, i068: 2. CB (internal diagnostic data) For detailed information, please refer to operating instructions of relevant CB or TB.		Ind: 68 Type: O2	P052 = 3
n733 (2733) (Z110) (Z111)	**CB/TB receive data** Display of control words and setpoints (process data) that are transferred to the basic converter from a communications board (CB) or technology board (TB). i001: 1st process data word from 1st CB/TB ... i016 16th process data word from 1st CB/TB i017: 1st process data word from 2nd CB ... i032: 16th process data word from 2nd CB		Ind: 32 Type: L2	P052 = 3
U734 (2734) * (Z110)	**Transmit data for first CB/TB (lower slot ID letter)** Selection of connectors whose contents must be injected as transmit data to the first communications board (CB) or technology board (TB). 0 = connector K0000 1 = connector K0001 etc. This parameter not only defines the transmit data, but also their position in the transmit telegram. i001: Word 1 in PZD section of telegram i002: Word 2 in PZD section of telegram ... i016: Word 16 in PZD section of telegram Status word 1 (K0032) should be linked to word 1.	All connector numbers 1	Ind: 16 FS=0 Type: L2	P052 = 3 Online
n735 (2735) (Z110) (Z111)	**Display of transmit data to CB/TB** i001: 1st process data word to 1st CB or TB ... i016 16th process data word to 1st CB or TB i017: 1st process data word to 2nd CB ... i032: 16th process data word to 2nd CB		Ind: 32 Type: L2	P052 = 3
U736 (2736) * (Z111)	**Transmit data for second CB (higher slot letter)** Selection of connectors whose contents must be injected as transmit data to a communications board (CB) with a higher slot ID letter. 0 = connector K0000 1 = connector K0001 etc. This parameter not only defines the transmit data, but also their position in the transmit telegram. i001: Word 1 in PZD section of telegram i002: Word 2 in PZD section of telegram ... i016: Word 16 in PZD section of telegram Status word 1 (K0032) should be linked to word 1.	All connector numbers 1	Ind: 16 FS=0 Type: L2	P052 = 3 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n738 (2738) (Z110) (Z111)	**Display of PKW job from supplementary boards** i001: 1st word of PKW job from 1st CB ... i004 4th word of PKW job from 1st CB i005: 1st word of PKW job from location 2nd CB ... i008 4th word of PKW job from 2nd CB i009: 1st word of PKW job from TB ... i012: 4th word of PKW job from TB Details refer to “Function diagrams”, Section 8 Sheets Z110 and Z111		Ind: 12 Type: L2	P052 = 3
n739 (2739) (Z110) (Z111)	**Display of PKW response to supplementary boards** i001: 1st word of PKW job from 1st CB ... i004 4th word of PKW job from 1st CB i005: 1st word of PKW job from location 2nd CB ... i008 4th word of PKW job from 2nd CB i009: 1st word of PKW job from TB ... i012: 4th word of PKW job from TB Details refer to “Function diagrams”, Section 8 Sheets Z110 and Z111		Ind: 12 Type: L2	P052 = 3

11.82 Configuring the SIMOLINK board

U740 (2740) * (Z121)	**SLB Node address** [SW 1.5 and later] 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. 0 = Dispatcher (generates telegram circulation) Not 0 = Transceiver 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. i001: For first SLB in unit i002: Reserved	0 to 200 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 =40 Offline
U741 (2741) * (Z121)	**SLB Telegram failure time** [SW 1.5 and later] 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. 0 = No telegram failure monitoring i001: For first SLB in unit i002: Reserved	0 to 6500 [ms] 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 =40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U742 (2742) * (Z121)	**SLB Transmitter power** [SW 1.5 and later] Setting of power of fiber optic transmitter 1 = 0m to 15m (length of plastic fiber optic cable) 2 = 15m to 25m (length of plastic fiber optic cable) 3 = 25m to 40m (length of plastic fiber optic cable) 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. i001: For first SLB in unit i002: Reserved	1 to 3 1	Ind: 2 FS=3 Type: O2	P052 = 3 P051 =40 Online
U744 (2744) * (Z121)	**SLB Selection of active SLB board** [SW 1.5 and later] Selection of the active SIMOLINK board (SLB) when two SLBs are installed in one unit. 0 = Binector B0000 1 = Binector B0001 etc. A binector value of 0 means "SLB in low slot is active". A binector value of 1 is reserved for "SLB in high slot is active".	All binector numbers	Ind: None FS=0 Type: L2	P052 = 3 P051 =40 Online
U745 (2745) * (Z121)	**SLB No. of channels** [SW 1.5 and later] Number of channels which dispatcher provides for each transceiver. Together with U746, the number of channels determines the number of addressable nodes. This parameter is relevant only for the dispatcher. i001: For first SLB in unit i002: Reserved	1 to 8 1	Ind: 2 FS=3 Type: O2	P052 = 3 P051 =40 Offline
U746 (2746) * (Z121)	**SLB Cycle time** [SW 1.5 and later] 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. This parameter is relevant only for the dispatcher. i001: For first SLB in unit i002: Reserved Caution: Settings 0.20 ms to 0.99 ms are permissible only if option S00 is not activated. Otherwise F059 with fault value 3 is output. If option S00 (free function blocks) is not activated and if an SLB cycle time of < 1.00 ms is set in parameter U746, connectors K7001 to K7008 are updated immediately every time 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 every 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. [A cycle time of < 1.00 ms can be set in SW 1.9 and later]	0.20 to 6.50 [ms] 0.01	Ind:2 FS=1.20 Type: O2	P052 = 3 P051 =40 Offline
n748 (2748) (Z121)	**SLB Diagnosis** [SW 1.5 and later] Visualization parameter which displays diagnostic information for an installed SIMOLINK board (SLB) i001: Number of error-free synchronizing telegrams i002: Number of CRC errors i003: Number of timeout errors i004: Last accessible bus address i005: Address of node sending the special telegram "Timeout" i006: Implemented bus cycle time i007: Number of new configurations i008: Reserved ... i016: Reserved		Ind: 16 Type: O2	P052 = 3

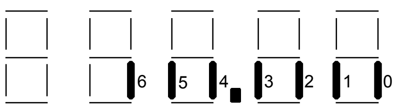
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U749 (2749) * (Z122)	**SLB Read address** [SW 1.5 and later] Definition of node addresses and channels from which the SLB must read data (a total of 8 channels can be read according to the index entries). The digits before the decimal point in the input value define the node address and those after the point the channel number (see also Section 7 "Starting up SIMOLINK boards" and Section 8 "SIMOLINK board: Receiving, transmitting"). Example: 2.0 = address 2 channel 0	0.0 to 200.7 0.1	Ind: 8 FS=0.0 Type: O2	P052 = 3 P051 =40 Offline
n750 (2750) (Z122)	**SLB Receive data** [SW 1.5 and later] Visualization parameter for data received via the SIMOLINK board (see also Section 7 "Starting up SIMOLINK boards" and Section 8 "SIMOLINK board: Receiving, transmitting") i001: Word 1 in PZD section of telegram ... i016: Word 16 in PZD section of telegram		Ind: 16 Type: L2	P052 = 3
U751 (2751) * (Z122)	**SLB Transmit data selection** [SW 1.5 and later] Selection of connectors whose contents must be transferred as transmit data by the SLB (see also Section 7 "Starting up SIMOLINK boards" and Section 8 "SIMOLINK board: Receiving, transmitting"). 0 = connector K0000 1 = connector K0001 etc. In addition to the transmit data itself, its place in the transmit telegram is also defined. i001: Channel0, low word i002: Channel0, high word ... i015: Channel7, low word i016: Channel7, high word	All connector numbers	Ind: 16 FS=0 Type: L2	P052 = 3 P051 =40 Offline
n752 (2752) (Z122)	**SLB Display of transmit data** [SW 1.5 and later] Process data transmitted by SLB via SIMOLINK in hexadecimal notation (see also Section 7 "Starting up SIMOLINK boards" and Section 8 "SIMOLINK board: Receiving, transmitting")		Ind: 16 Type: L2	P052 = 3
U753 (2753) * (Z121)	**SLB Fault delay** [SW 1.5 and later] Delay in activation of fault message F015 (see also U741) 0 = fault message is activated immediately the telegram failure monitor responds	0.0 to 100.0 [s] 0.1	Ind: None FS=0.0 Type: O2	P052 = 3 P051 =40 Offline

11.83 Configuring the EB1 expansion board

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U755 (2755) * (Z112) (Z115)	**Signal type of analog inputs on EB1** [SW 1.5 and later] 0 = Voltage input 0 to ± 10 V 1 = Current input 0 to ± 20 mA i001: AI1 of the first EB1 i002: AI1 of the second EB1	0 to 1 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Online

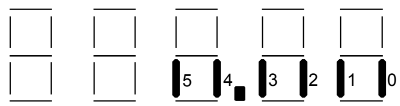
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U756 (2756) (Z112) (Z115)	**Normalization of analog inputs on EB1** [SW 1.5 and later] This parameter specifies the percentage value which is generated for an input voltage of 10V (or an input current of 20mA) at the analog input. The following general rule applies: With a voltage input: $U756\,[\%] = 10\,V * \frac{Y}{X}$ X .. input voltage in volts Y .. % value which is generated for input voltage X With a current input: $U756\,[\%] = 20\,mA * \frac{Y}{X}$ X .. input current in mA Y .. % value which is generated for input current X i001: AI1 of the first EB1 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB1 i005: AI2 of the second EB1 i006: AI3 of the second EB1	-1000.0 to 1000.0 [%] 0.1%	Ind: 6 FS=100.0 Type: I2	P052 = 3 P051 = 40 Online
U757 (2757) (Z112) (Z115)	**Offset for analog inputs on EB1** [SW 1.5 and later] i001: AI1 of the first EB1 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB1 i005: AI2 of the second EB1 i006: AI3 of the second EB1	-100.00 to 100.00 [%] 0.01%	Ind: 6 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
U758 (2758) * (Z112) (Z115)	**Mode of signal injection at analog inputs on EB1** [SW 1.5 and later] 0 = Injection of signal with sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted i001: AI1 of the first EB1 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB1 i005: AI2 of the second EB1 i006: AI3 of the second EB1	0 to 3 1	Ind: 6 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U759 (2759) * (Z112) (Z115)	**Source for selection of sign reversal at analog inputs on EB1** [SW 1.5 and later] Selection of binector to control **sign reversal at the analog input** ("1" state = reverse sign) 0 = binector B0000 1 = binector B0001 etc. i001: AI1 of the first EB1 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB1 i005: AI2 of the second EB1 i006: AI3 of the second EB1	All binector numbers 1	Ind: 6 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U760 (2760) * (Z112) (Z115)	**Filtering time for analog inputs on EB1** [SW 1.5 and later] Note: Hardware filtering of approximately 0.2 ms is applied as standard i001: AI1 of the first EB1 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB1 i005: AI2 of the second EB1 i006: AI3 of the second EB1	0 to 10000 [ms] 1ms	Ind: 6 FS=0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U761 (2761) * (Z112) (Z115)	**Source for enabling of analog inputs on EB1** [SW 1.5 and later] Selection of binector to control **enabling of the analog input** ("1" state = enabled) 0 = binector B0000 1 = binector B0001 etc. i001: AI1 of the first EB1 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB1 i005: AI2 of the second EB1 i006: AI3 of the second EB1	All binector numbers 1	Ind: 6 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
n762 (2762) (Z112) (Z115)	**Display of analog inputs on EB1** [SW 1.5 and later] i001: AI1 of the first EB1 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB1 i005: AI2 of the second EB1 i006: AI3 of the second EB1	-200.0 to 199.99 [%] 0.01%	Ind: 6 Type: I2	P052 = 3
U763 (2763) * (Z113) (Z116)	**Source for output value at analog outputs on EB1** [SW 1.5 and later] Selection of connector whose value must be output at the analog output 0 = connector K0000 1 = connector K0001 etc. i001: AO1 of the first EB1 i002: AO2 of the first EB1 i003: AO1 of the second EB1 i004: AO2 of the second EB1	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Online
U764 (2764) * (Z113) (Z116)	**Mode of signal injection at analog outputs on EB1** [SW 1.5 and later] 0 = Injection of signal with sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted i001: AO1 of the first EB1 i002: AO2 of the first EB1 i003: AO1 of the second EB1 i004: AO2 of the second EB1	0 to 3 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
U765 (2765) * (Z113) (Z116)	**Filtering time for analog outputs on EB1** [SW 1.5 and later] i001: AO1 of the first EB1 i002: AO2 of the first EB1 i003: AO1 of the second EB1 i004: AO2 of the second EB1	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
U766 (2766) (Z113) (Z116)	**Normalization of analog outputs on EB1** [SW 1.5 and later] $y[V] = x * \frac{U766}{100\%}$ x = normalization input (corresponds to filtering output) y = normalization output (corresponds to output voltage at analog output with an offset of 0) i001: AO1 of the first EB1 i002: AO2 of the first EB1 i003: AO1 of the second EB1 i004: AO2 of the second EB1	-200.00 to 199.99 [V] 0.01V	Ind: 4 FS=10.00 Type: I2	P052 = 3 P051 = 40 Online
U767 (2767) (Z113) (Z116)	**Offset for analog outputs on EB1** [SW 1.5 and later] i001: AO1 of the first EB1 i002: AO2 of the first EB1 i003: AO1 of the second EB1 i004: AO2 of the second EB1	-10.00 to 10.00 [V] 0.01V	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n768 (2768) (Z113) (Z116)	**Display of analog outputs on EB1** [SW 1.5 and later] i001: AO1 of the first EB1 i002: AO2 of the first EB1 i003: AO1 of the second EB1 i004: AO2 of the second EB1	-200.0 to 199.99 [%] 0.01%	Ind: 4 Type: I2	P052 = 3
U769 (2769) * (Z114) (Z117)	**Source for output values at binary outputs on EB1** [SW 1.5 and later] Selection of binectors to be applied to binary outputs at terminals 43 - 46. 0 = Binector B0000 1 = Binector B0001 etc. i001: BO1 of the first EB1 i002: BO2 of the first EB1 i003: BO3 of the first EB1 i004: BO4 of the first EB1 i005: BO1 of the second EB1 i006: BO2 of the second EB1 i007: BO3 of the second EB1 i008: BO4 of the second EB1	All binector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
n770 (2770) (Z114) (Z117)	**Display of status of binary inputs and outputs on EB1** [SW 1.5 and later] Representation on operator panel (PMU):  Segment ON: Corresponding terminal is activated (HIGH level is applied) Segment OFF: Corresponding terminal is not activated (LOW level is applied) Segment or bit 0 .... Terminal 40 1 .... Terminal 41 2 .... Terminal 42 3 .... Terminal 43 4 .... Terminal 44 5 .... Terminal 45 6 .... Terminal 46 i001: Terminal states of first EB1 i002: Terminal states of second EB1		Ind: 2 Type: V2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.84 Configuring the EB2 expansion board

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n773 (2773) (Z118) (Z119)	**Display of status of binary inputs and outputs on EB2** [SW 1.5 and later] Representation on operator panel (PMU):  Segment ON: Corresponding terminal is activated (HIGH level is applied) Segment OFF: Corresponding terminal is not activated (LOW level is applied) Segment or bit 0 .... Terminal 53 1 .... Terminal 54 2 .... Terminal 39 3 .... Terminal 41 4 .... Terminal 43 5 .... Terminal 45 i001: Terminal states of first EB2 i002: Terminal states of second EB2		Ind: 2 Type: V2	P052 = 3
U774 (2774) * (Z118) (Z119)	**Source for output values at binary outputs on EB2** [SW 1.5 and later] Selection of binectors to be applied to binary outputs at terminals 39 - 46. 0 = binector B0000 1 = binector B0001 etc. i001: BO1 of the first EB2 i002: BO2 of the first EB2 i003: BO3 of the first EB2 i004: BO4 of the first EB2 i005: BO1 of the second EB2 i006: BO2 of the second EB2 i007: BO3 of the second EB2 i008: BO4 of the second EB2	All binector numbers 1	Ind: 8 FS=0 Type: L2	P052 = 3 P051 = 40 Online
U775 (2775) * (Z118) (Z119)	**Signal type of analog input on EB2** [SW 1.5 and later] 0 = voltage input 0 to ± 10 V 1 = current input 0 to ± 20 mA i001: AI1 of the first EB2 i002: AI1 of the second EB2	0 to 1 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Online
U776 (2776) (Z118) (Z119)	**Normalization of analog input on EB2** [SW 1.5 and later] 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. The following general rule applies: With a voltage input: $U776\,[\%] = 10\,V * \frac{Y}{X}$ X .. input voltage in volts Y .. % value which is generated for input voltage X With a current input: $U776\,[\%] = 20\,mA * \frac{Y}{X}$ X .. input current in mA Y .. % value which is generated for input current X i001: AI of the first EB2 i002: AI of the second EB2	-1000.0 to 1000.0 [%] 0.1%	Ind: 2 FS=100.0 Type: I2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U777 (2777) (Z118) (Z119)	**Offset for analog input on EB2** [SW 1.5 and later] i001: AI of the first EB2 i002: AI of the second EB2	-100.00 to 100.00 [%] 0.01%	Ind: 2 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
U778 (2778) * (Z118) (Z119)	**Mode of signal injection at analog input on EB2** [SW 1.5 and later] 0 = Injection of signal with sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted i001: AI of the first EB2 i002: AI of the second EB2	0 to 3 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U779 (2779) * (Z118) (Z119)	**Source for selection of sign reversal at analog input on EB2** [SW 1.5 and later] Selection of binector to control **sign reversal at the analog input** ("1" state = reverse sign) 0 = binector B0000 1 = binector B0001 etc. i001: AI of the first EB2 i002: AI of the second EB2	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U780 (2780) (Z118) (Z119)	**Filtering time for analog input on EB2** [SW 1.5 and later] Note: Hardware filtering of approximately 0.2 ms is applied as standard i001: AI of the first EB2 i002: AI of the second EB2	0 to 10000 [ms] 1ms	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Online
U781 (2781) * (Z118) (Z119)	**Source for enabling of analog inputs on EB2** [SW 1.5 and later] Selection of binector to control **enabling of the analog input** ("1" state = enabled) 0 = binector B0000 1 = binector B0001 etc. i001: AI of the first EB2 i002: AI of the second EB2	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
n782 (2782) (Z118) (Z119)	**Display of analog input on EB2** [SW 1.5 and later] i001: AI of the first EB2 i002: AI of the second EB2	-200.0 to 199.99 [%] 0.01%	Ind: 2 Type: I2	P052 = 3
U783 (2783) * (Z118) (Z119)	**Source for output value at analog output on EB2** [SW 1.5 and later] Selection of connector whose value must be output at the analog output 0 = connector K0000 1 = connector K0001 etc. i001: AO of the first EB2 i002: AO of the second EB2	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Online
U784 (2784) * (Z118) (Z119)	**Mode of signal injection at analog output on EB2** [SW 1.5 and later] 0 = Injection of signal with sign 1 = Injection of absolute value of signal 2 = Injection of signal with sign, inverted 3 = Injection of absolute value of signal, inverted i001: AO of the first EB2 i002: AO of the second EB2	0 to 3 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Online
U785 (2785) (Z118) (Z119)	**Filtering time for analog outputs on EB2** [SW 1.5 and later] i001: AO of the first EB2 i002: AO of the second EB2	0 to 10000 [ms] 1ms	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U786 (2786) (Z118) (Z119)	**Normalization of analog outputs on EB2** [SW 1.5 and later] $y[V] = x * \frac{U786}{100\%}$ x = normalization input (corresponds to filtering output) y = normalization output (corresponds to output voltage at analog output with an offset of 0) i001: AO of the first EB2 i002: AO of the second EB2	-200.00 to 199.99 [V] 0.01V	Ind: 2 FS=10.00 Type: I2	P052 = 3 P051 = 40 Online
U787 (2787) (Z118) (Z119)	**Offset for analog output on EB2** [SW 1.5 and later] i001: AO of the first EB2 i002: AO of the second EB2	-10.00 to 10.00 [V] 0.01V	Ind: 2 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
n788 (2788) (Z118) (Z119)	**Display of analog outputs on EB2** [SW 1.5 and later] i001: AO of the first EB2 i002: AO of the second EB2	-200.00 to 199.99 [%] 0.01%	Ind: 2 Type: I2	P052 = 3

11.85 Configuring the SBP pulse encoder board

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U790 (2790) * (Z120)	**Configuration of input level of A/B and CRTL tracks** [SW 1.5 and later] 0: HTL unipolar 1: TTL unipolar 2: HTL differential input 3: TTL/RS422 differential input	0 to 3 1	Ind: None FS=1 Type: O2	P052 = 3 P051 = 40 Offline
U791 (2791) * (Z120)	**Configuration of encoder supply voltage** [SW 1.5 and later] The supply is subject to a current limit of 250mA **Caution:** Setting the parameter incorrectly can damage the encoder (i.e. 15 V voltage for an encoder which requires a 5 V supply). 0: 5V voltage supply 1: 15V voltage supply	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U792 (2792) * (Z120)	**Number of pulses per revolution** [SW 1.5 and later] Number of lines on one track around circumference of disk	100 to 20000 1	Ind: None FS=1024 Type: O2	P052 = 3 P051 = 40 Offline
U793 (2793) * (Z120)	**Encoder type** [SW 1.5 and later] 0: Encoder with A/B track (two tracks displaced by 90 degrees) 1: Encoder with separate forward and reverse tracks	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U794 (2794) (Z120)	**Reference speed** [SW 1.5 and later] When actual speed = reference speed a value of 100% is output in the appropriate diagnostic parameter (n795) and connector	50.0 to 6500.0 [rev/min] 0.1	Ind: None FS=500.0 Type: O2	P052 = 3 P051 = 40 Online
n795 (2795) (Z120)	**Display of actual speed in % of reference speed** [SW 1.5 and later]	-200.00 to 199.99 [%]	Ind: None Type: I2	P052 = 3
U796 (2796) * S00 (Z120)	**Resetting the position counter** [SW 2.0 and later] Setting the type of resetting for position acquisition 0 = free-running (no reset) 1 = see function diagram Z120 2 = see function diagram Z120	0 to 2 1	Ind: none FS=0 Type: O2	P052 = 2 P051 = 40 online

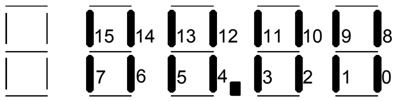
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.86 Configuration of paralleling interface

Notes about parameterization of the paralleling interface see Chapter 6.3.2

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U800 (2800) * (G195)	**Control word for parallel connection of SIMOREG converters** 0: SIMOREG converters are not connected in parallel 1: SIMOREG converters are connected in parallel The gating pulses are generated by each individual converter 2: SIMOREG converters are connected in parallel The gating pulses are generated by the master for all slaves	0 to 2 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
U803 (2803) * (G195)	**Operating mode for the parallel connection** [SW 1.7 and later] 0 Standard mode All parallel-connected SIMOREG devices must be in continuous operation. Failure (fault message, fuse blown) of one of the parallel-connected SIMOREG devices causes immediate pulse disabling for all SIMOREG devices. 1 "N+1 mode" (redundancy mode) 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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 off-line
U804 (2804) * (G195)	**Transmit data on paralleling interface** Selection of connectors whose contents must be injected as transmit data (master to slaves or slave to master) for the paralleling interface. 0 = connector K0000 1 = connector K0001 etc. This parameter not only defines the transmit data, but also their position in the transmit telegram. i001: Word 1 of telegram ... i005: Word 5 of telegram i006: word 1 of the telegram, if "standby master" [SW 1.7 and later] ... i010: word 5 of the telegram, if "standby master" [SW 1.7 and later]	All connector numbers 1	Ind: 10 FS=0 Type: L2	P052 = 3 P051 = 40 Online
U805 (2805) (G195)	**Control word for bus terminator of paralleling interface** 0: No bus terminator 1: Bus terminator active	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
U806 (2806) * (G195)	**Address for the parallel connection of SIMOREG devices** i001: Address of the masters or of the slaves i002: Address of the "standby master" or slaves [SW 1.7 and later] 2: Slave device with address 2 3: Slave device with address 3 4: Slave device with address 4 5: Slave device with address 5 6: Slave device with address 6 12: Master device for 1 slave device with address 2 13: Master device for 2 slave devices with addresses 2 and 3 14: Master device for 3 slave devices with addresses 2, 3 and 4 15: Master device for 4 slave devices with addresses 2, 3, 4 and 5 16: Master device for 5 slave devices with addresses 2, 3, 4, 5 and 6 In "Standard" mode (U803 = 0), i001 and i002 must be set to the same value. 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. On the master, a value of 12 to 16 must be set in i001, in i002 a value of 2 to 6. 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 FS=2 Type: O2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U807 (2807) (G195)	**Telegram failure time on paralleling interface** 0 No time monitoring 0.001...65.000 Permissible time interval between two data exchange operations before a fault message is output. Fault message F014 is displayed if no data are exchanged with the parallel-connected converter within this delay period. 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. Note: The telegram monitoring function is active • from the receipt of the first error-free telegram after connection of the electronics power supply • from the receipt of the first error-free telegram after the telegram monitor has responded (i.e. monitoring timeout).	0.000 to 65.000 [s] 0.001s	Ind: None FS=0.100 Type: O2	P052 = 3 P051 = 40 Online
U808 (2808) * (G195)	**Source for triggering of message F014** Selection of binector which must trigger message F014 when it switches to log. "1" 6040 = binector B6040 6041 = binector B6041	6040, 6041	Ind: None FS=6040 Type: L2	P052 = 3 P051 = 40 Offline
n809 (2809) (G195)	**Diagnostic information for paralleling interface** i001 to i008=Free-running counter, overflow at 65535 i001: Error-free Telegram Counter i002: Errored Telegram Counter i003: Transmit Error Counter i004: Receive Error Counter i005: Phase Error Counter i006: Baud rate Error Counter i007: Bad BCC Counter i008: Timeout Counter i009: Bit 2: Valid telegram received from (if master) / for (if slave) address 2 ... Bit6: Valid telegram received from (if master) / for (if slave) address 6	0 to 65535	Ind: 9 Type: O2	P052 ≥ 0

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n810 (2810) (G195)	**Diagnostic information for the paralleling interface**  <u>Paralleling master: (i.e. when U800 = 1)</u> Segment 0 .... 1 .... 2 .... Illuminated: Slave with address 2 responding 3 .... Illuminated: Slave with address 3 responding 4 .... Illuminated: Slave with address 4 responding 5 .... Illuminated: Slave with address 5 responding 6 .... Illuminated: Slave with address 6 responding 7 .... 8 .... Dark 9 .... Dark 10 .... 11 .... 12 .... 13 .... 14 .... 15 .... Illuminated: Master function active <u>Paralleling slave: (i.e. when U800 = 2)</u> Segment 0 .... 1 .... 2 .... Illuminated: Data for slave with address 2 are ok 3 .... Illuminated: Data for slave with address 3 are ok 4 .... Illuminated: Data for slave with address 4 are ok 5 .... Illuminated: Data for slave with address 5 are ok 6 .... Illuminated: Data for slave with address 6 are ok 7 .... 8 .... Illuminated: Slave function active 9 .... Illuminated: Firing pulses of master are used 10 .... 11 .... 12 .... 13 .... 14 .... 15 .... Dark		Ind: None Type: V2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n812 (2812) (G195)	**Receive data on paralleling interface** When U806=1 (master) is selected i001 Receive data from slave with address 2, word 1 ... i005 Receive data from slave with address 2, word 5 i006 Receive data from slave with address 3, word 1 ... i010 Receive data from slave with address 3, word 5 i011 Receive data from slave with address 4, word 1 ... i015 Receive data from slave with address 4, word 5 i016 Receive data from slave with address 5, word 1 ... i020 Receive data from slave with address 5, word 5 i021 Receive data from slave with address 6, word 1 ... i025 Receive data from slave with address 6, word 5 When U806=2 to 6 (slave) is selected: i001 Receive data from master, word 1 ... i005 Receive data from master, word 5 i006 Not in use ... i025 Not in use	0000 to FFFFH 1	Ind: 25 Type: L2	P052 ≥ 0
n813 (2813) (G195)	**Transmit data on paralleling interface** When U806=1 (master) is selected i001 Transmit data to slaves, word 1 ... i005 Transmit data to slaves, word 5 When U806=2 to 6 (slave) is selected: i001 Transmit data to master, word 1 ... i005 Transmit data to master, word 5	0 to FFFFH	Ind: 5 Type: L2	P052 ≥ 0

11.87 Parameters for SIMOREG CM (Control Module)

U819 **to** **U833** (2819 to 2833)	**These parameters have no meaning for SIMOREG DC Master!** The SIMOREG CM (Control Module, control section for converting or upgrading systems) requires these parameters. (for details see operating instructions for SIMOREG CM, order No. 6RX1700-0BD76)			

11.88 Rated DC current of external field device

U838 (2838) *****	**Rated DC current of external field device** [SW 1.9 and later] 0.00 Parameter not yet set Note: This parameter is operative only if P082 >= 21.	0.00 to 600.00 [A] 0.01A	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 on-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.89 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 DC master is in an operating state ≥ o7.
As soon as the SIMOREG DC master is in simulation operation, it goes into operating state o8.1 (simulation operation).
Simulation operation is exited by resetting parameter U840 to zero.

U840 (2840) *	**Control parameters for simulation operation** [SW 1.7 and later] 0 No simulation operation 11 Firing cable 11 ... 16 Firing cable 16 21 Firing cable 21 ... 26 Firing cable 26	0, 11 to 16, 21 to 26 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 off-line

11.90 Parameter for DriveMonitor

n845 to n909 (2840 to 2909)	**These parameters are used by DriveMonitor**			

11.91 Slot deactivation

U910 (2910) * (G101)	**Slot deactivation parameter** [SW 1.9 and later] Parameter for deactivating supplementary boards, e.g. during start-up or troubleshooting (for details of slot identification codes, see diagram under parameter r063) i001: - i002: Slot D i003: Slot E i004: Slot F i005: Slot G 0 Board in slot active 1 Board in slot not active 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. Note: Slot E can simply be deactivated to conceal a technology board (large format). 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 1	Ind: 5 FS=0 Type: O2	P052 = 3 P051 = 40 off-line

11.92 Parameter for DriveMonitor

n911 to n949 (2911 to 2949)	**These parameters are used by DriveMonitor**			

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.93 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 (2950) * S00

Selection of time slices for function blocks FB1 to FB100

Value range: 1, 2, 4, 10, 20

Ind: 100 FS= see column on left Type: O2

P052 = 3 P051 = 40 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 [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U951 (2951) * S00	**Selection of time slices for function blocks FB101 to FB200**	1, 2, 4, 10, 20	Ind: 100 FS= see column on left Type: O2	P052 = 3 P051 = 40 off-line

Index	Function block	Time slice (FS)	Index	Function block	Time slice (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 [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U952 (2952) * S00	**Selection of time slices for function blocks FB201 to FB300**	1, 2, 4, 10, 20	Ind: 100 FS= see column on left Type: O2	P052 = 3 P051 = 40 off-line

Index	Function block	Time slice (FS)	Index	Function block	Time slice (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

11.94 Parameter for DriveMonitor

n953 **to** **n959** (2953 to 2959)	**These parameters are used by DriveMonitor**			

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.95 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).

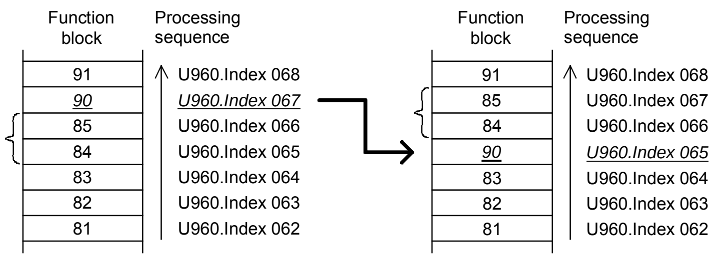
<u>Altering the processing sequence:</u>

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 <u>after</u> 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.

<u>Example 1:</u>

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):

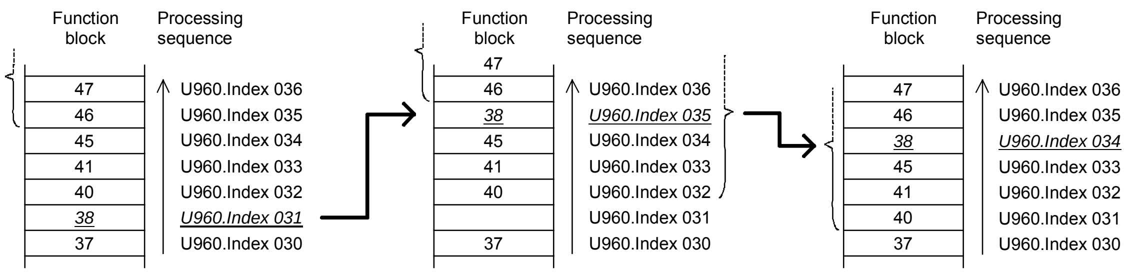
Function block no. 90 must be entered in the index in which the number of the function block previously processed <u>after</u> block 83 (84 in U960.9065) is currently stored. Function block numbers (84 and 85) in the following indices of U960 will be shifted up to the next index automatically.



<u>Example 2:</u>

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 <u>after</u> 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 [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U960 (2960) * S00	**Processing sequence of function blocks of S00 technology software (1)** i001: Number of function block for 1st place in processing sequence i002: Number of function block for 2nd place in processing sequence etc.	Numbers of all function blocks	Ind: 100 FS= Standard sequence Type: O2	P052 = 3 P051 = 40 Offline
U961 (2961) * S00	**Processing sequence of function blocks of S00 technology software (2)** i001: Number of function block for 101st place in processing sequence i002: Number of function block for 102nd place in processing sequence etc.	Numbers of all function blocks	Ind: 100 FS= Standard sequence Type: O2	P052 = 3 P051 = 40 Offline
U962 (2962) * S00	**Processing sequence of function blocks of S00 technology software (3)** i001: Number of function block for 201st place in processing sequence i002: Number of function block for 202nd place in processing sequence etc.	Numbers of all function blocks	Ind: 100 FS= Standard sequence Type: O2	P052 = 3 P051 = 40 Offline
U969 (2969) * S00	**Automatic setting and activation of the execution sequence** 0 Return 1 Set standard sequence: 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. 2 Set optimum sequence: 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. 3 Set standard setting of the sampling times. U950, U951, and U952 are set to the factory setting. 4 Automatic activation / deactivation: 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. 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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 off-line

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.96 Enabling of technology software in basic unit, S00 option ("freely assignable function blocks")

The S00 technology option can only be utilized on SIMOREG DC Master 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:

1. Find out the serial number of your SIMOREG DC Master 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 DC Master
   - The serial number can be displayed in parameter r069 on the OP1S
2. Find out the PIN number (a number between 2001 and 65535) which matches the converter serial number:
   - If you have ordered the SIMOREG Master 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.
3. 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.
4. 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).

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U977 (2977) * S00	**PIN number for S00 option** 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 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
n978 (2978) S00	**"S00 enabled" display** 0 The optional S00 technology software is disabled The time credit for temporary enabling has run out xxx The optional S00 technology software is not enabled. xxx = number of credit hours which are still available for use under temporary enabling PIN number 1xxx The optional SOO technology software is temporarily enabled. xxx = number of credit hours still available 2000 The optional S00 technology software is permanently enabled.	see column on left	Ind: None Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.97 Parameter access for experts

U979 (2979) *	**Parameter access for experts** [SW 1.9 and later] 999 Parameter access for experts is activated. This means that even offline parameters can be modified in operation. Notes: The value of this parameter is lost when the electronics power supply is switched off. Parameters can be modified only if both P051 and P052 as well as P927 are set to the correct values.	0 to 2000 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 on-line

11.98 List of existing and modified U and n parameters

n980 (2980)	**List of existing parameter numbers, continuation** Viewing parameter for displaying the first 100 parameter numbers in the U or n parameter range (numbers 2000 to 2999). The parameters are arranged in ascending sequence. The list is continued in the parameter whose number is displayed in index 101. This means, for example, 2981 = n981 The first 0 to be displayed signals that no further parameter numbers are stored.		Ind: 101 Type: O2	P052 = 3
n981 (2981)	**List of existing parameter numbers, continuation** See n980.		Ind: 101 Type: O2	P052 = 3
n982 (2982)	**List of existing parameter numbers, continuation** See n980.		Ind: 101 Type: O2	P052 = 3
n983 (2983)	**List of existing parameter numbers, continuation** See n980.		Ind: 101 Type: O2	P052 = 3
n984 (2984)	**List of existing parameter numbers, continuation** See n980.		Ind: 101 Type: O2	P052 = 3
n985 (2985)	**List of existing parameter numbers, continuation** See n980.		Ind: 101 Type: O2	P052 = 3
n986 (2986)	**List of existing parameter numbers, continuation** See n980.		Ind: 101 Type: O2	P052 = 3
n987 (2987)	**List of existing parameter numbers, continuation** See n980.		Ind: 101 Type: O2	P052 = 3
n988 (2988)	**List of existing parameter numbers, continuation** See n980.		Ind: 101 Type: O2	P052 = 3
n989 (2989)	**List of existing parameter numbers, continuation** See n980.		Ind: 101 Type: O2	P052 = 3
n990 (2990)	**List of modified parameters, continuation** Viewing parameter for displaying the first 100 modified parameters in the U or n parameter range (numbers 2000 to 2999). The parameters are arranged in ascending sequence. The list is continued in the parameter whose number is displayed in index 101. This means, for example, 2991 = n991 The first 0 to be displayed signals that there are no further modified parameters.		Ind: 101 Type: O2	P052 = 3
n991 (2991)	**List of modified parameters, continuation** See n990.		Ind: 101 Type: O2	P052 = 3
n992 (2992)	**List of modified parameters, continuation** See n990.		Ind: 101 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n993 (2993)	**List of modified parameters, continuation** See n990.		Ind: 101 Type: O2	P052 = 3
n994 (2994)	**List of modified parameters, continuation** See n990.		Ind: 101 Type: O2	P052 = 3
n995 (2995)	**List of modified parameters, continuation** See n990.		Ind: 101 Type: O2	P052 = 3
n996 (2996)	**List of modified parameters, continuation** See n990.		Ind: 101 Type: O2	P052 = 3
n997 (2997)	**List of modified parameters, continuation** See n990.		Ind: 101 Type: O2	P052 = 3
n998 (2998)	**List of modified parameters, continuation** See n990.		Ind: 101 Type: O2	P052 = 3
n999 (2999)	**List of modified parameters, continuation** See n990.		Ind: 101 Type: O2	P052 = 3

12 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 diag., Sheet
Fixed values			
K0000	Fixed value 0		G120
K0001	Fixed value 100.00%	16384 ≙ 100%	G120
K0002	Fixed value 200.00%	16384 ≙ 100%	G120
K0003	Fixed value -100.00%	16384 ≙ 100%	G120
K0004	Fixed value -200.00%	16384 ≙ 100%	G120
K0005	Fixed value 50.00%	16384 ≙ 100%	G120
K0006	Fixed value 150.00%	16384 ≙ 100%	G120
K0007	Fixed value -50.00%	16384 ≙ 100%	G120
K0008	Fixed value -150.00%	16384 ≙ 100%	G120
K0009	Fixed value 0 or special function specified in each case		
Analog inputs			
K0010	Analog input, terminal 4 / 5 (main setpoint) Raw value after A/D conversion (unfiltered, not normalized)	16384 ≙ 100%	G113
K0011	Analog input, terminal 4 / 5 (main setpoint) After normalization, offset injection, filtering	16384 ≙ 100%	G113
K0012	Analog input, terminal 103 / 104 (main actual value) Raw value after A/D conversion (unfiltered, not normalized)	16384 ≙ 100%	G113
K0013	Analog input, terminal 103 / 104 (main actual value) After normalization, offset injection, filtering	16384 ≙ 100%	G113
K0014	Analog input, terminal 6 / 7 (analog selectable input 1) Raw value after A/D conversion (unfiltered, not normalized)	16384 ≙ 100%	G113
K0015	Analog input, terminal 6 / 7 (analog selectable input 1) After normalization, offset injection, filtering	16384 ≙ 100%	G113
K0016	Analog input, terminal 8 / 9 (analog selectable input 2) Raw value after A/D conversion (unfiltered, not normalized)	16384 ≙ 100%	G114
K0017	Analog input, terminal 8 / 9 (analog selectable input 2) After normalization, offset injection, filtering	16384 ≙ 100%	G114
K0018	Analog input, terminal 10 / 11 (analog selectable input 3) Raw value after A/D conversion (unfiltered, not normalized)	16384 ≙ 100%	G114
K0019	Analog input, terminal 10 / 11 (analog selectable input 3) After normalization, offset injection, filtering	16384 ≙ 100%	G114

Connector	Description	Normalization	Function diag., Sheet
Binary inputs, binary outputs			
K0020	Binary inputs, terminals 36 to 43 and 211 to 214, E Stop Bit0 = Status of terminal 36 Bit1 = Status of terminal 37 Bit2 = Status of terminal 38 Bit3 = Status of terminal 39 Bit4 = Status of terminal 40 Bit5 = Status of terminal 41 Bit6 = Status of terminal 42 Bit7 = Status of terminal 43 Bit8 = Status of terminal 211 Bit9 = Status of terminal 212 Bit10 = Status of terminal 213 Bit11 = Status of terminal 214 Bit12 = 0 ... E Stop is active 1 ... No E Stop is active	1 ≙ 1	G110
K0021	Binary outputs, terminals 46 to 52, 109/110 Bit0 = Status of terminal 46 Bit1 = Status of terminal 48 Bit2 = Status of terminal 50 Bit3 = Status of terminal 52 Bit7 = Status of terminal 109/110	1 ≙ 1	G112 G117

Analog outputs			
K0026	Analog output, terminal 14 / 15	16384 ≙ 100%	G115
K0027	Analog output, terminal 16 / 17	16384 ≙ 100%	G115
K0028	Analog output, terminal 18 / 19	16384 ≙ 100%	G116
K0029	Analog output, terminal 20 / 21	16384 ≙ 100%	G116

Control word, status word			
K0030	Control word 1	1 ≙ 1	G180
K0031	Control word 2	1 ≙ 1	G181
K0032	Status word 1	1 ≙ 1	G182
K0033	Status word 2	1 ≙ 1	G183
K0034	Active function data set [SW 2.0 and later]	1 ≙ 1	G175
K0035	Active BICO data set [SW 2.0 and later]	1 ≙ 1	G175

Evaluation of the pulse encoder board SBP [SW 1.6 and later]			
KK0036	Position actual value of SBP [SW 2.0 and later]	1 ≙ 1	Z120
K0038	Actual speed value of SBP in rev./min [SW 2.0 and later]	1 ≙ 1 rpm	Z120
K0039	Actual speed value of SBP	16384 ≙ 100%	Z120

Pulse encoder evaluation

The pulse encoder evaluation function supplies an actual speed value (K0040 und K0041) and an actual position value (K0042, K0043, K0044, KK0046).

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.)
The setting in parameter P144 (multiple evaluation) is also relevant,
i.e. when P144 = 0, every positive edge of the first track of the pulse encoder is counted,
when P144 = 1, every edge of the first track of the encoder is counted,
when P144 = 2, every edge of both tracks of the encoder is counted.

When P145 = 1 (automatic switchover of multiple evaluation), the position sensor (K0042, K0043, K0044, KK0046) produces invalid data!

K0042 and K0043 together form a signed 24-bit actual position value.
(value range: FF80 0000H to 007F FFFFH or -2^{23} to $+2^{23}$ -1)

K0040	Actual speed value from pulse encoder	16384 ≙ 100%	G145
K0041	Absolute actual speed value from pulse encoder	16384 ≙ 100%	G145
K0042	Actual position value, LOW word LOW word of 24-bit actual position value	1 ≙ 1	G145

Connector	Description	Normalization	Function diag., Sheet
K0043	Actual position value, HIGH word HIGH word of 24-bit actual position value	1 ≙ 1	G145
K0044	Actual position value, number of zero markers	1 ≙ 1	G145
KK0046	Actual position value [SW 1.9 and later] Actual position value extended in the software to a 32-bit value (value range: 8000 0000H to 7FFF FFFFH or -2^{31} to $+2^{31}$ -1)	1 ≙ 1	G145
KK0047	Deceleration distance [SW 1.9 and later] 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. This double-word connector specifies the requisite deceleration distance as the number of increments of the pulse encoder (defined in parameters P140 ff.). 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 ≙ 1	G136
K0048	Actual speed value from pulse encoder in rpm [SW 2.0 and later]	1 ≙ 1 rpm	G145
Heatsink temperature			
K0050	Heatsink temperature	16384 ≙ 100°C	
Motor interface K0050 is always set to 0 when a PTC thermistor or no temperature sensor is connected (P490.x ≠ 1).			
K0051	Motor temperature 1 (from sensor to terminal 22 / 23)	16384 ≙ 100°C	G185
K0052	Motor temperature 2 (from sensor to terminal 204 / 205)	16384 ≙ 100°C	G185
Closed-loop armature current control, auto-reversing stage, armature gating unit			
K0100	Firing angle (armature)	16384 ≙ 0° 0 ≙ 90° -16384 ≙ 180°	G163
K0101	Firing angle (armature) before limitation	16384 ≙ 0° 0 ≙ 90° -16384 ≙ 180°	G163
K0102	Precontrol value + armature current controller output (gating unit input)	16384 ≙ 0° 0 ≙ 90° -16384 ≙ 180°	G162
K0103	$100\% * \frac{\text{duration of current flow}}{\text{time between 2 firing pulses}}$ [SW 2.0 and later]	16384 ≙ 100%	G162
K0105	Code of triggered thyristor pair in a thyristor bridge for switching through the corresponding line phase: 0 UV 2 UW 4 VW 6 VU 8 WU 10 WV	1 ≙ 1	
K0106	Selected torque direction	0 = No torque direction 1 = Torque direction I 2 = Torque direction II	G163
K0107	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 ≙ 100% of P100	G162
K0109	Internal signed actual current value (armature), averaged over the last 6 current peaks in each case	16384 ≙ 100%	G162
K0110	Current controller output (armature)	16384 ≙ 100%	G162
K0111	Current controller output, P component (armature)	16384 ≙ 100%	G162
K0112	Current controller output, I component (armature)	16384 ≙ 100%	G162
K0113	Current controller actual value/setpoint deviation (armature)	16384 ≙ 100%	G162
K0114	Internal signed actual current value (armature), averaged over one firing cycle	16384 ≙ 100%	G162
K0115	Current controller actual value (armature)	16384 ≙ 100%	G162

Connector	Description	Normalization	Function diag., Sheet
K0116	Absolute value of internal actual current (armature)	16384 ≙ 100%	G162
K0117	Internal signed actual current value (armature)	16384 ≙ 100%	G162
K0118	Current controller setpoint (armature)	16384 ≙ 100%	G162
K0119	Current controller setpoint (armature) before absolute-value generation	16384 ≙ 100%	G162
K0120	Current setpoint (armature) before reduced gear stressing	16384 ≙ 100%	G161
K0121	Precontrol output (armature)	16384 ≙ 0° 0 ≙ 90° -16384 ≙ 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 ≙ 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 ≙ 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 ≙ 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 ≙ 100%	G161
K0132	Highest negative current limit (armature)	16384 ≙ 100%	G161
K0133	Current setpoint (armature) before limitation (incl. additional setpoint)	16384 ≙ 100%	G161
K0134	Current setpoint (armature) before torque limitation	16384 ≙ 100%	G160

Torque limitation, speed limiting controller

<u>Normalization of torque connectors:</u>
An armature current corresponding to 100% of the <u>converter</u> rated DC current (r072.002) with a motor flux (K0290) corresponding to 100 % of the rated <u>motor</u> field current (P102) produces a torque of 100%.

<u>Note</u>:
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 ≙ 100%	G160
K0137	Speed limiting controller, active torque limit 2	16384 ≙ 100%	G160
K0140	Torque setpoint (after speed limiting controller)	16384 ≙ 100%	G160
K0141	Torque setpoint (after torque limitation)	16384 ≙ 100%	G160
K0142	Actual torque value	16384 ≙ 100%	G162
K0143	Upper torque limit	16384 ≙ 100%	G160
K0144	Lower torque limit	16384 ≙ 100%	G160
K0145	Torque setpoint before limitation (incl. additional setpoint)	16384 ≙ 100%	G160
K0147	Torque setpoint before limitation (without additional setpoint)	16384 ≙ 100%	G160
K0148	Torque setpoint (from speed controller)	16384 ≙ 100%	G152
K0149	Torque actual value related to P100 * P102 [SW 2.0 and later]	16384 ≙ 100%	G162

Compensation of moment of inertia (dv/dt injection)			
K0150	Component of precontrol for speed controller calculated from d(K0168)/dt * P540	16384 ≙ 100%	G153
K0152	Component of precontrol for speed controller calculated from f(K0164) * P541 (= function of speed actual value/setpoint deviation in K0164)	16384 ≙ 100%	G153

Connector	Description	Normalization	Function diag., Sheet
Speed controller			
Setpoint processing, ramp-function generator, friction and moment of inertia compensation			
K0160	Speed controller output	16384 ≙ 100%	G152
K0161	P component	16384 ≙ 100%	G152
K0162	I component	16384 ≙ 100%	G152
K0164	Setpoint/actual value deviation	16384 ≙ 100%	G152
K0165	Generation of setpoint/actual value deviation output	16384 ≙ 100%	G152
K0166	Selected actual speed value (absolute value)	16384 ≙ 100%	G152
K0167	Selected actual speed value (signed)	16384 ≙ 100%	G152
K0168	D component output * (-1)	16384 ≙ 100%	G152
K0169	D component output	16384 ≙ 100%	G152
K0170	Speed setpoint from ramp-function generator after limitation	16384 ≙ 100%	G136
K0171	Precontrol for speed controller (friction and moment of inertia compensation)	16384 ≙ 100%	G153
K0172	Component of precontrol determined by friction for speed controller	16384 ≙ 100%	G153
K0173	Filtered component of precontrol determined by moment of inertia for speed controller	16384 ≙ 100%	G153
K0174	Filtering element output for nset filtering	16384 ≙ 100%	G152
K0176	Speed droop	16384 ≙ 100%	G151
K0177	Band-stop output 1	16384 ≙ 100%	G152
K0178	Band-stop output 2	16384 ≙ 100%	G152
K0179	Filtering element output for nact filtering	16384 ≙ 100%	G152
K0181	Lowest positive setpoint limit	16384 ≙ 100%	G136
K0182	Highest negative setpoint limit	16384 ≙ 100%	G136
K0183	Speed setpoint before limitation	16384 ≙ 100%	G136
K0190	Ramp-function generator output (before speed setpoint limitation)	16384 ≙ 100%	G136
K0191	dv/dt (rise in ramp-function generator output in time period set in P542)	16384 ≙ 100%	G136
K0192	Effective ramp-function generator input variable	16384 ≙ 100%	G136
K0193	Setpoint input for ramp-function generator	16384 ≙ 100%	G135
K0194	Total of main setpoint (limited) + additional setpoint	16384 ≙ 100%	G135
K0195	Ramp-function generator input before the setpoint reduction [SW 1.6 and later]	16384 ≙ 100%	G135
K0196	Effective positive limit for main setpoint	16384 ≙ 100%	G135
K0197	Effective negative limit for main setpoint	16384 ≙ 100%	G135
K0198	Main setpoint before limitation	16384 ≙ 100%	G135

Crawling setpoint, inching setpoint, oscillation, fixed setpoint			
K0201	Crawling setpoint	16384 ≙ 100%	G130
K0202	Inching setpoint	16384 ≙ 100%	G129
K0203	Oscillation setpoint	16384 ≙ 100%	G128
K0204	Fixed setpoint	16384 ≙ 100%	G127
K0206	Crawling setpoint: Output value of function block	16384 ≙ 100%	G130
K0207	Inching setpoint: Output value of function block	16384 ≙ 100%	G129
K0208	Oscillation: Output value of function block	16384 ≙ 100%	G128
K0209	Fixed setpoint: Output value of function block	16384 ≙ 100%	G127

Connector selector switches			
K0230	Output of connector selector switch 1 [SW 1.9 and later]	1 ≙ 1	G124
K0231	Output of connector selector switch 2 [SW 1.9 and later]	1 ≙ 1	G124

Connector	Description	Normalization	Function diag., Sheet
Motorized potentiometer			
K0240	Motorized potentiometer output (setpoint from potentiometer)	16384 ≙ 100%	G126
K0241	dy/dt (rise in ramp-function generator output in time period set in P542 + P465)	16384 ≙ 100%	G126
K0242	Ramp-function generator input in motorized potentiometer (setpoint)	16384 ≙ 100%	G126
Closed-loop field current control, field gating unit			
K0250	Firing angle (field)	16384 ≙ 0° 0 ≙ 90° -16384 ≙ 180°	G166
K0251	Firing angle (field) before limitation	16384 ≙ 0° 0 ≙ 90° -16384 ≙ 180°	G166
K0252	Precontrol value + field current controller output (gating unit input)	16384 ≙ 0° 0 ≙ 90° -16384 ≙ 180°	G166
K0260	Current controller output (field)	16384 ≙ 100%	G166
K0261	Current controller P component (field)	16384 ≙ 100%	G166
K0262	Current controller I component (field)	16384 ≙ 100%	G166
K0263	Current controller setpoint/actual value deviation (field)	16384 ≙ 100%	G166
K0265	Actual value at field current controller input	16384 ≙ 100%	G166
K0266	Absolute internal actual current value (field)	16384 ≙ 100%	G166
K0268	Setpoint at field current controller input	16384 ≙ 100%	G166
K0271	Precontrol output (field)	16384 ≙ 100%	G166
Closed-loop EMF control			
K0273	Lowest positive current limit (field)	16384 ≙ 100%	G165
K0274	Lowest negative current limit (field)	16384 ≙ 100%	G165
K0275	Current controller setpoint (field) before standstill field	16384 ≙ 100%	G165
K0276	Current controller setpoint (field) before limitation	16384 ≙ 100%	G165
K0277	Current controller setpoint (field) before summing stage at limiter input	16384 ≙ 100%	G165
K0278	Precontrol value + EMF controller output	16384 ≙ 100%	G165
K0280	EMF controller output	16384 ≙ 100%	G165
K0281	P component of EMF controller	16384 ≙ 100%	G165
K0282	I component of EMF controller	16384 ≙ 100%	G165
K0283	EMF controller, setpoint/actual value deviation	16384 ≙ 100%	G165
K0284	EMF controller, setpoint/actual value deviation after droop	16384 ≙ 100%	G165
K0285	EMF controller actual value	16384 ≙ P078.001 $* \frac{3\sqrt{2}}{\pi}$	G165
K0286	Absolute value of actual EMF	16384 ≙ P078.001 $* \frac{3\sqrt{2}}{\pi}$	G165
K0287	Signed actual EMF value	16384 ≙ P078.001 $* \frac{3\sqrt{2}}{\pi}$	G165
K0288	EMF controller setpoint	16384 ≙ P078.001 $* \frac{3\sqrt{2}}{\pi}$	G165
K0289	EMF setpoint	16384 ≙ P078.001 $* \frac{3\sqrt{2}}{\pi}$	G165
K0290	Motor flux	16384 ≙ 100% 100% motor flux is reached at rated motor field current (P102)	G166
K0291	Absolute actual armature voltage	16384 ≙ P078.001 $* \frac{3\sqrt{2}}{\pi}$	

Connector	Description	Normalization	Function diag., Sheet
K0292	Signed actual armature voltage	16384 ≙ P078.001* $\frac{3\sqrt{2}}{\pi}$	
K0293	Precontrol output (EMF)	16384 ≙ 100%	G165
General connectors			
K0301	Line voltage U-V (armature)	16384 ≙ P078.001	
K0302	Line voltage V-W (armature)	16384 ≙ P078.001	
K0303	Line voltage W-U (armature)	16384 ≙ P078.001	
K0304	Line voltage (field)	16384 ≙ 400V	
K0305	Average line voltage (armature), filtered	16384 ≙ P078.001	
K0306	Line frequency	16384 ≙ 50.0Hz	
K0307	Motor power output Normalization: 16384 ≙ P100 * (P101 – P100 * P110)	see Column 2	
K0309	Calculated motor temperature rise Normalization: 16384 ≙ the overtemperature which is reached at a continuous current corresponding to the rated motor armature current	see Column 2	
K0310	Calculated thyristor temperature rise as % of maximum permissible thyristor temperature rise	16384 ≙ 100%	
K0311	Hours run [SW 1.9 and later]	1 ≙ 1h	G189
Fixed setpoints			
K0401	Fixed value 1 (P401)	16384 ≙ 100%	G120
K0402	Fixed value 2 (P402)	16384 ≙ 100%	G120
K0403	Fixed value 3 (P403)	16384 ≙ 100%	G120
K0404	Fixed value 4 (P404)	16384 ≙ 100%	G120
K0405	Fixed value 5 (P405)	16384 ≙ 100%	G120
K0406	Fixed value 6 (P406)	16384 ≙ 100%	G120
K0407	Fixed value 7 (P407)	16384 ≙ 100%	G120
K0408	Fixed value 8 (P408)	16384 ≙ 100%	G120
K0409	Fixed value 9 (P409)	16384 ≙ 100%	G120
K0410	Fixed value 10 (P410)	16384 ≙ 100%	G120
K0411	Fixed value 11 (P411)	16384 ≙ 100%	G120
K0412	Fixed value 12 (P412)	16384 ≙ 100%	G120
K0413	Fixed value 13 (P413)	16384 ≙ 100%	G120
K0414	Fixed value 14 (P414)	16384 ≙ 100%	G120
K0415	Fixed value 15 (P415)	16384 ≙ 100%	G120
K0416	Fixed value 16 (P416)	16384 ≙ 100%	G120
Start pulse for the speed controller [SW 1.7 and later]			
K0451	Fixed setting value 1 for the n controller I component	16384 ≙ 100% of P100	G150
K0452	Setting value 1 for the n controller I component, weighted	16384 ≙ 100% of P100	G150
K0453	Fixed setting value 2 for the n controller I component	16384 ≙ 100% of P100	G150
K0454	Setting value for the n controller I component	16384 ≙ 100% of P100	G150
4-step master switch [SW 1.7 and later]			
K0510	Setpoint of the 4-step master switch	16384 ≙ 100%	G125
General connectors			
K0800	Operating status (code number) with one decimal place		

Connector	Description	Normalization	Function diag., Sheet
K0801	Latest fault and alarm message Low byte: Latest alarm message If several alarms are active simultaneously, the alarm with the lowest number if displayed here. Value "0" means that no alarm is active. High byte: Latest fault message Value "0" means that no fault is active.		G189
K0810	Limitation bits The meaning of these bits is described in Section 11, Parameter List, under parameter r040.		

K0900	Optimization run, setpoint 0		
K0901	Optimization run, setpoint 1		
K0902	Optimization run, setpoint 2		
K0903	Optimization run, setpoint 3		
K0904	Optimization run, setpoint 4		

Connectors for raw data of pulse encoder evaluation			
K0910	Measuring time for speed evaluation of pulse encoder 1 corresponds to 41.6666 ns if K0912 = xxxx xx0x (divisor 1:1) 1 corresponds to 83.3333 ns if K0912 = xxxx x01x (divisor 1:2) 1 corresponds to 166.666 ns if K0912 = xxxx x11x (divisor 1:4) This value is always slightly higher than the measuring time set in P147.		G145
K0911	Number of pulses during measuring time set in K0910 The speed of the pulse encoder can be calculated from connectors K0910, K0911 and K0912 by the following equation: $n_{act}[rev/s] = \frac{K0911 * 24\,000\,000}{Pulse\ no.\ of\ encoder * Meas.\ time}$ Pulse number of encoder = 1* P141, if K0912 = xx0x xxxx (1x evaluation) Pulse number of encoder = 2* P141, if K0912 = x01x xxxx (2x evaluation) Pulse number of encoder = 4* P141, if K0912 = x11x xxxx (4x evaluation) Meas. time = 1* K0910 if K0912 =xxxx xx0x (divisor 1:1) Meas. time = 2* K0910 if K0912 =xxxx x01x (divisor 1:2) Meas. time = 4* K0910 if K0912 =xxxx x11x (divisor 1:4)		G145
K0912	Status of speed evaluation of pulse encoder xxxx xxx0 = asynchronous measurement xxxx xxx1 = (gating-pulse-)synchronized measurement xxxx xx0x = divisor 1:1 xxxx x01x = divisor 1:2 xxxx x11x = divisor 1:4 xxx0 0xxx = pulse encoder type1 (P140 = 1) xxx1 0xxx = pulse encoder type1a (P140 = 2) xxx0 1xxx = pulse encoder type2 (P140 = 3) xxx1 1xxx = pulse encoder type3 (P140 = 4) xx0x xxxx = 1x evaluation x01x xxxx = 2x evaluation x11x xxxx = 4x evaluation 0xxx xxxx = No pulse encoder error 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. 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 diag., Sheet
K0960	Time interval between averaged line synchronization time reference point and "unfiltered" zero crossing of scanned and software-filtered line voltage in 1.334 µs (when P152 = 1 to 20)	1 ≙ 1.334 µs	
K0970	Positive line zero crossing of phase U-V (as T1 instant)		
K0971	Negative line zero crossing of phase W-U (as T1 instant)		
K0972	Positive line zero crossing of phase V-W (as T1 instant)		
K0973	Negative line zero crossing of phase U-V (as T1 instant)		
K0974	Positive line zero crossing of phase W-U (as T1 instant)		
K0975	Negative line zero crossing of phase V-W (as T1 instant)		
K0976	Positive line zero crossing, field supply		
K0977	Negative line zero crossing, field supply		
K0984	Last line zero crossing used (as T1 instant) (field)		
K0985	Field firing instant (as T1 instant)		
K0986	Last line zero crossing used (as T1 instant) (armature)		
K0987	Armature firing instant (as T1 instant)		
K0988	Firing pulse cycle time (time difference between current and previous armature firing instant) in T1 increments of 1.334 µs each		

Connector	Description	Normalization	Function diag., Sheet
K0989	Information about torque direction and firing angle Nibble 0 .. Torque direction 0 = M0 (--) 1 = MI 2 = MII 9 = The master waits in M0 until all slaves have reached the RUN state Nibble 1 .. Code number for firing angle 1 = Firing angle requested by current controller+precontrol implemented 2 = Firing angle requested by current controller+precontrol was > P151. It has been implemented or limited to 165 ° 3 = Alpha-W pulse at 165° 4 = Alpha-W pulse at P151 angle setting 5 = Firing angle requested by current controller+precontrol could not be implemented due to strong pulse compression 6 = Slave connected in parallel could not adapt its computing cycle to the firing angle of the paralleling master 7 = No firing angle received from paralleling master 8 = The cycle time received from the paralleling master is too long 9 = The firing angle of the paralleling master has been implemented Nibble 2 .. Code number for requested torque direction 0: Not RUN (≥ o1.0) 1: Torque direction acc. to current setpoint K119 (==> M0, MI, MII) 2: Wait for enable from parallel drive [acc. to P165] (==> M0) 3: Firing angle of > 165 degrees requested (==> M0) 4: Additional wait time in auto-reversing stage (==> M0) 5: Output 165-degree pulse without second pulse in the old torque direction (==> MI, MII) 6: Output Alpha-W pulse (as set in P151) without second pulse in the old torque direction (==> MI, MII) 7: Torque direction request during short-circuit test of thyristor check function (==> MI) 8: Torque direction request during open circuit test of thyristor check function (==> M0, MI, MII) 9: The selected thyristor pair is disabled during thyristor check (==> M0) A: No meaning B: Torque direction of paralleling is being implemented (==> M0, MI, MII) C: Simulation operation (==> MI, MII) [SW 1.8 and later] D: The command “Fire all thyristors simultaneously“ is being executed (see also under P0176) [SW 1.8 and later] E: Output 165-degree pulse with second pulse in the old torque direction (==> MI, MII) (see also P0179) [SW 1.9 and later] F: Output Alpha-W pulse (as set in P151) with second pulse in the old torque direction (==> MI, MII) (see also P0179) [SW 1.9 and later] Nibble 3 .. Code number for zero current signal [SW 1.9 and later] 0: The "I=0" signal is not evaluated because no change in torque direction is required 1: I <> 0 2: I = 0 for less than 0.1 msec 3: I = 0 for more than 0.1 msec 4: I = 0 for more than 0.6 msec 5: Ia-act (K116) is < 1 % for more than 6 current peaks		
K0990	Current total processor capacity utilization (C167)		
K0991	Projected total processor capacity utilization (C167) for maximum line frequency (65 Hz)		
K0992	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 ≙ 1	G170
K2002	USS1 receive data, word 2	1 ≙ 1	G170
K2003	USS1 receive data, word 3	1 ≙ 1	G170
K2004	USS1 receive data, word 4	1 ≙ 1	G170
K2005	USS1 receive data, word 5	1 ≙ 1	G170
K2006	USS1 receive data, word 6	1 ≙ 1	G170
K2007	USS1 receive data, word 7	1 ≙ 1	G170
K2008	USS1 receive data, word 8	1 ≙ 1	G170
K2009	USS1 receive data, word 9	1 ≙ 1	G170
K2010	USS1 receive data, word 10	1 ≙ 1	G170
K2011	USS1 receive data, word 11	1 ≙ 1	G170
K2012	USS1 receive data, word 12	1 ≙ 1	G170
K2013	USS1 receive data, word 13	1 ≙ 1	G170
K2014	USS1 receive data, word 14	1 ≙ 1	G170
K2015	USS1 receive data, word 15	1 ≙ 1	G170
K2016	USS1 receive data, word 16	1 ≙ 1	G170
K2020	Output of binector/connector converter for G-SST1 [SW 1.4 and later]	1 ≙ 1	G170
KK2031	USS1 receive data, word 1 and 2 [SW 2.0 and later]	1 ≙ 1	G169
KK2032	USS1 receive data, word 2 and 3 [SW 2.0 and later]	1 ≙ 1	G169
KK2033	USS1 receive data, word 3 and 4 [SW 2.0 and later]	1 ≙ 1	G169
KK2034	USS1 receive data, word 4 and 5 [SW 2.0 and later]	1 ≙ 1	G169
KK2035	USS1 receive data, word 5 and 6 [SW 2.0 and later]	1 ≙ 1	G169
KK2036	USS1 receive data, word 6 and 7 [SW 2.0 and later]	1 ≙ 1	G169
KK2037	USS1 receive data, word 7 and 8 [SW 2.0 and later]	1 ≙ 1	G169
KK2038	USS1 receive data, word 8 and 9 [SW 2.0 and later]	1 ≙ 1	G169
KK2039	USS1 receive data, word 9 and 10 [SW 2.0 and later]	1 ≙ 1	G169
KK2040	USS1 receive data, word 10 and 11 [SW 2.0 and later]	1 ≙ 1	G169
KK2041	USS1 receive data, word 11 and 12 [SW 2.0 and later]	1 ≙ 1	G169
KK2042	USS1 receive data, word 12 and 13 [SW 2.0 and later]	1 ≙ 1	G169
KK2043	USS1 receive data, word 13 and 14 [SW 2.0 and later]	1 ≙ 1	G169
KK2044	USS1 receive data, word 14 and 15 [SW 2.0 and later]	1 ≙ 1	G169
KK2045	USS1 receive data, word 15 and 16 [SW 2.0 and later]	1 ≙ 1	G169

Process data exchange with 1st CB/TB			
K3001	Receive data from 1st CB/TB, word 1	1 ≙ 1	Z110
K3002	Receive data from 1st CB/TB, word 2	1 ≙ 1	Z110
K3003	Receive data from 1st CB/TB, word 3	1 ≙ 1	Z110
K3004	Receive data from 1st CB/TB, word 4	1 ≙ 1	Z110
K3005	Receive data from 1st CB/TB, word 5	1 ≙ 1	Z110
K3006	Receive data from 1st CB/TB, word 6	1 ≙ 1	Z110
K3007	Receive data from 1st CB/TB, word 7	1 ≙ 1	Z110
K3008	Receive data from 1st CB/TB, word 8	1 ≙ 1	Z110
K3009	Receive data from 1st CB/TB, word 9	1 ≙ 1	Z110
K3010	Receive data from 1st CB/TB, word 10	1 ≙ 1	Z110

Connector	Description	Normalization	Function diag., Sheet
K3011	Receive data from 1st CB/TB, word 11	1 ≙ 1	Z110
K3012	Receive data from 1st CB/TB, word 12	1 ≙ 1	Z110
K3013	Receive data from 1st CB/TB, word 13	1 ≙ 1	Z110
K3014	Receive data from 1st CB/TB, word 14	1 ≙ 1	Z110
K3015	Receive data from 1st CB/TB, word 15	1 ≙ 1	Z110
K3016	Receive data from 1st CB/TB, word 16	1 ≙ 1	Z110
K3020	Output of binector/connector converter for 1st CB/TB [SW 1.9 and later]	1 ≙ 1	Z110
KK3031	Receive data from 1st CB/TB, word 1 and 2 [SW 2.0 and later]	1 ≙ 1	Z124
KK3032	Receive data from 1st CB/TB, word 2 and 3 [SW 2.0 and later]	1 ≙ 1	Z124
KK3033	Receive data from 1st CB/TB, word 3 and 4 [SW 2.0 and later]	1 ≙ 1	Z124
KK3034	Receive data from 1st CB/TB, word 4 and 5 [SW 2.0 and later]	1 ≙ 1	Z124
KK3035	Receive data from 1st CB/TB, word 5 and 6 [SW 2.0 and later]	1 ≙ 1	Z124
KK3036	Receive data from 1st CB/TB, word 6 and 7 [SW 2.0 and later]	1 ≙ 1	Z124
KK3037	Receive data from 1st CB/TB, word 7 and 8 [SW 2.0 and later]	1 ≙ 1	Z124
KK3038	Receive data from 1st CB/TB, word 8 and 9 [SW 2.0 and later]	1 ≙ 1	Z124
KK3039	Receive data from 1st CB/TB, word 9 and 10 [SW 2.0 and later]	1 ≙ 1	Z124
KK3040	Receive data from 1st CB/TB, word 10 and 11 [SW 2.0 and later]	1 ≙ 1	Z124
KK3041	Receive data from 1st CB/TB, word 11 and 12 [SW 2.0 and later]	1 ≙ 1	Z124
KK3042	Receive data from 1st CB/TB, word 12 and 13 [SW 2.0 and later]	1 ≙ 1	Z124
KK3043	Receive data from 1st CB/TB, word 13 and 14 [SW 2.0 and later]	1 ≙ 1	Z124
KK3044	Receive data from 1st CB/TB, word 14 and 15 [SW 2.0 and later]	1 ≙ 1	Z124
KK3045	Receive data from 1st CB/TB, word 15 and 16 [SW 2.0 and later]	1 ≙ 1	Z124

SCB1 with SCI1			
K4101	SCI, slave 1, analog input 1 [SW 1.9 and later]	1 ≙ 1	Z150
K4102	SCI, slave 1, analog input 2 [SW 1.9 and later]	1 ≙ 1	Z150
K4103	SCI, slave 1, analog input 3 [SW 1.9 and later]	1 ≙ 1	Z150
K4201	SCI, slave 2, analog input 1 [SW 1.9 and later]	1 ≙ 1	Z151
K4202	SCI, slave 2, analog input 2 [SW 1.9 and later]	1 ≙ 1	Z151
K4203	SCI, slave 2, analog input 3 [SW 1.9 and later]	1 ≙ 1	Z151

Expansion boards [SW 1.5 and later]			
K5101	1st analog input of 1st plugged EB1	16384 ≙ 100%	Z112
K5102	2nd analog input of 1st plugged EB1	16384 ≙ 100%	Z112
K5103	3rd analog input of 1st plugged EB1	16384 ≙ 100%	Z112
K5104	1st analog output of 1st plugged EB1	16384 ≙ 100%	Z113
K5105	2nd analog output of 1st plugged EB1	16384 ≙ 100%	Z113
K5106	Binary inputs and outputs of 1st plugged EB1	1 ≙ 1	Z114
K5111	Analog input of 1st plugged EB2	16384 ≙ 100%	Z118
K5112	Analog output of 1st plugged EB2	16384 ≙ 100%	Z118
K5113	Binary inputs and outputs of 1st plugged EB2	1 ≙ 1	Z118
K5201	1st analog input of 2nd plugged EB1	16384 ≙ 100%	Z115
K5202	2nd analog input of 2nd plugged EB1	16384 ≙ 100%	Z115
K5203	3rd analog input of 2nd plugged EB1	16384 ≙ 100%	Z115
K5204	1st analog output of 2nd plugged EB1	16384 ≙ 100%	Z116
K5205	2nd analog output of 2nd plugged EB1	16384 ≙ 100%	Z116
K5206	Binary inputs and outputs of 2nd plugged EB1	1 ≙ 1	Z117
K5211	Analog input of 2nd plugged EB2	16384 ≙ 100%	Z119
K5212	Analog output of 2nd plugged EB2	16384 ≙ 100%	Z119

Connector	Description	Normalization	Function diag., Sheet
K5213	Binary inputs and outputs of 2nd plugged EB2	1 ≙ 1	Z119

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)			
K6001	USS2 / Peer2 receive data, word 1	1 ≙ 1	G171, G173
K6002	USS2 / Peer2 receive data, word 2	1 ≙ 1	G171, G173
K6003	USS2 / Peer2 receive data, word 3	1 ≙ 1	G171, G173
K6004	USS2 / Peer2 receive data, word 4	1 ≙ 1	G171, G173
K6005	USS2 / Peer2 receive data, word 5	1 ≙ 1	G171, G173
K6006	USS2 receive data, word 6	1 ≙ 1	G171
K6007	USS2 receive data, word 7	1 ≙ 1	G171
K6008	USS2 receive data, word 8	1 ≙ 1	G171
K6009	USS2 receive data, word 9	1 ≙ 1	G171
K6010	USS2 receive data, word 10	1 ≙ 1	G171
K6011	USS2 receive data, word 11	1 ≙ 1	G171
K6012	USS2 receive data, word 12	1 ≙ 1	G171
K6013	USS2 receive data, word 13	1 ≙ 1	G171
K6014	USS2 receive data, word 14	1 ≙ 1	G171
K6015	USS2 receive data, word 15	1 ≙ 1	G171
K6016	USS2 receive data, word 16	1 ≙ 1	G171
K6020	Output of binector/connector converter for G-SST2 [SW 1.4 and later]	1 ≙ 1	G171, G173

Paralleling interface			
K6021	Word 1 from master / Word 1 from slave with address 2	1 ≙ 1	G195
K6022	Word 2 from master / Word 2 from slave with address 2	1 ≙ 1	G195
K6023	Word 3 from master / Word 3 from slave with address 2	1 ≙ 1	G195
K6024	Word 4 from master / Word 4 from slave with address 2	1 ≙ 1	G195
K6025	Word 5 from master / Word 5 from slave with address 2	1 ≙ 1	G195
K6031	Word 1 from slave with address 3	1 ≙ 1	G195
K6032	Word 2 from slave with address 3	1 ≙ 1	G195
K6033	Word 3 from slave with address 3	1 ≙ 1	G195
K6034	Word 4 from slave with address 3	1 ≙ 1	G195
K6035	Word 5 from slave with address 3	1 ≙ 1	G195
K6041	Word 1 from slave with address 4	1 ≙ 1	G195
K6042	Word 2 from slave with address 4	1 ≙ 1	G195
K6043	Word 3 from slave with address 4	1 ≙ 1	G195
K6044	Word 4 from slave with address 4	1 ≙ 1	G195
K6045	Word 5 from slave with address 4	1 ≙ 1	G195
K6051	Word 1 from slave with address 5	1 ≙ 1	G195
K6052	Word 2 from slave with address 5	1 ≙ 1	G195
K6053	Word 3 from slave with address 5	1 ≙ 1	G195
K6054	Word 4 from slave with address 5	1 ≙ 1	G195
K6055	Word 5 from slave with address 5	1 ≙ 1	G195
K6061	Word 1 from slave with address 6	1 ≙ 1	G195
K6062	Word 2 from slave with address 6	1 ≙ 1	G195
K6063	Word 3 from slave with address 6	1 ≙ 1	G195
K6064	Word 4 from slave with address 6	1 ≙ 1	G195
K6065	Word 5 from slave with address 6	1 ≙ 1	G195

Connector	Description	Normalization	Function diag., Sheet
Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)			
KK6081	USS2 / Peer2 receive data, word 1 and 2 [SW 2.0 and later]	1 ≙ 1	G169
KK6082	USS2 / Peer2 receive data, word 2 and 3 [SW 2.0 and later]	1 ≙ 1	G169
KK6083	USS2 / Peer2 receive data, word 3 and 4 [SW 2.0 and later]	1 ≙ 1	G169
KK6084	USS2 / Peer2 receive data, word 4 and 5 [SW 2.0 and later]	1 ≙ 1	G169
KK6085	USS2 receive data, word 5 and 6 [SW 2.0 and later]	1 ≙ 1	G169
KK6086	USS2 receive data, word 6 and 7 [SW 2.0 and later]	1 ≙ 1	G169
KK6087	USS2 receive data, word 7 and 8 [SW 2.0 and later]	1 ≙ 1	G169
KK6088	USS2 receive data, word 8 and 9 [SW 2.0 and later]	1 ≙ 1	G169
KK6089	USS2 receive data, word 9 and 10 [SW 2.0 and later]	1 ≙ 1	G169
KK6090	USS2 receive data, word 10 and 11 [SW 2.0 and later]	1 ≙ 1	G169
KK6091	USS2 receive data, word 11 and 12 [SW 2.0 and later]	1 ≙ 1	G169
KK6092	USS2 receive data, word 12 and 13 [SW 2.0 and later]	1 ≙ 1	G169
KK6093	USS2 receive data, word 13 and 14 [SW 2.0 and later]	1 ≙ 1	G169
KK6094	USS2 receive data, word 14 and 15 [SW 2.0 and later]	1 ≙ 1	G169
KK6095	USS2 receive data, word 15 and 16 [SW 2.0 and later]	1 ≙ 1	G169

Process data exchange with SIMOLINK			[SW 1.5 and later]
K7001	Receive data from SIMOLINK, word 1	1 ≙ 1	Z122
K7002	Receive data from SIMOLINK, word 2	1 ≙ 1	Z122
K7003	Receive data from SIMOLINK, word 3	1 ≙ 1	Z122
K7004	Receive data from SIMOLINK, word 4	1 ≙ 1	Z122
K7005	Receive data from SIMOLINK, word 5	1 ≙ 1	Z122
K7006	Receive data from SIMOLINK, word 6	1 ≙ 1	Z122
K7007	Receive data from SIMOLINK, word 7	1 ≙ 1	Z122
K7008	Receive data from SIMOLINK, word 8	1 ≙ 1	Z122
K7009	Receive data from SIMOLINK, word 9	1 ≙ 1	Z122
K7010	Receive data from SIMOLINK, word 10	1 ≙ 1	Z122
K7011	Receive data from SIMOLINK, word 11	1 ≙ 1	Z122
K7012	Receive data from SIMOLINK, word 12	1 ≙ 1	Z122
K7013	Receive data from SIMOLINK, word 13	1 ≙ 1	Z122
K7014	Receive data from SIMOLINK, word 14	1 ≙ 1	Z122
K7015	Receive data from SIMOLINK, word 15	1 ≙ 1	Z122
K7016	Receive data from SIMOLINK, word 16	1 ≙ 1	Z122
KK7031	Receive data from SIMOLINK, word 1 and 2 [SW 2.0 and later]	1 ≙ 1	Z124
KK7032	Receive data from SIMOLINK, word 2 and 3 [SW 2.0 and later]	1 ≙ 1	Z124
KK7033	Receive data from SIMOLINK, word 3 and 4 [SW 2.0 and later]	1 ≙ 1	Z124
KK7034	Receive data from SIMOLINK, word 4 and 5 [SW 2.0 and later]	1 ≙ 1	Z124
KK7035	Receive data from SIMOLINK, word 5 and 6 [SW 2.0 and later]	1 ≙ 1	Z124
KK7036	Receive data from SIMOLINK, word 6 and 7 [SW 2.0 and later]	1 ≙ 1	Z124
KK7037	Receive data from SIMOLINK, word 7 and 8 [SW 2.0 and later]	1 ≙ 1	Z124
K7101	Receive data from SIMOLINK, special data word 1	1 ≙ 1	Z122
K7102	Receive data from SIMOLINK, special data word 2	1 ≙ 1	Z122
K7103	Receive data from SIMOLINK, special data word 3	1 ≙ 1	Z122
K7104	Receive data from SIMOLINK, special data word 4	1 ≙ 1	Z122
K7105	Receive data from SIMOLINK, special data word 5	1 ≙ 1	Z122
K7106	Receive data from SIMOLINK, special data word 6	1 ≙ 1	Z122
K7107	Receive data from SIMOLINK, special data word 7	1 ≙ 1	Z122
K7108	Receive data from SIMOLINK, special data word 8	1 ≙ 1	Z122

Connector	Description	Normalization	Function diag., Sheet
KK7131	Receive data from SIMOLINK, special data word 1 and 2 [SW 2.0 and later]	1 ≙ 1	Z124
KK7132	Receive data from SIMOLINK, special data word 2 and 3 [SW 2.0 and later]	1 ≙ 1	Z124
KK7133	Receive data from SIMOLINK, special data word 3 and 4 [SW 2.0 and later]	1 ≙ 1	Z124
KK7134	Receive data from SIMOLINK, special data word 4 and 5 [SW 2.0 and later]	1 ≙ 1	Z124
KK7135	Receive data from SIMOLINK, special data word 5 and 6 [SW 2.0 and later]	1 ≙ 1	Z124
KK7136	Receive data from SIMOLINK, special data word 6 and 7 [SW 2.0 and later]	1 ≙ 1	Z124
KK7137	Receive data from SIMOLINK, special data word 7 and 8 [SW 2.0 and later]	1 ≙ 1	Z124
Process data exchange with 2nd CB			
K8001	Receive data from 2nd CB, word 1	1 ≙ 1	Z111
K8002	Receive data from 2nd CB, word 2	1 ≙ 1	Z111
K8003	Receive data from 2nd CB, word 3	1 ≙ 1	Z111
K8004	Receive data from 2nd CB, word 4	1 ≙ 1	Z111
K8005	Receive data from 2nd CB, word 5	1 ≙ 1	Z111
K8006	Receive data from 2nd CB, word 6	1 ≙ 1	Z111
K8007	Receive data from 2nd CB, word 7	1 ≙ 1	Z111
K8008	Receive data from 2nd CB, word 8	1 ≙ 1	Z111
K8009	Receive data from 2nd CB, word 9	1 ≙ 1	Z111
K8010	Receive data from 2nd CB, word 10	1 ≙ 1	Z111
K8011	Receive data from 2nd CB, word 11	1 ≙ 1	Z111
K8012	Receive data from 2nd CB, word 12	1 ≙ 1	Z111
K8013	Receive data from 2nd CB, word 13	1 ≙ 1	Z111
K8014	Receive data from 2nd CB, word 14	1 ≙ 1	Z111
K8015	Receive data from 2nd CB, word 15	1 ≙ 1	Z111
K8016	Receive data from 2nd CB, word 16	1 ≙ 1	Z111
K8020	Output of binector/connector converter for 2nd CB [SW 1.9 and later]	1 ≙ 1	Z111
KK8031	Receive data from 2nd CB, word 1 and 2 [SW 2.0 and later]	1 ≙ 1	Z124
KK8032	Receive data from 2nd CB, word 2 and 3 [SW 2.0 and later]	1 ≙ 1	Z124
KK8033	Receive data from 2nd CB, word 3 and 4 [SW 2.0 and later]	1 ≙ 1	Z124
KK8034	Receive data from 2nd CB, word 4 and 5 [SW 2.0 and later]	1 ≙ 1	Z124
KK8035	Receive data from 2nd CB, word 5 and 6 [SW 2.0 and later]	1 ≙ 1	Z124
KK8036	Receive data from 2nd CB, word 6 and 7 [SW 2.0 and later]	1 ≙ 1	Z124
KK8037	Receive data from 2nd CB, word 7 and 8 [SW 2.0 and later]	1 ≙ 1	Z124
KK8038	Receive data from 2nd CB, word 8 and 9 [SW 2.0 and later]	1 ≙ 1	Z124
KK8039	Receive data from 2nd CB, word 9 and 10 [SW 2.0 and later]	1 ≙ 1	Z124
KK8040	Receive data from 2nd CB, word 10 and 11 [SW 2.0 and later]	1 ≙ 1	Z124
KK8041	Receive data from 2nd CB, word 11 and 12 [SW 2.0 and later]	1 ≙ 1	Z124
KK8042	Receive data from 2nd CB, word 12 and 13 [SW 2.0 and later]	1 ≙ 1	Z124
KK8043	Receive data from 2nd CB, word 13 and 14 [SW 2.0 and later]	1 ≙ 1	Z124
KK8044	Receive data from 2nd CB, word 14 and 15 [SW 2.0 and later]	1 ≙ 1	Z124
KK8045	Receive data from 2nd CB, word 15 and 16 [SW 2.0 and later]	1 ≙ 1	Z124
Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3)			
K9001	USS3 / Peer3 receive data, word 1	1 ≙ 1	G172, G174
K9002	USS3 / Peer3 receive data, word 2	1 ≙ 1	G172, G174
K9003	USS3 / Peer3 receive data, word 3	1 ≙ 1	G172, G174
K9004	USS3 / Peer3 receive data, word 4	1 ≙ 1	G172, G174
K9005	USS3 / Peer3 receive data, word 5	1 ≙ 1	G172, G174
K9006	USS3 receive data, word 6	1 ≙ 1	G172

Connector	Description	Normalization	Function diag., Sheet
K9007	USS3 receive data, word 7	1 ≙ 1	G172
K9008	USS3 receive data, word 8	1 ≙ 1	G172
K9009	USS3 receive data, word 9	1 ≙ 1	G172
K9010	USS3 receive data, word 10	1 ≙ 1	G172
K9011	USS3 receive data, word 11	1 ≙ 1	G172
K9012	USS3 receive data, word 12	1 ≙ 1	G172
K9013	USS3 receive data, word 13	1 ≙ 1	G172
K9014	USS3 receive data, word 14	1 ≙ 1	G172
K9015	USS3 receive data, word 15	1 ≙ 1	G172
K9016	USS3 receive data, word 16	1 ≙ 1	G172
K9020	Output of binector/connector converter for G-SST3 [SW 1.4 and later]	1 ≙ 1	G172, G174
KK9081	USS3 / Peer3 receive data, word 1 and 2 [SW 2.0 and later]	1 ≙ 1	G169
KK9082	USS3 / Peer3 receive data, word 2 and 3 [SW 2.0 and later]	1 ≙ 1	G169
KK9083	USS3 / Peer3 receive data, word 3 and 4 [SW 2.0 and later]	1 ≙ 1	G169
KK9084	USS3 / Peer3 receive data, word 4 and 5 [SW 2.0 and later]	1 ≙ 1	G169
KK9085	USS3 receive data, word 5 and 6 [SW 2.0 and later]	1 ≙ 1	G169
KK9086	USS3 receive data, word 6 and 7 [SW 2.0 and later]	1 ≙ 1	G169
KK9087	USS3 receive data, word 7 and 8 [SW 2.0 and later]	1 ≙ 1	G169
KK9088	USS3 receive data, word 8 and 9 [SW 2.0 and later]	1 ≙ 1	G169
KK9089	USS3 receive data, word 9 and 10 [SW 2.0 and later]	1 ≙ 1	G169
KK9090	USS2 receive data, word 10 and 11 [SW 2.0 and later]	1 ≙ 1	G169
KK9091	USS3 receive data, word 11 and 12 [SW 2.0 and later]	1 ≙ 1	G169
KK9092	USS3 receive data, word 12 and 13 [SW 2.0 and later]	1 ≙ 1	G169
KK9093	USS3 receive data, word 13 and 14 [SW 2.0 and later]	1 ≙ 1	G169
KK9094	USS3 receive data, word 14 and 15 [SW 2.0 and later]	1 ≙ 1	G169
KK9095	USS3 receive data, word 15 and 16 [SW 2.0 and later]	1 ≙ 1	G169

Technology software S00: Binector/connector converters			
K9113	Output of binector/connector converter 1 FB 13	1 ≙ 1	B121
K9114	Output of binector/connector converter 2 FB 14	1 ≙ 1	B121
K9115	Output of binector/connector converter 3 FB 15	1 ≙ 1	B121

Technology software S00: Adders / Subtracters			
K9120	Output of adder/subtracter 1 FB 20	16384 ≙ 100%	B125
K9121	Output of adder/subtracter 2 FB 21	16384 ≙ 100%	B125
K9122	Output of adder/subtracter 3 FB 22	16384 ≙ 100%	B125
K9123	Output of adder/subtracter 4 FB 23	16384 ≙ 100%	B125
K9124	Output of adder/subtracter 5 FB 24	16384 ≙ 100%	B125
K9125	Output of adder/subtracter 6 FB 25	16384 ≙ 100%	B125
K9126	Output of adder/subtracter 7 FB 26	16384 ≙ 100%	B125
K9127	Output of adder/subtracter 8 FB 27	16384 ≙ 100%	B125
K9128	Output of adder/subtracter 9 FB 28	16384 ≙ 100%	B125
K9129	Output of adder/subtracter 10 FB 29	16384 ≙ 100%	B125
K9130	Output of adder/subtracter 11 FB 30	16384 ≙ 100%	B125
K9131	Output of adder/subtracter 12 FB 31	16384 ≙ 100%	B125
K9132	Output of adder/subtracter 13 [SW 1.8 and later] FB 32	16384 ≙ 100%	B125
K9133	Output of adder/subtracter 14 [SW 1.8 and later] FB 33	16384 ≙ 100%	B125
K9134	Output of adder/subtracter 15 [SW 1.8 and later] FB 34	16384 ≙ 100%	B125

Connector	Description	Normalization	Function diag., Sheet
Technology software S00: Sign inverters, switchable sign inverters			
K9135	Output of sign inverter 1 FB 35	16384 ≙ 100%	B125
K9136	Output of sign inverter 2 FB 36	16384 ≙ 100%	B125
K9137	Output of sign inverter 3 FB 37	16384 ≙ 100%	B125
K9138	Output of sign inverter 4 FB 38	16384 ≙ 100%	B125
K9140	Output of switchable sign inverter 1 FB 40	16384 ≙ 100%	B125
K9141	Output of switchable sign inverter 2 FB 41	16384 ≙ 100%	B125

Technology software S00: Dividers, multipliers, high-resolution multipliers/dividers			
K9142	Output of divider 4 [SW 1.8 and later] FB 42	16384 ≙ 100%	B131
K9143	Output of divider 5 [SW 1.8 and later] FB 43	16384 ≙ 100%	B131
K9144	Output of divider 6 [SW 1.8 and later] FB 44	16384 ≙ 100%	B131
K9145	Output of divider 1 FB 45	16384 ≙ 100%	B131
K9146	Output of divider 2 FB 46	16384 ≙ 100%	B131
K9147	Output of divider 3 FB 47	16384 ≙ 100%	B131
K9150	Output of multiplier 1 FB 50	16384 ≙ 100%	B130
K9151	Output of multiplier 2 FB 51	16384 ≙ 100%	B130
K9152	Output of multiplier 3 FB 52	16384 ≙ 100%	B130
K9153	Output of multiplier 4 FB 53	16384 ≙ 100%	B130
K9155	Output of high-resolution multiplier/divider 1 FB 55	16384 ≙ 100%	B131
K9156	Output of high-resolution multiplier/divider 2 FB 56	16384 ≙ 100%	B131
K9157	Output of high-resolution multiplier/divider 3 FB 57	16384 ≙ 100%	B131

Technology software S00: Absolute-value generator with filter			
K9160	Output of absolute-value generator with filter 1 FB 60	16384 ≙ 100%	B135
K9161	Output of absolute-value generator with filter 2 FB 61	16384 ≙ 100%	B135
K9162	Output of absolute-value generator with filter 3 FB 62	16384 ≙ 100%	B135
K9163	Output of absolute-value generator with filter 4 FB 63	16384 ≙ 100%	B135

Technology software S00: Limiters			
K9165	Limiter 1: Fixed limiting value FB 65	16384 ≙ 100%	B135
K9166	Limiter 1: Positive limiting value * (-1) FB 65	16384 ≙ 100%	B135
K9167	Limiter 1: Output FB 65	16384 ≙ 100%	B135
K9168	Limiter 2: Fixed limiting value FB 66	16384 ≙ 100%	B135
K9169	Limiter 2: Positive limiting value * (-1) FB 66	16384 ≙ 100%	B135
K9170	Limiter 2: Output FB 66	16384 ≙ 100%	B135
K9171	Limiter 3: Fixed limiting value FB 67	16384 ≙ 100%	B135
K9172	Limiter 3: Positive limiting value * (-1) FB 67	16384 ≙ 100%	B135
K9173	Limiter 3: Output FB 67	16384 ≙ 100%	B135
K9174	Limiter 4: Fixed limiting value [SW 2.0 and later] FB 212	16384 ≙ 100%	B134
K9175	Limiter 4: Positive limiting value * (-1) [SW 2.0 and later] FB 212	16384 ≙ 100%	B134
K9176	Limiter 4: Output [SW 2.0 and later] FB 212	16384 ≙ 100%	B134
K9177	Limiter 5: Fixed limiting value [SW 2.0 and later] FB 213	16384 ≙ 100%	B134
K9178	Limiter 5: Positive limiting value * (-1) [SW 2.0 and later] FB 213	16384 ≙ 100%	B134
K9179	Limiter 5: Output [SW 2.0 and later] FB 213	16384 ≙ 100%	B134

Technology software S00: Limit-value monitor with filter			
K9180	Limit-value monitor with filter 1: Filtered input quantity FB 70	16384 ≙ 100%	B136
K9181	Limit-value monitor with filter 1: Fixed operating point FB 70	16384 ≙ 100%	B136

Connector	Description	Normalization	Function diag., Sheet
K9182	Limit-value monitor with filter 2: Filtered input quantity FB 71	16384 ≙ 100%	B136
K9183	Limit-value monitor with filter 2: Fixed operating point FB 71	16384 ≙ 100%	B136
K9184	Limit-value monitor with filter 3: Filtered input quantity FB 72	16384 ≙ 100%	B136
K9185	Limit-value monitor with filter 3: Fixed operating point FB 72	16384 ≙ 100%	B136

Technology software S00: Limit-value monitor without filter			
K9186	Limit-value monitor without filter 1: Fixed operating point FB 73	16384 ≙ 100%	B137
K9187	Limit-value monitor without filter 2: Fixed operating point FB 74	16384 ≙ 100%	B137
K9188	Limit-value monitor without filter 3: Fixed operating point FB 75	16384 ≙ 100%	B137
K9189	Limit-value monitor without filter 4: Fixed operating point FB 76	16384 ≙ 100%	B137
K9190	Limit-value monitor without filter 5: Fixed operating point FB 77	16384 ≙ 100%	B138
K9191	Limit-value monitor without filter 6: Fixed operating point FB 78	16384 ≙ 100%	B138
K9192	Limit-value monitor without filter 7: Fixed operating point FB 79	16384 ≙ 100%	B138

Technology software S00: Minimum selection, maximum selection			
K9193	Minimum selection output FB 80	16384 ≙ 100%	B140
K9194	Maximum selection output FB 81	16384 ≙ 100%	B140

Technology software S00: Tracking/storage elements			
K9195	Output of tracking/storage element 1 FB 82	16384 ≙ 100%	B145
K9196	Output of tracking/storage element 2 FB 83	16384 ≙ 100%	B145

Technology software S00: Connector memories			
K9197	Output connector memory 1 FB 84	16384 ≙ 100%	B145
K9198	Output connector memory 2 FB 85	16384 ≙ 100%	B145

Technology software S00: Connector changeover switches			
K9210	Output connector changeover switch 1 FB 90	16384 ≙ 100%	B150
K9211	Output connector changeover switch 2 FB 91	16384 ≙ 100%	B150
K9212	Output connector changeover switch 3 FB 92	16384 ≙ 100%	B150
K9213	Output connector changeover switch 4 FB 93	16384 ≙ 100%	B150
K9214	Output connector changeover switch 5 FB 94	16384 ≙ 100%	B150
K9215	Output connector changeover switch 6 FB 95	16384 ≙ 100%	B150
K9216	Output connector changeover switch 7 FB 96	16384 ≙ 100%	B150
K9217	Output connector changeover switch 8 FB 97	16384 ≙ 100%	B150
K9218	Output connector changeover switch 9 FB 98	16384 ≙ 100%	B150
K9219	Output connector changeover switch 10 FB 99	16384 ≙ 100%	B150

Technology software S00: Integrators			
K9220	Output of integrator 1 FB 100	16384 ≙ 100%	B155
K9221	Output of integrator 2 FB 101	16384 ≙ 100%	B155
K9222	Output of integrator 3 FB 102	16384 ≙ 100%	B155

Technology software S00: DT1 elements			
K9223	Output of DT1 element 1 FB 103	16384 ≙ 100%	B155
K9224	Output of DT1 element 1, inverted FB 103	16384 ≙ 100%	B155
K9225	Output of DT1 element 2 FB 104	16384 ≙ 100%	B155
K9226	Output of DT1 element 2, inverted FB 104	16384 ≙ 100%	B155
K9227	Output of DT1 element 3 FB 105	16384 ≙ 100%	B155
K9228	Output of DT1 element 3, inverted FB 105	16384 ≙ 100%	B155

Connector	Description		Normalization	Function diag., Sheet
Technology software S00: Characteristic blocks				
K9229	Output of characteristic block 1	FB 106	16384 ≙ 100%	B160
K9230	Output of characteristic block 2	FB 107	16384 ≙ 100%	B160
K9231	Output of characteristic block 3	FB 108	16384 ≙ 100%	B160
Technology software S00: Dead zones				
K9232	Output of dead zone 1	FB 109	16384 ≙ 100%	B161
K9233	Output of dead zone 2	FB 110	16384 ≙ 100%	B161
K9234	Output of dead zone 3	FB 111	16384 ≙ 100%	B161
Technology software S00: Setpoint branching				
K9235	Setpoint branching output	FB 112	16384 ≙ 100%	B161
Technology software S00: Simple ramp-function generator				
K9236	Simple ramp-function generator output	FB 113	16384 ≙ 100%	B165
Technology software S00: Technology controller				
K9240	Technology controller, signed actual value	FB 114	16384 ≙ 100%	B170
K9241	Technology controller, absolute actual value	FB 114	16384 ≙ 100%	B170
K9242	D component	FB 114	16384 ≙ 100%	B170
K9243	Technology controller, setpoint	FB 114	16384 ≙ 100%	B170
K9244	Technology controller, filtered setpoint	FB 114	16384 ≙ 100%	B170
K9245	Setpoint/actual value deviation	FB 114	16384 ≙ 100%	B170
K9246	Setpoint/actual value deviation after droop	FB 114	16384 ≙ 100%	B170
K9247	P component	FB 114	16384 ≙ 100%	B170
K9248	I component	FB 114	16384 ≙ 100%	B170
K9249	Technology controller output before limitation	FB 114	16384 ≙ 100%	B170
K9250	Positive limit for technology controller output	FB 114	16384 ≙ 100%	B170
K9251	Negative limit for technology controller output	FB 114	16384 ≙ 100%	B170
K9252	Positive limit for technology controller output * (-1)	FB 114	16384 ≙ 100%	B170
K9253	Technology controller output after limitation	FB 114	16384 ≙ 100%	B170
K9254	Technology controller output after multiplication with weighting factor	FB 114	16384 ≙ 100%	B170
Technology software S00: Speed/velocity calculator, velocity/speed calculator				
K9256	Speed/velocity calculator: Actual velocity	FB 115	16384 ≙ 100%	B190
K9257	Velocity/speed calculator: Speed setpoint	FB 115	16384 ≙ 100%	B190
Technology software S00: Variable moment of inertia	[SW 1.8 and later]			**FB 116**
K9258	Variable moment of inertia (output)		16384 ≙ 100%	B191
Technology software S00: Limiters				
K9260	Limiter 6: Fixed limiting value [SW 2.0 and later]	FB 214	16384 ≙ 100%	B134
K9261	Limiter 6: Positive limiting value * (-1) [SW 2.0 and later]	FB 214	16384 ≙ 100%	B134
K9262	Limiter 6: Output [SW 2.0 and later]	FB 214	16384 ≙ 100%	B134
Technology software S00: Connector changeover switches				
K9265	Output connector changeover switch 11 [SW 2.0 and later]	FB 196	16384 ≙ 100%	B150
K9266	Output connector changeover switch 12 [SW 2.0 and later]	FB 197	16384 ≙ 100%	B150
K9267	Output connector changeover switch 13 [SW 2.0 and later]	FB 198	16384 ≙ 100%	B150

Connector	Description	Normalization	Function diag., Sheet
K9268	Output connector changeover switch 14 [SW 2.0 and later] FB 199	16384 ≙ 100%	B150
K9269	Output connector changeover switch 15 [SW 2.0 and later] FB 229	16384 ≙ 100%	B150

Technology software S00: PI controller 1 [SW 1.8 and later]			**FB260**
K9300	Input quantity filtered	16384 ≙ 100%	B180
K9301	P component	16384 ≙ 100%	B180
K9302	I component	16384 ≙ 100%	B180
K9303	Output PI controller before limitation	16384 ≙ 100%	B180
K9304	Output PI controller after limitation	16384 ≙ 100%	B180
K9305	Positive limit for the output of the PI controller	16384 ≙ 100%	B180
K9306	Positive limit for the output of the PI controller (K9305) ∗ -1	16384 ≙ 100%	B180
K9307	Negative limit for the output of the PI controller	16384 ≙ 100%	B180

Technology software S00: PI controller 2 [SW 1.8 and later]			**FB261**
K9310	Input quantity filtered	16384 ≙ 100%	B181
K9311	P component	16384 ≙ 100%	B181
K9312	I component	16384 ≙ 100%	B181
K9313	Output PI controller before limitation	16384 ≙ 100%	B181
K9314	Output PI controller after limitation	16384 ≙ 100%	B181
K9315	Positive limit for the output of the PI controller	16384 ≙ 100%	B181
K9316	Positive limit for the output of the PI controller (K9315) ∗ -1	16384 ≙ 100%	B181
K9317	Negative limit for the output of the PI controller	16384 ≙ 100%	B181

Technology software S00: PI controller 3 [SW 1.8 and later]			**FB262**
K9320	Input quantity filtered	16384 ≙ 100%	B182
K9321	P component	16384 ≙ 100%	B182
K9322	I component	16384 ≙ 100%	B182
K9323	Output PI controller before limitation	16384 ≙ 100%	B182
K9324	Output PI controller after limitation	16384 ≙ 100%	B182
K9325	Positive limit for the output of the PI controller	16384 ≙ 100%	B182
K9326	Positive limit for the output of the PI controller (K9325) ∗ -1	16384 ≙ 100%	B182
K9327	Negative limit for the output of the PI controller	16384 ≙ 100%	B182

Technology software S00: PI controller 4 [SW 1.8 and later]			**FB263**
K9330	Input quantity filtered	16384 ≙ 100%	B183
K9331	P component	16384 ≙ 100%	B183
K9332	I component	16384 ≙ 100%	B183
K9333	Output PI controller before limitation	16384 ≙ 100%	B183
K9334	Output PI controller after limitation	16384 ≙ 100%	B183
K9335	Positive limit for the output of the PI controller	16384 ≙ 100%	B183
K9336	Positive limit for the output of the PI controller (K9335) ∗ -1	16384 ≙ 100%	B183
K9337	Negative limit for the output of the PI controller	16384 ≙ 100%	B183

Technology software S00: PI controller 5 [SW 1.8 and later]			**FB264**
K9340	Input quantity filtered	16384 ≙ 100%	B184
K9341	P component	16384 ≙ 100%	B184
K9342	I component	16384 ≙ 100%	B184
K9343	Output PI controller before limitation	16384 ≙ 100%	B184
K9344	Output PI controller after limitation	16384 ≙ 100%	B184

Connector	Description	Normalization	Function diag., Sheet
K9345	Positive limit for the output of the PI controller	16384 ≙ 100%	B184
K9346	Positive limit for the output of the PI controller (K9345) * -1	16384 ≙ 100%	B184
K9347	Negative limit for the output of the PI controller	16384 ≙ 100%	B184

Technology software S00: PI controller 6 [SW 1.8 and later]			**FB265**
K9350	Input quantity filtered	16384 ≙ 100%	B185
K9351	P component	16384 ≙ 100%	B185
K9352	I component	16384 ≙ 100%	B185
K9353	Output PI controller before limitation	16384 ≙ 100%	B185
K9354	Output PI controller after limitation	16384 ≙ 100%	B185
K9355	Positive limit for the output of the PI controller	16384 ≙ 100%	B185
K9356	Positive limit for the output of the PI controller (K9355) * -1	16384 ≙ 100%	B185
K9357	Negative limit for the output of the PI controller	16384 ≙ 100%	B185

Technology software S00: PI controller 7 [SW 1.8 and later]			**FB266**
K9360	Input quantity filtered	16384 ≙ 100%	B186
K9361	P component	16384 ≙ 100%	B186
K9362	I component	16384 ≙ 100%	B186
K9363	Output PI controller before limitation	16384 ≙ 100%	B186
K9364	Output PI controller after limitation	16384 ≙ 100%	B186
K9365	Positive limit for the output of the PI controller	16384 ≙ 100%	B186
K9366	Positive limit for the output of the PI controller (K9365) * -1	16384 ≙ 100%	B186
K9367	Negative limit for the output of the PI controller	16384 ≙ 100%	B186

Technology software S00: PI controller 8 [SW 1.8 and later]			**FB267**
K9370	Input quantity filtered	16384 ≙ 100%	B187
K9371	P component	16384 ≙ 100%	B187
K9372	I component	16384 ≙ 100%	B187
K9373	Output PI controller before limitation	16384 ≙ 100%	B187
K9374	Output PI controller after limitation	16384 ≙ 100%	B187
K9375	Positive limit for the output of the PI controller	16384 ≙ 100%	B187
K9376	Positive limit for the output of the PI controller (K9375) * -1	16384 ≙ 100%	B187
K9377	Negative limit for the output of the PI controller	16384 ≙ 100%	B187

Technology software S00: PI controller 9 [SW 1.8 and later]			**FB268**
K9380	Input quantity filtered	16384 ≙ 100%	B188
K9381	P component	16384 ≙ 100%	B188
K9382	I component	16384 ≙ 100%	B188
K9383	Output PI controller before limitation	16384 ≙ 100%	B188
K9384	Output PI controller after limitation	16384 ≙ 100%	B188
K9385	Positive limit for the output of the PI controller	16384 ≙ 100%	B188
K9386	Positive limit for the output of the PI controller (K9385) * -1	16384 ≙ 100%	B188
K9387	Negative limit for the output of the PI controller	16384 ≙ 100%	B188

Technology software S00: PI controller 10 [SW 1.8 and later]			**FB269**
K9390	Input quantity filtered	16384 ≙ 100%	B189
K9391	P component	16384 ≙ 100%	B189
K9392	I component	16384 ≙ 100%	B189
K9393	Output PI controller before limitation	16384 ≙ 100%	B189

Connector	Description	Normalization	Function diag., Sheet
K9394	Output PI controller after limitation	16384 ≙ 100%	B189
K9395	Positive limit for the output of the PI controller	16384 ≙ 100%	B189
K9396	Positive limit for the output of the PI controller (K9395) ∗ -1	16384 ≙ 100%	B189
K9397	Negative limit for the output of the PI controller	16384 ≙ 100%	B189
Technology software S00: Derivative/delay elements			
K9400	Derivative/delay element 1 output [SW 1.8 and later] FB 270	16384 ≙ 100%	B156
K9401	Derivative/delay element 2 output [SW 1.8 and later] FB 271	16384 ≙ 100%	B156
K9402	Derivative/delay element 3 output [SW 1.8 and later] FB 272	16384 ≙ 100%	B156
K9403	Derivative/delay element 4 output [SW 1.8 and later] FB 273	16384 ≙ 100%	B156
K9404	Derivative/delay element 5 output [SW 1.8 and later] FB 274	16384 ≙ 100%	B157
K9405	Derivative/delay element 6 output [SW 1.8 and later] FB 275	16384 ≙ 100%	B157
K9406	Derivative/delay element 7 output [SW 1.8 and later] FB 276	16384 ≙ 100%	B157
K9407	Derivative/delay element 8 output [SW 1.8 and later] FB 277	16384 ≙ 100%	B157
K9408	Derivative/delay element 9 output [SW 1.8 and later] FB 278	16384 ≙ 100%	B158
K9409	Derivative/delay element 10 output [SW 1.8 and later] FB 279	16384 ≙ 100%	B158
Technology software S00: Characteristic blocks			
K9410	Output characteristic block 4 [SW 1.8 and later] FB 280	16384 ≙ 100%	B160
K9411	Output characteristic block 5 [SW 1.8 and later] FB 281	16384 ≙ 100%	B160
K9412	Output characteristic block 6 [SW 1.8 and later] FB 282	16384 ≙ 100%	B160
K9413	Output characteristic block 7 [SW 1.8 and later] FB 283	16384 ≙ 100%	B160
K9414	Output characteristic block 8 [SW 1.8 and later] FB 284	16384 ≙ 100%	B160
K9415	Output characteristic block 9 [SW 1.8 and later] FB 285	16384 ≙ 100%	B160
Technology software S00: Multiplier			
K9430	Output multiplier 5 [SW 1.8 and later] FB 290	16384 ≙ 100%	B130
K9431	Output multiplier 6 [SW 1.8 and later] FB 291	16384 ≙ 100%	B130
K9432	Output multiplier 7 [SW 1.8 and later] FB 292	16384 ≙ 100%	B130
K9433	Output multiplier 8 [SW 1.8 and later] FB 293	16384 ≙ 100%	B130
K9434	Output multiplier 9 [SW 1.8 and later] FB 294	16384 ≙ 100%	B130
K9435	Output multiplier 10 [SW 1.8 and later] FB 295	16384 ≙ 100%	B130
K9436	Output multiplier 11 [SW 1.8 and later] FB 296	16384 ≙ 100%	B130
K9437	Output multiplier 12 [SW 1.8 and later] FB 297	16384 ≙ 100%	B130
S00 technology software: Software counter			
K9441	Minimum value for software counter [SW 1.9 and later] FB 89	1 ≙ 1	B196
K9442	Maximum value for software counter [SW 1.9 and later] FB 89	1 ≙ 1	B196
K9443	Setting value for software counter [SW 1.9 and later] FB 89	1 ≙ 1	B196
K9444	Start value for software counter [SW 1.9 and later] FB 89	1 ≙ 1	B196
K9445	Software counter output [SW 1.9 and later] FB 89	1 ≙ 1	B196
Technology software S00: Multiplexer			
K9450	Output multiplexer 1 [SW 1.8 and later] FB 86	16384 ≙ 100%	B195
K9451	Output multiplexer 2 [SW 1.8 and later] FB 87	16384 ≙ 100%	B195
K9452	Output multiplexer 3 [SW 1.8 and later] FB 88	16384 ≙ 100%	B195
Technology software S00: Averagers			
K9455	Output averager 1 [SW 1.8 and later] FB 16	16384 ≙ 100%	B139

Connector	Description	Normalization	Function diag., Sheet
K9456	Output averager 2 [SW 1.8 and later] FB 17	16384 ≙ 100%	B139
K9457	Output averager 3 [SW 1.8 and later] FB 18	16384 ≙ 100%	B139
K9458	Output averager 4 [SW 1.8 and later] FB 19	16384 ≙ 100%	B139

Technology software S00: Minimum selections, Maximum selections			
K9460	Output Maximum selection 2 [SW 1.8 and later] FB 174	16384 ≙ 100%	B140
K9461	Output Maximum selection 3 [SW 1.8 and later] FB 175	16384 ≙ 100%	B140
K9462	Output Maximum selection 4 [SW 1.8 and later] FB 176	16384 ≙ 100%	B140
K9463	Output Minimum selection 2 [SW 1.8 and later] FB 177	16384 ≙ 100%	B140
K9464	Output Minimum selection 3 [SW 1.8 and later] FB 178	16384 ≙ 100%	B140
K9465	Output Minimum selection 4 [SW 1.8 and later] FB 179	16384 ≙ 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 ≙ 100%	B152
KK9472	Position fixed value2 [SW 2.0 and later] FB 54	16384 ≙ 100%	B152
KK9473	Position fixed value3 [SW 2.0 and later] FB 54	16384 ≙ 100%	B152
KK9474	Position fixed value4 [SW 2.0 and later] FB 54	16384 ≙ 100%	B152
KK9481	Position actual value 1 [SW 2.0 and later] FB 54	16384 ≙ 100%	B152
KK9482	Position actual value 2 [SW 2.0 and later] FB 54	16384 ≙ 100%	B152
KK9483	Positional deviation [SW 2.0 and later] FB 54	16384 ≙ 100%	B152
K9484	Positional deviation limited [SW 2.0 and later] FB 54	16384 ≙ 100%	B152

Technology software S00: root extractor			
KK9485	Root extractor output [SW 2.0 and later] FB 58	16384 ≙ 100%	B153

S00 technology software: Adders / subtracters for double-word connectors			
KK9490	Output of 1st adder / subtracter [SW 1.9 and later] FB 48	16384* 16384 ≙ 100%	B151
K9491	Output of 1st adder / subtracter (limited) [SW 1.9 and later] FB 48	16384 ≙ 100%/16384	B151
KK9492	Output of 2nd adder / subtracter [SW 1.9 and later] FB 49	16384* 16384 ≙ 100%	B151
K9493	Output of 2nd adder / subtracter (limited) [SW 1.9 and later] FB 49	16384 ≙ 100%/16384	B151

S00 technology software: Connector type converters			
KK9498	Output of 1st connector type converter [SW 1.9 and later] FB 298	16384* 16384 ≙ 100%	B151
KK9499	Output of 2nd connector type converter [SW 1.9 and later] FB 299	16384* 16384 ≙ 100%	B151

Technology software S00: Fixed values			[SW 1.8 and later]
K9501	Fixed value 1 (U099.01) [SW 1.8 and later]	16384 ≙ 100%	B110
K9502	Fixed value 2 (U099.02) [SW 1.8 and later]	16384 ≙ 100%	B110
K9503	Fixed value 3 (U099.03) [SW 1.8 and later]	16384 ≙ 100%	B110
K9504	Fixed value 4 (U099.04) [SW 1.8 and later]	16384 ≙ 100%	B110
K9505	Fixed value 5 (U099.05) [SW 1.8 and later]	16384 ≙ 100%	B110
K9506	Fixed value 6 (U099.06) [SW 1.8 and later]	16384 ≙ 100%	B110
K9507	Fixed value 7 (U099.07) [SW 1.8 and later]	16384 ≙ 100%	B110
K9508	Fixed value 8 (U099.08) [SW 1.8 and later]	16384 ≙ 100%	B110
K9509	Fixed value 9 (U099.09) [SW 1.8 and later]	16384 ≙ 100%	B110
K9510	Fixed value 10 (U099.10) [SW 1.8 and later]	16384 ≙ 100%	B110
K9511	Fixed value 11 (U099.11) [SW 1.8 and later]	16384 ≙ 100%	B110
K9512	Fixed value 12 (U099.12) [SW 1.8 and later]	16384 ≙ 100%	B110
K9513	Fixed value 13 (U099.13) [SW 1.8 and later]	16384 ≙ 100%	B110

Connector	Description	Normalization	Function diag., Sheet
K9514	Fixed value 14 (U099.14) [SW 1.8 and later]	16384 ≙ 100%	B110
K9515	Fixed value 15 (U099.15) [SW 1.8 and later]	16384 ≙ 100%	B110
K9516	Fixed value 16 (U099.16) [SW 1.8 and later]	16384 ≙ 100%	B110
K9517	Fixed value 17 (U099.17) [SW 1.8 and later]	16384 ≙ 100%	B110
K9518	Fixed value 18 (U099.18) [SW 1.8 and later]	16384 ≙ 100%	B110
K9519	Fixed value 19 (U099.19) [SW 1.8 and later]	16384 ≙ 100%	B110
K9520	Fixed value 20 (U099.20) [SW 1.8 and later]	16384 ≙ 100%	B110
K9521	Fixed value 21 (U099.21) [SW 1.8 and later]	16384 ≙ 100%	B110
K9522	Fixed value 22 (U099.22) [SW 1.8 and later]	16384 ≙ 100%	B110
K9523	Fixed value 23 (U099.23) [SW 1.8 and later]	16384 ≙ 100%	B110
K9524	Fixed value 24 (U099.24) [SW 1.8 and later]	16384 ≙ 100%	B110
K9525	Fixed value 25 (U099.25) [SW 1.8 and later]	16384 ≙ 100%	B110
K9526	Fixed value 26 (U099.26) [SW 1.8 and later]	16384 ≙ 100%	B110
K9527	Fixed value 27 (U099.27) [SW 1.8 and later]	16384 ≙ 100%	B110
K9528	Fixed value 28 (U099.28) [SW 1.8 and later]	16384 ≙ 100%	B110
K9529	Fixed value 29 (U099.29) [SW 1.8 and later]	16384 ≙ 100%	B110
K9530	Fixed value 30 (U099.30) [SW 1.8 and later]	16384 ≙ 100%	B110
K9531	Fixed value 31 (U099.31) [SW 1.8 and later]	16384 ≙ 100%	B110
K9532	Fixed value 32 (U099.32) [SW 1.8 and later]	16384 ≙ 100%	B110
K9533	Fixed value 33 (U099.33) [SW 1.8 and later]	16384 ≙ 100%	B110
K9534	Fixed value 34 (U099.34) [SW 1.8 and later]	16384 ≙ 100%	B110
K9535	Fixed value 35 (U099.35) [SW 1.8 and later]	16384 ≙ 100%	B110
K9536	Fixed value 36 (U099.36) [SW 1.8 and later]	16384 ≙ 100%	B110
K9537	Fixed value 37 (U099.37) [SW 1.8 and later]	16384 ≙ 100%	B110
K9538	Fixed value 38 (U099.38) [SW 1.8 and later]	16384 ≙ 100%	B110
K9539	Fixed value 39 (U099.39) [SW 1.8 and later]	16384 ≙ 100%	B110
K9540	Fixed value 40 (U099.40) [SW 1.8 and later]	16384 ≙ 100%	B110
K9541	Fixed value 41 (U099.41) [SW 1.8 and later]	16384 ≙ 100%	B110
K9542	Fixed value 42 (U099.42) [SW 1.8 and later]	16384 ≙ 100%	B110
K9543	Fixed value 43 (U099.43) [SW 1.8 and later]	16384 ≙ 100%	B110
K9544	Fixed value 44 (U099.44) [SW 1.8 and later]	16384 ≙ 100%	B110
K9545	Fixed value 45 (U099.45) [SW 1.8 and later]	16384 ≙ 100%	B110
K9546	Fixed value 46 (U099.46) [SW 1.8 and later]	16384 ≙ 100%	B110
K9547	Fixed value 47 (U099.47) [SW 1.8 and later]	16384 ≙ 100%	B110
K9548	Fixed value 48 (U099.48) [SW 1.8 and later]	16384 ≙ 100%	B110
K9549	Fixed value 49 (U099.49) [SW 1.8 and later]	16384 ≙ 100%	B110
K9550	Fixed value 50 (U099.50) [SW 1.8 and later]	16384 ≙ 100%	B110
K9551	Fixed value 51 (U099.51) [SW 1.8 and later]	16384 ≙ 100%	B110
K9552	Fixed value 52 (U099.52) [SW 1.8 and later]	16384 ≙ 100%	B110
K9553	Fixed value 53 (U099.53) [SW 1.8 and later]	16384 ≙ 100%	B110
K9554	Fixed value 54 (U099.54) [SW 1.8 and later]	16384 ≙ 100%	B110
K9555	Fixed value 55 (U099.55) [SW 1.8 and later]	16384 ≙ 100%	B110
K9556	Fixed value 56 (U099.56) [SW 1.8 and later]	16384 ≙ 100%	B110
K9557	Fixed value 57 (U099.57) [SW 1.8 and later]	16384 ≙ 100%	B110
K9558	Fixed value 58 (U099.58) [SW 1.8 and later]	16384 ≙ 100%	B110
K9559	Fixed value 59 (U099.59) [SW 1.8 and later]	16384 ≙ 100%	B110
K9560	Fixed value 60 (U099.60) [SW 1.8 and later]	16384 ≙ 100%	B110
K9561	Fixed value 61 (U099.61) [SW 1.8 and later]	16384 ≙ 100%	B110

Connector	Description	Normalization	Function diag., Sheet
K9562	Fixed value 62 (U099.62) [SW 1.8 and later]	16384 ≙ 100%	B110
K9563	Fixed value 63 (U099.63) [SW 1.8 and later]	16384 ≙ 100%	B110
K9564	Fixed value 64 (U099.64) [SW 1.8 and later]	16384 ≙ 100%	B110
K9565	Fixed value 65 (U099.65) [SW 1.8 and later]	16384 ≙ 100%	B110
K9566	Fixed value 66 (U099.66) [SW 1.8 and later]	16384 ≙ 100%	B110
K9567	Fixed value 67 (U099.67) [SW 1.8 and later]	16384 ≙ 100%	B110
K9568	Fixed value 68 (U099.68) [SW 1.8 and later]	16384 ≙ 100%	B110
K9569	Fixed value 69 (U099.69) [SW 1.8 and later]	16384 ≙ 100%	B110
K9570	Fixed value 70 (U099.70) [SW 1.8 and later]	16384 ≙ 100%	B110
K9571	Fixed value 71 (U099.71) [SW 1.8 and later]	16384 ≙ 100%	B110
K9572	Fixed value 72 (U099.72) [SW 1.8 and later]	16384 ≙ 100%	B110
K9573	Fixed value 73 (U099.73) [SW 1.8 and later]	16384 ≙ 100%	B110
K9574	Fixed value 74 (U099.74) [SW 1.8 and later]	16384 ≙ 100%	B110
K9575	Fixed value 75 (U099.75) [SW 1.8 and later]	16384 ≙ 100%	B110
K9576	Fixed value 76 (U099.76) [SW 1.8 and later]	16384 ≙ 100%	B110
K9577	Fixed value 77 (U099.77) [SW 1.8 and later]	16384 ≙ 100%	B110
K9578	Fixed value 78 (U099.78) [SW 1.8 and later]	16384 ≙ 100%	B110
K9579	Fixed value 79 (U099.79) [SW 1.8 and later]	16384 ≙ 100%	B110
K9580	Fixed value 80 (U099.80) [SW 1.8 and later]	16384 ≙ 100%	B110
K9581	Fixed value 81 (U099.81) [SW 1.8 and later]	16384 ≙ 100%	B110
K9582	Fixed value 82 (U099.82) [SW 1.8 and later]	16384 ≙ 100%	B110
K9583	Fixed value 83 (U099.83) [SW 1.8 and later]	16384 ≙ 100%	B110
K9584	Fixed value 84 (U099.84) [SW 1.8 and later]	16384 ≙ 100%	B110
K9585	Fixed value 85 (U099.85) [SW 1.8 and later]	16384 ≙ 100%	B110
K9586	Fixed value 86 (U099.86) [SW 1.8 and later]	16384 ≙ 100%	B110
K9587	Fixed value 87 (U099.87) [SW 1.8 and later]	16384 ≙ 100%	B110
K9588	Fixed value 88 (U099.88) [SW 1.8 and later]	16384 ≙ 100%	B110
K9589	Fixed value 89 (U099.89) [SW 1.8 and later]	16384 ≙ 100%	B110
K9590	Fixed value 90 (U099.90) [SW 1.8 and later]	16384 ≙ 100%	B110
K9591	Fixed value 91 (U099.91) [SW 1.8 and later]	16384 ≙ 100%	B110
K9592	Fixed value 92 (U099.92) [SW 1.8 and later]	16384 ≙ 100%	B110
K9593	Fixed value 93 (U099.93) [SW 1.8 and later]	16384 ≙ 100%	B110
K9594	Fixed value 94 (U099.94) [SW 1.8 and later]	16384 ≙ 100%	B110
K9595	Fixed value 95 (U099.95) [SW 1.8 and later]	16384 ≙ 100%	B110
K9596	Fixed value 96 (U099.96) [SW 1.8 and later]	16384 ≙ 100%	B110
K9597	Fixed value 97 (U099.97) [SW 1.8 and later]	16384 ≙ 100%	B110
K9598	Fixed value 98 (U099.98) [SW 1.8 and later]	16384 ≙ 100%	B110
K9599	Fixed value 99 (U099.99) [SW 1.8 and later]	16384 ≙ 100%	B110
K9600	Fixed value 100 (U099.100) [SW 1.8 and later]	16384 ≙ 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)		

Connector	Description	Normalization	Function diag., Sheet
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
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
Fixed values		
B0000	Fixed value 0	G120
B0001	Fixed value 1	G120

Binary inputs, terminals 36 to 43		
B0010	Status of terminal 36	G110
B0011	Status of terminal 36, inverted	G110
B0012	Status of terminal 37	G110
B0013	Status of terminal 37, inverted	G110
B0014	Status of terminal 38	G110
B0015	Status of terminal 38, inverted	G110
B0016	Status of terminal 39	G110
B0017	Status of terminal 39, inverted	G110
B0018	Status of terminal 40	G111
B0019	Status of terminal 40, inverted	G111
B0020	Status of terminal 41	G111
B0021	Status of terminal 41, inverted	G111
B0022	Status of terminal 42	G111
B0023	Status of terminal 42, inverted	G111
B0024	Status of terminal 43	G111
B0025	Status of terminal 43, inverted	G111

B0032	No meaning	
B0033	No meaning	
B0034	No meaning	
B0035	No meaning	

Binary inputs, terminals 211 to 214 / motor interface		
B0040	Status of terminal 211 / Brush length monitor (binary) (0=fault)	G186
B0041	Status of terminal 211, inverted	G186
B0042	Status of terminal 212 / Bearing condition monitor (binary) (1=fault)	G186
B0043	Status of terminal 212, inverted	G186
B0044	Status of terminal 213 / Motor fan monitor (binary) (0=fault)	G186
B0045	Status of terminal 213, inverted	G186
B0046	Status of terminal 214 / Motor temperature monitor (binary) (0=fault)	G186
B0047	Status of terminal 214, inverted	G186

Analog inputs		
B0050	Analog input, terminal 4: 1 = Open circuit ($i \leq 2$ mA)	G113
B0051	Analog input, terminal 6: 1 = Open circuit ($i \leq 2$ mA)	G113

Pulse encoder evaluation		
B0052	Fault in digital speed sensing circuit	G145
B0053	Underflow of actual position value [SW 1.9 and later] 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 (= $+2^{31}-1$). Binector B0053 does not change back to 0 until connector KK0046 assumes a value other than 7FFF FFFFH (= $+2^{31}-1$) again.	G145

Binector	Name, description	Function diag., Sheet
B0054	Overrflow of actual position value [SW 1.9 and later] 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}). 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		
B0055	Position acquisition of SBP, underflow [SW 2.0 and later]	Z120
B0056	Position acquisition of SBP, overflow [SW 2.0 and later]	Z120

Monitoring of the armature currents		
B0057	Armature actual value too large (F030 triggered) [SW 2.0 and later]	G162

Status word 1		
B0100	Stat.word 1, bit 0: 0=not ready to switch on, 1=ready to switch on	G182
B0101	Stat.word 1, bit 0 inverted	G182
B0102	Stat.word 1, bit 1: 0=not ready, 1=ready (pulses disabled)	G182
B0103	Stat.word 1, bit 1 inverted	G182
B0104	Stat.word 1, bit 2: 0=pulses disabled, 1=Run (output terminals energized)	G182
B0105	Stat.word 1, bit 2 inverted	G182
B0106	Stat.word 1, bit 3: 0=no active fault, 1=active fault (pulses disabled)	G182
B0107	Stat.word 1, bit 3 inverted	G182
B0108	Stat.word 1, bit 4: 0=OFF2 active, 1=no active OFF2	G182
B0109	Stat.word 1, bit 4 inverted	G182
B0110	Stat.word 1, bit 5: 0=OFF3 active, 1=no active OFF3	G182
B0111	Stat.word 1, bit 5 inverted	G182
B0112	Stat.word 1, bit 6: 0=no starting lockout (unit can be switched on), 1=starting lockout active	G182
B0113	Stat.word 1, bit 6 inverted	G182
B0114	Stat.word 1, bit 7: 0=no active alarm, 1=alarm active	G182
B0115	Stat.word 1, bit 7 inverted	G182
B0116	Stat.word 1, bit 8: 0=setp./act. val. deviation detected, 1=no setp./act. val. deviation	G182
B0117	Stat.word 1, bit 8 inverted	G182
B0120	Stat.word 1, bit 10: 0=comparison setpoint not reached, 1=comparison setpoint reached	G182
B0121	Stat.word 1, bit 10 inverted	G182
B0122	Stat.word 1, bit 11: 0=undervoltage fault not active, 1=undervoltage fault active	G182
B0123	Stat.word 1, bit11 inverted	G182
B0124	Stat.word 1, bit 12: 0=main contactor request not active, 1=request to energize main contactor active	G182
B0125	Stat.word 1, bit 12 inverted	G182
B0126	Stat.word 1, bit 13: 0=ramp-function generator not active, 1=ramp-function generator active	G182
B0127	Stat.word 1, bit 13 inverted	G182
B0128	Stat.word 1, bit 14: 0=negative speed setpoint, 1=positive speed setpoint	G182
B0129	Stat.word 1, bit 14 inverted	G182

Status word 2		
B0136	Stat.word 2, bit 18: 0=overspeed, 1=no overspeed	G183
B0137	Stat.word 2, bit 18 inverted	G183
B0138	Stat.word 2, bit 19: 0=no external fault 1 active, 1=external fault 1 active	G183
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

Binector	Name, description	Function diag., Sheet
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 = $n < n_{min}$ [SW 1.4 and later]	G187
B0165	B0164 inverted [SW 1.4 and later]	G187
B0166	1 = Voltage at power section is active [SW 1.4 and later]	
B0167	B0166 inverted [SW 1.4 and later]	
B0168	1 = E-Stop is active [SW 1.4 and later]	G117
B0169	B0168 inverted [SW 1.4 and later]	G117
B0172	Output of "Setpoint-actual value deviation 2" signal [SW 1.9 and later]	G187
B0173	B0172 inverted [SW 1.9 and later]	G187

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 [SW 1.6 and later]		
B0184	1=Alarm motor temperature 1	G185
B0185	1=Alarm motor temperature 2	G185

Alarms [SW 1.6 and later]		
B0186	1=Alarm A037 (I2t motor) is pending	
B0187	1=Alarm A039 (I2t power section) is pending	
B0188	1=Alarm A067 (heat sink temperature) is pending	
B0189	1=Alarm A067 (device fan) is pending	

Torque limitation, current limitation, current controller, armature gating unit		
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	α_G limit reached [SW 1.8 and later]	G163
B0197	α_W limit reached [SW 1.8 and later]	G163

Binector	Name, description		Function diag., Sheet
B0198	Any positive limit (speed, torque, armature, α_G) reached	[SW 2.0 and later]	
B0199	Any positive limit (speed, torque, armature, α_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

Speed controller			
B0205	Speed controller enabling by sequencing control		G152

Setpoint processing, ramp-function generator			
B0206	Limitation after ramp-function generator (setpoint limitation) has responded		G136
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)	[SW 1.6 and later]	G136

Limit-value monitor for field current			
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

Armature gating unit			
B0220	Enabled torque direction for parallel drive		G163

Motorized potentiometer			
B0240	Motorized potentiometer output = 0 (y = 0)		G126
B0241	Ramp-up/ramp-down finished (y = x)		G126

Brake control			
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	[SW 1.5 and later]	
B0255	B0250 inverted	[SW 1.4 and later]	G140
B0256	B0251 inverted	[SW 1.5 and later]	

Field reversal			
B0260	1=Close field contactor 1 (control command for one contactor for connection of positive field direction)		G200
B0261	1=Close field contactor 2 (control command for one contactor for connection of negative field direction)		G200

Fixed control bits			
B0421	Control bit 1 (P421)		G120
B0422	Control bit 2 (P422)		G120
B0423	Control bit 3 (P423)		G120
B0424	Control bit 4 (P424)		G120
B0425	Control bit 5 (P425)		G120
B0426	Control bit 6 (P426)		G120
B0427	Control bit 7 (P427)		G120
B0428	Control bit 8 (P428)		G120

Binector	Name, description	Function diag., Sheet
Serial interface 1 (USS1 on G-SST1)		
B2030	USS1 telegram monitoring timeout - maintained signal	G170
B2031	USS1 telegram monitoring timeout - 1s pulse	G170

Serial interface 1 (USS1 on G-SST1)		
B2100	USS1 receive data, word 1, bit 0	G170
B2101	USS1 receive data, word 1, bit 1	G170
B2102	USS1 receive data, word 1, bit 2	G170
B2103	USS1 receive data, word 1, bit 3	G170
B2104	USS1 receive data, word 1, bit 4	G170
B2105	USS1 receive data, word 1, bit 5	G170
B2106	USS1 receive data, word 1, bit 6	G170
B2107	USS1 receive data, word 1, bit 7	G170
B2108	USS1 receive data, word 1, bit 8	G170
B2109	USS1 receive data, word 1, bit 9	G170
B2110	USS1 receive data, word 1, bit 10	G170
B2111	USS1 receive data, word 1, bit 11	G170
B2112	USS1 receive data, word 1, bit 12	G170
B2113	USS1 receive data, word 1, bit 13	G170
B2114	USS1 receive data, word 1, bit 14	G170
B2115	USS1 receive data, word 1, bit 15	G170
B2200	USS1 receive data, word 2, bit 0	G170
B2201	USS1 receive data, word 2, bit 1	G170
B2202	USS1 receive data, word 2, bit 2	G170
B2203	USS1 receive data, word 2, bit 3	G170
B2204	USS1 receive data, word 2, bit 4	G170
B2205	USS1 receive data, word 2, bit 5	G170
B2206	USS1 receive data, word 2, bit 6	G170
B2207	USS1 receive data, word 2, bit 7	G170
B2208	USS1 receive data, word 2, bit 8	G170
B2209	USS1 receive data, word 2, bit 9	G170
B2210	USS1 receive data, word 2, bit 10	G170
B2211	USS1 receive data, word 2, bit 11	G170
B2212	USS1 receive data, word 2, bit 12	G170
B2213	USS1 receive data, word 2, bit 13	G170
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

Binector	Name, description	Function diag., Sheet
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
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

Binector	Name, description	Function diag., Sheet
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
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

Binector	Name, description	Function diag., Sheet
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 1st CB/TB		
B3030	Fault delay timeout for 1st CB/TB - maintained signal	Z110
B3031	Fault delay timeout for 1st CB/TB - 1s pulse	Z110
B3035	Telegram failure timeout for 1st CB/TB [SW 1.9 and later]	Z110

Process data exchange with 1st CB/TB		
B3100	Receive data from 1st CB/TB, word 1, bit 0	Z110
B3101	Receive data from 1st CB/TB, word 1, bit 1	Z110
B3102	Receive data from 1st CB/TB, word 1, bit 2	Z110
B3103	Receive data from 1st CB/TB, word 1, bit 3	Z110
B3104	Receive data from 1st CB/TB, word 1, bit 4	Z110
B3105	Receive data from 1st CB/TB, word 1, bit 5	Z110
B3106	Receive data from 1st CB/TB, word 1, bit 6	Z110
B3107	Receive data from 1st CB/TB, word 1, bit 7	Z110
B3108	Receive data from 1st CB/TB, word 1, bit 8	Z110
B3109	Receive data from 1st CB/TB, word 1, bit 9	Z110
B3110	Receive data from 1st CB/TB, word 1, bit 10	Z110
B3111	Receive data from 1st CB/TB, word 1, bit 11	Z110
B3112	Receive data from 1st CB/TB, word 1, bit 12	Z110
B3113	Receive data from 1st CB/TB, word 1, bit 13	Z110
B3114	Receive data from 1st CB/TB, word 1, bit 14	Z110
B3115	Receive data from 1st CB/TB, word 1, bit 15	Z110
B3200	Receive data from 1st CB/TB, word 2, bit 0	Z110
B3201	Receive data from 1st CB/TB, word 2, bit 1	Z110
B3202	Receive data from 1st CB/TB, word 2, bit 2	Z110
B3203	Receive data from 1st CB/TB, word 2, bit 3	Z110
B3204	Receive data from 1st CB/TB, word 2, bit 4	Z110
B3205	Receive data from 1st CB/TB, word 2, bit 5	Z110
B3206	Receive data from 1st CB/TB, word 2, bit 6	Z110
B3207	Receive data from 1st CB/TB, word 2, bit 7	Z110
B3208	Receive data from 1st CB/TB, word 2, bit 8	Z110
B3209	Receive data from 1st CB/TB, word 2, bit 9	Z110
B3210	Receive data from 1st CB/TB, word 2, bit 10	Z110
B3211	Receive data from 1st CB/TB, word 2, bit 11	Z110
B3212	Receive data from 1st CB/TB, word 2, bit 12	Z110
B3213	Receive data from 1st CB/TB, word 2, bit 13	Z110
B3214	Receive data from 1st CB/TB, word 2, bit 14	Z110
B3215	Receive data from 1st CB/TB, word 2, bit 15	Z110
B3300	Receive data from 1st CB/TB, word 3, bit 0	Z110
B3301	Receive data from 1st CB/TB, word 3, bit 1	Z110
B3302	Receive data from 1st CB/TB, word 3, bit 2	Z110
B3303	Receive data from 1st CB/TB, word 3, bit 3	Z110
B3304	Receive data from 1st CB/TB, word 3, bit 4	Z110
B3305	Receive data from 1st CB/TB, word 3, bit 5	Z110
B3306	Receive data from 1st CB/TB, word 3, bit 6	Z110

Binector	Name, description	Function diag., Sheet
B3307	Receive data from 1st CB/TB, word 3, bit 7	Z110
B3308	Receive data from 1st CB/TB, word 3, bit 8	Z110
B3309	Receive data from 1st CB/TB, word 3, bit 9	Z110
B3310	Receive data from 1st CB/TB, word 3, bit 10	Z110
B3311	Receive data from 1st CB/TB, word 3, bit 11	Z110
B3312	Receive data from 1st CB/TB, word 3, bit 12	Z110
B3313	Receive data from 1st CB/TB, word 3, bit 13	Z110
B3314	Receive data from 1st CB/TB, word 3, bit 14	Z110
B3315	Receive data from 1st CB/TB, word 3, bit 15	Z110
B3400	Receive data from 1st CB/TB, word 4, bit 0	Z110
B3401	Receive data from 1st CB/TB, word 4, bit 1	Z110
B3402	Receive data from 1st CB/TB, word 4, bit 2	Z110
B3403	Receive data from 1st CB/TB, word 4, bit 3	Z110
B3404	Receive data from 1st CB/TB, word 4, bit 4	Z110
B3405	Receive data from 1st CB/TB, word 4, bit 5	Z110
B3406	Receive data from 1st CB/TB, word 4, bit 6	Z110
B3407	Receive data from 1st CB/TB, word 4, bit 7	Z110
B3408	Receive data from 1st CB/TB, word 4, bit 8	Z110
B3409	Receive data from 1st CB/TB, word 4, bit 9	Z110
B3410	Receive data from 1st CB/TB, word 4, bit 10	Z110
B3411	Receive data from 1st CB/TB, word 4, bit 11	Z110
B3412	Receive data from 1st CB/TB, word 4, bit 12	Z110
B3413	Receive data from 1st CB/TB, word 4, bit 13	Z110
B3414	Receive data from 1st CB/TB, word 4, bit 14	Z110
B3415	Receive data from 1st CB/TB, word 4, bit 15	Z110
B3500	Receive data from 1st CB/TB, word 5, bit 0	Z110
B3501	Receive data from 1st CB/TB, word 5, bit 1	Z110
B3502	Receive data from 1st CB/TB, word 5, bit 2	Z110
B3503	Receive data from 1st CB/TB, word 5, bit 3	Z110
B3504	Receive data from 1st CB/TB, word 5, bit 4	Z110
B3505	Receive data from 1st CB/TB, word 5, bit 5	Z110
B3506	Receive data from 1st CB/TB, word 5, bit 6	Z110
B3507	Receive data from 1st CB/TB, word 5, bit 7	Z110
B3508	Receive data from 1st CB/TB, word 5, bit 8	Z110
B3509	Receive data from 1st CB/TB, word 5, bit 9	Z110
B3510	Receive data from 1st CB/TB, word 5, bit 10	Z110
B3511	Receive data from 1st CB/TB, word 5, bit 11	Z110
B3512	Receive data from 1st CB/TB, word 5, bit 12	Z110
B3513	Receive data from 1st CB/TB, word 5, bit 13	Z110
B3514	Receive data from 1st CB/TB, word 5, bit 14	Z110
B3515	Receive data from 1st CB/TB, word 5, bit 15	Z110
B3600	Receive data from 1st CB/TB, word 6, bit 0	Z110
B3601	Receive data from 1st CB/TB, word 6, bit 1	Z110
B3602	Receive data from 1st CB/TB, word 6, bit 2	Z110
B3603	Receive data from 1st CB/TB, word 6, bit 3	Z110
B3604	Receive data from 1st CB/TB, word 6, bit 4	Z110
B3605	Receive data from 1st CB/TB, word 6, bit 5	Z110
B3606	Receive data from 1st CB/TB, word 6, bit 6	Z110
B3607	Receive data from 1st CB/TB, word 6, bit 7	Z110

Binector	Name, description	Function diag., Sheet
B3608	Receive data from 1st CB/TB, word 6, bit 8	Z110
B3609	Receive data from 1st CB/TB, word 6, bit 9	Z110
B3610	Receive data from 1st CB/TB, word 6, bit 10	Z110
B3611	Receive data from 1st CB/TB, word 6, bit 11	Z110
B3612	Receive data from 1st CB/TB, word 6, bit 12	Z110
B3613	Receive data from 1st CB/TB, word 6, bit 13	Z110
B3614	Receive data from 1st CB/TB, word 6, bit 14	Z110
B3615	Receive data from 1st CB/TB, word 6, bit 15	Z110
B3700	Receive data from 1st CB/TB, word 7, bit 0	Z110
B3701	Receive data from 1st CB/TB, word 7, bit 1	Z110
B3702	Receive data from 1st CB/TB, word 7, bit 2	Z110
B3703	Receive data from 1st CB/TB, word 7, bit 3	Z110
B3704	Receive data from 1st CB/TB, word 7, bit 4	Z110
B3705	Receive data from 1st CB/TB, word 7, bit 5	Z110
B3706	Receive data from 1st CB/TB, word 7, bit 6	Z110
B3707	Receive data from 1st CB/TB, word 7, bit 7	Z110
B3708	Receive data from 1st CB/TB, word 7, bit 8	Z110
B3709	Receive data from 1st CB/TB, word 7, bit 9	Z110
B3710	Receive data from 1st CB/TB, word 7, bit 10	Z110
B3711	Receive data from 1st CB/TB, word 7, bit 11	Z110
B3712	Receive data from 1st CB/TB, word 7, bit 12	Z110
B3713	Receive data from 1st CB/TB, word 7, bit 13	Z110
B3714	Receive data from 1st CB/TB, word 7, bit 14	Z110
B3715	Receive data from 1st CB/TB, word 7, bit 15	Z110
B3800	Receive data from 1st CB/TB, word 8, bit 0	Z110
B3801	Receive data from 1st CB/TB, word 8, bit 1	Z110
B3802	Receive data from 1st CB/TB, word 8, bit 2	Z110
B3803	Receive data from 1st CB/TB, word 8, bit 3	Z110
B3804	Receive data from 1st CB/TB, word 8, bit 4	Z110
B3805	Receive data from 1st CB/TB, word 8, bit 5	Z110
B3806	Receive data from 1st CB/TB, word 8, bit 6	Z110
B3807	Receive data from 1st CB/TB, word 8, bit 7	Z110
B3808	Receive data from 1st CB/TB, word 8, bit 8	Z110
B3809	Receive data from 1st CB/TB, word 8, bit 9	Z110
B3810	Receive data from 1st CB/TB, word 8, bit 10	Z110
B3811	Receive data from 1st CB/TB, word 8, bit 11	Z110
B3812	Receive data from 1st CB/TB, word 8, bit 12	Z110
B3813	Receive data from 1st CB/TB, word 8, bit 13	Z110
B3814	Receive data from 1st CB/TB, word 8, bit 14	Z110
B3815	Receive data from 1st CB/TB, word 8, bit 15	Z110
B3900	Receive data from 1st CB/TB, word 9, bit 0	Z110
B3901	Receive data from 1st CB/TB, word 9, bit 1	Z110
B3902	Receive data from 1st CB/TB, word 9, bit 2	Z110
B3903	Receive data from 1st CB/TB, word 9, bit 3	Z110
B3904	Receive data from 1st CB/TB, word 9, bit 4	Z110
B3905	Receive data from 1st CB/TB, word 9, bit 5	Z110
B3906	Receive data from 1st CB/TB, word 9, bit 6	Z110
B3907	Receive data from 1st CB/TB, word 9, bit 7	Z110
B3908	Receive data from 1st CB/TB, word 9, bit 8	Z110

Binector	Name, description	Function diag., Sheet
B3909	Receive data from 1st CB/TB, word 9, bit 9	Z110
B3910	Receive data from 1st CB/TB, word 9, bit 10	Z110
B3911	Receive data from 1st CB/TB, word 9, bit 11	Z110
B3912	Receive data from 1st CB/TB, word 9, bit 12	Z110
B3913	Receive data from 1st CB/TB, word 9, bit 13	Z110
B3914	Receive data from 1st CB/TB, word 9, bit 14	Z110
B3915	Receive data from 1st 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
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

Binector	Name, description		Function diag., Sheet
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		[SW 1.5 and later]
B5101	Analog input terminal 50 / 51: 1 = wire break (i ≤ 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
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		[SW 1.5 and later]
B5121	Analog input terminal 49 / 50: 1 = wire break (i ≤ 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

Binector	Name, description	Function diag., Sheet
B5125	State terminal 54 (digital input)	Z118

Optional supplementary boards: 2nd expansion board EB1	[SW 1.5 and later]	
B5201	Analog input terminal 50 / 51: 1 = wire break (i ≤ 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: 2nd Expansion board EB2	[SW 1.5 and later]	
B5221	Analog input terminal 49 / 50: 1 = wire break (i ≤ 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

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)		
B6100	USS2 / Peer2 receive data, word 1, bit 0	G171, G173
B6101	USS2 / Peer2 receive data, word 1, bit 1	G171, G173
B6102	USS2 / Peer2 receive data, word 1, bit 2	G171, G173
B6103	USS2 / Peer2 receive data, word 1, bit 3	G171, G173
B6104	USS2 / Peer2 receive data, word 1, bit 4	G171, G173
B6105	USS2 / Peer2 receive data, word 1, bit 5	G171, G173
B6106	USS2 / Peer2 receive data, word 1, bit 6	G171, G173
B6107	USS2 / Peer2 receive data, word 1, bit 7	G171, G173
B6108	USS2 / Peer2 receive data, word 1, bit 8	G171, G173
B6109	USS2 / Peer2 receive data, word 1, bit 9	G171, G173
B6110	USS2 / Peer2 receive data, word 1, bit 10	G171, G173
B6111	USS2 / Peer2 receive data, word 1, bit 11	G171, G173
B6112	USS2 / Peer2 receive data, word 1, bit 12	G171, G173

Binector	Name, description	Function diag., Sheet
B6113	USS2 / Peer2 receive data, word 1, bit 13	G171, G173
B6114	USS2 / Peer2 receive data, word 1, bit 14	G171, G173
B6115	USS2 / Peer2 receive data, word 1, bit 15	G171, G173
B6200	USS2 / Peer2 receive data, word 2, bit 0	G171, G173
B6201	USS2 / Peer2 receive data, word 2, bit 1	G171, G173
B6202	USS2 / Peer2 receive data, word 2, bit 2	G171, G173
B6203	USS2 / Peer2 receive data, word 2, bit 3	G171, G173
B6204	USS2 / Peer2 receive data, word 2, bit 4	G171, G173
B6205	USS2 / Peer2 receive data, word 2, bit 5	G171, G173
B6206	USS2 / Peer2 receive data, word 2, bit 6	G171, G173
B6207	USS2 / Peer2 receive data, word 2, bit 7	G171, G173
B6208	USS2 / Peer2 receive data, word 2, bit 8	G171, G173
B6209	USS2 / Peer2 receive data, word 2, bit 9	G171, G173
B6210	USS2 / Peer2 receive data, word 2, bit 10	G171, G173
B6211	USS2 / Peer2 receive data, word 2, bit 11	G171, G173
B6212	USS2 / Peer2 receive data, word 2, bit 12	G171, G173
B6213	USS2 / Peer2 receive data, word 2, bit 13	G171, G173
B6214	USS2 / Peer2 receive data, word 2, bit 14	G171, G173
B6215	USS2 / Peer2 receive data, word 2, bit 15	G171, G173

Paralleling interface		
B6220	Word 1 from master / Word 1 from slave with address 2, bit 0	G195
B6221	Word 1 from master / Word 1 from slave with address 2, bit 1	G195
B6222	Word 1 from master / Word 1 from slave with address 2, bit 2	G195
B6223	Word 1 from master / Word 1 from slave with address 2, bit 3	G195
B6224	Word 1 from master / Word 1 from slave with address 2, bit 4	G195
B6225	Word 1 from master / Word 1 from slave with address 2, bit 5	G195
B6226	Word 1 from master / Word 1 from slave with address 2, bit 6	G195
B6227	Word 1 from master / Word 1 from slave with address 2, bit 7	G195
B6228	Word 1 from master / Word 1 from slave with address 2, bit 8	G195
B6229	Word 1 from master / Word 1 from slave with address 2, bit 9	G195
B6230	Word 1 from master / Word 1 from slave with address 2, bit 10	G195
B6231	Word 1 from master / Word 1 from slave with address 2, bit 11	G195
B6232	Word 1 from master / Word 1 from slave with address 2, bit 12	G195
B6233	Word 1 from master / Word 1 from slave with address 2, bit 13	G195
B6234	Word 1 from master / Word 1 from slave with address 2, bit 14	G195
B6235	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)		
B6300	USS2 / Peer2 receive data, word 3, bit 0	G171, G173
B6301	USS2 / Peer2 receive data, word 3, bit 1	G171, G173
B6302	USS2 / Peer2 receive data, word 3, bit 2	G171, G173
B6303	USS2 / Peer2 receive data, word 3, bit 3	G171, G173
B6304	USS2 / Peer2 receive data, word 3, bit 4	G171, G173
B6305	USS2 / Peer2 receive data, word 3, bit 5	G171, G173
B6306	USS2 / Peer2 receive data, word 3, bit 6	G171, G173
B6307	USS2 / Peer2 receive data, word 3, bit 7	G171, G173
B6308	USS2 / Peer2 receive data, word 3, bit 8	G171, G173
B6309	USS2 / Peer2 receive data, word 3, bit 9	G171, G173

Binector	Name, description	Function diag., Sheet
B6310	USS2 / Peer2 receive data, word 3, bit 10	G171, G173
B6311	USS2 / Peer2 receive data, word 3, bit 11	G171, G173
B6312	USS2 / Peer2 receive data, word 3, bit 12	G171, G173
B6313	USS2 / Peer2 receive data, word 3, bit 13	G171, G173
B6314	USS2 / Peer2 receive data, word 3, bit 14	G171, G173
B6315	USS2 / Peer2 receive data, word 3, bit 15	G171, G173

Paralleling interface		
B6320	Word 1 from slave with address 3, bit 0	G195
B6321	Word 1 from slave with address 3, bit 1	G195
B6322	Word 1 from slave with address 3, bit 2	G195
B6323	Word 1 from slave with address 3, bit 3	G195
B6324	Word 1 from slave with address 3, bit 4	G195
B6325	Word 1 from slave with address 3, bit 5	G195
B6326	Word 1 from slave with address 3, bit 6	G195
B6327	Word 1 from slave with address 3, bit 7	G195
B6328	Word 1 from slave with address 3, bit 8	G195
B6329	Word 1 from slave with address 3, bit 9	G195
B6330	Word 1 from slave with address 3, bit 10	G195
B6331	Word 1 from slave with address 3, bit 11	G195
B6332	Word 1 from slave with address 3, bit 12	G195
B6333	Word 1 from slave with address 3, bit 13	G195
B6334	Word 1 from slave with address 3, bit 14	G195
B6335	Word 1 from slave with address 3, bit 15	G195

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)		
B6400	USS2 / Peer2 receive data, word 4, bit 0	G171, G173
B6401	USS2 / Peer2 receive data, word 4, bit 1	G171, G173
B6402	USS2 / Peer2 receive data, word 4, bit 2	G171, G173
B6403	USS2 / Peer2 receive data, word 4, bit 3	G171, G173
B6404	USS2 / Peer2 receive data, word 4, bit 4	G171, G173
B6405	USS2 / Peer2 receive data, word 4, bit 5	G171, G173
B6406	USS2 / Peer2 receive data, word 4, bit 6	G171, G173
B6407	USS2 / Peer2 receive data, word 4, bit 7	G171, G173
B6408	USS2 / Peer2 receive data, word 4, bit 8	G171, G173
B6409	USS2 / Peer2 receive data, word 4, bit 9	G171, G173
B6410	USS2 / Peer2 receive data, word 4, bit 10	G171, G173
B6411	USS2 / Peer2 receive data, word 4, bit 11	G171, G173
B6412	USS2 / Peer2 receive data, word 4, bit 12	G171, G173
B6413	USS2 / Peer2 receive data, word 4, bit 13	G171, G173
B6414	USS2 / Peer2 receive data, word 4, bit 14	G171, G173
B6415	USS2 / Peer2 receive data, word 4, bit 15	G171, G173

Paralleling interface		
B6420	Word 1 from slave with address 4, bit 0	G195
B6421	Word 1 from slave with address 4, bit 1	G195
B6422	Word 1 from slave with address 4, bit 2	G195
B6423	Word 1 from slave with address 4, bit 3	G195
B6424	Word 1 from slave with address 4, bit 4	G195

Binector	Name, description	Function diag., Sheet
B6425	Word 1 from slave with address 4, bit 5	G195
B6426	Word 1 from slave with address 4, bit 6	G195
B6427	Word 1 from slave with address 4, bit 7	G195
B6428	Word 1 from slave with address 4, bit 8	G195
B6429	Word 1 from slave with address 4, bit 9	G195
B6430	Word 1 from slave with address 4, bit 10	G195
B6431	Word 1 from slave with address 4, bit 11	G195
B6432	Word 1 from slave with address 4, bit 12	G195
B6433	Word 1 from slave with address 4, bit 13	G195
B6434	Word 1 from slave with address 4, bit 14	G195
B6435	Word 1 from slave with address 4, bit 15	G195

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)		
B6500	USS2 / Peer2 receive data, word 5, bit 0	G171, G173
B6501	USS2 / Peer2 receive data, word 5, bit 1	G171, G173
B6502	USS2 / Peer2 receive data, word 5, bit 2	G171, G173
B6503	USS2 / Peer2 receive data, word 5, bit 3	G171, G173
B6504	USS2 / Peer2 receive data, word 5, bit 4	G171, G173
B6505	USS2 / Peer2 receive data, word 5, bit 5	G171, G173
B6506	USS2 / Peer2 receive data, word 5, bit 6	G171, G173
B6507	USS2 / Peer2 receive data, word 5, bit 7	G171, G173
B6508	USS2 / Peer2 receive data, word 5, bit 8	G171, G173
B6509	USS2 / Peer2 receive data, word 5, bit 9	G171, G173
B6510	USS2 / Peer2 receive data, word 5, bit 10	G171, G173
B6511	USS2 / Peer2 receive data, word 5, bit 11	G171, G173
B6512	USS2 / Peer2 receive data, word 5, bit 12	G171, G173
B6513	USS2 / Peer2 receive data, word 5, bit 13	G171, G173
B6514	USS2 / Peer2 receive data, word 5, bit 14	G171, G173
B6515	USS2 / Peer2 receive data, word 5, bit 15	G171, G173

Paralleling interface		
B6520	Word 1 from slave with address 5, bit 0	G195
B6521	Word 1 from slave with address 5, bit 1	G195
B6522	Word 1 from slave with address 5, bit 2	G195
B6523	Word 1 from slave with address 5, bit 3	G195
B6524	Word 1 from slave with address 5, bit 4	G195
B6525	Word 1 from slave with address 5, bit 5	G195
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

Binector	Name, description	Function diag., Sheet
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
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

Binector	Name, description	Function diag., Sheet
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		[SW 1.5 and later]
B7000	State terminal 74 / 75 (check track)	Z120
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		[SW 1.5 and later]
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

Binector	Name, description	Function diag., Sheet
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
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

Binector	Name, description	Function diag., Sheet
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
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

Binector	Name, description	Function diag., Sheet
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
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 2nd CB		
B8030	Fault delay timeout for 2nd CB - maintained signal	Z111
B8031	Fault delay timeout for 2nd CB - 1s pulse	Z111
B8035	Telegram failure timeout for 2nd CB [SW 1.9 and later]	Z111

Binector	Name, description	Function diag., Sheet
Process data exchange with 2^{nd} CB		
B8100	Receive data from 2^{nd} CB, word 1, bit 0	Z111
B8101	Receive data from 2^{nd} CB, word 1, bit 1	Z111
B8102	Receive data from 2^{nd} CB, word 1, bit 2	Z111
B8103	Receive data from 2^{nd} CB, word 1, bit 3	Z111
B8104	Receive data from 2^{nd} CB, word 1, bit 4	Z111
B8105	Receive data from 2^{nd} CB, word 1, bit 5	Z111
B8106	Receive data from 2^{nd} CB, word 1, bit 6	Z111
B8107	Receive data from 2^{nd} CB, word 1, bit 7	Z111
B8108	Receive data from 2^{nd} CB, word 1, bit 8	Z111
B8109	Receive data from 2^{nd} CB, word 1, bit 9	Z111
B8110	Receive data from 2^{nd} CB, word 1, bit 10	Z111
B8111	Receive data from 2^{nd} CB, word 1, bit 11	Z111
B8112	Receive data from 2^{nd} CB, word 1, bit 12	Z111
B8113	Receive data from 2^{nd} CB, word 1, bit 13	Z111
B8114	Receive data from 2^{nd} CB, word 1, bit 14	Z111
B8115	Receive data from 2^{nd} CB, word 1, bit 15	Z111
B8200	Receive data from 2^{nd} CB, word 2, bit 0	Z111
B8201	Receive data from 2^{nd} CB, word 2, bit 1	Z111
B8202	Receive data from 2^{nd} CB, word 2, bit 2	Z111
B8203	Receive data from 2^{nd} CB, word 2, bit 3	Z111
B8204	Receive data from 2^{nd} CB, word 2, bit 4	Z111
B8205	Receive data from 2^{nd} CB, word 2, bit 5	Z111
B8206	Receive data from 2^{nd} CB, word 2, bit 6	Z111
B8207	Receive data from 2^{nd} CB, word 2, bit 7	Z111
B8208	Receive data from 2^{nd} CB, word 2, bit 8	Z111
B8209	Receive data from 2^{nd} CB, word 2, bit 9	Z111
B8210	Receive data from 2^{nd} CB, word 2, bit 10	Z111
B8211	Receive data from 2^{nd} CB, word 2, bit 11	Z111
B8212	Receive data from 2^{nd} CB, word 2, bit 12	Z111
B8213	Receive data from 2^{nd} CB, word 2, bit 13	Z111
B8214	Receive data from 2^{nd} CB, word 2, bit 14	Z111
B8215	Receive data from 2^{nd} CB, word 2, bit 15	Z111
B8300	Receive data from 2^{nd} CB, word 3, bit 0	Z111
B8301	Receive data from 2^{nd} CB, word 3, bit 1	Z111
B8302	Receive data from 2^{nd} CB, word 3, bit 2	Z111
B8303	Receive data from 2^{nd} CB, word 3, bit 3	Z111
B8304	Receive data from 2^{nd} CB, word 3, bit 4	Z111
B8305	Receive data from 2^{nd} CB, word 3, bit 5	Z111
B8306	Receive data from 2^{nd} CB, word 3, bit 6	Z111
B8307	Receive data from 2^{nd} CB, word 3, bit 7	Z111
B8308	Receive data from 2^{nd} CB, word 3, bit 8	Z111
B8309	Receive data from 2^{nd} CB, word 3, bit 9	Z111
B8310	Receive data from 2^{nd} CB, word 3, bit 10	Z111
B8311	Receive data from 2^{nd} CB, word 3, bit 11	Z111
B8312	Receive data from 2^{nd} CB, word 3, bit 12	Z111
B8313	Receive data from 2^{nd} CB, word 3, bit 13	Z111
B8314	Receive data from 2^{nd} CB, word 3, bit 14	Z111

Binector	Name, description	Function diag., Sheet
B8315	Receive data from 2nd CB, word 3, bit 15	Z111
B8400	Receive data from 2nd CB, word 4, bit 0	Z111
B8401	Receive data from 2nd CB, word 4, bit 1	Z111
B8402	Receive data from 2nd CB, word 4, bit 2	Z111
B8403	Receive data from 2nd CB, word 4, bit 3	Z111
B8404	Receive data from 2nd CB, word 4, bit 4	Z111
B8405	Receive data from 2nd CB, word 4, bit 5	Z111
B8406	Receive data from 2nd CB, word 4, bit 6	Z111
B8407	Receive data from 2nd CB, word 4, bit 7	Z111
B8408	Receive data from 2nd CB, word 4, bit 8	Z111
B8409	Receive data from 2nd CB, word 4, bit 9	Z111
B8410	Receive data from 2nd CB, word 4, bit 10	Z111
B8411	Receive data from 2nd CB, word 4, bit 11	Z111
B8412	Receive data from 2nd CB, word 4, bit 12	Z111
B8413	Receive data from 2nd CB, word 4, bit 13	Z111
B8414	Receive data from 2nd CB, word 4, bit 14	Z111
B8415	Receive data from 2nd CB, word 4, bit 15	Z111
B8500	Receive data from 2nd CB, word 5, bit 0	Z111
B8501	Receive data from 2nd CB, word 5, bit 1	Z111
B8502	Receive data from 2nd CB, word 5, bit 2	Z111
B8503	Receive data from 2nd CB, word 5, bit 3	Z111
B8504	Receive data from 2nd CB, word 5, bit 4	Z111
B8505	Receive data from 2nd CB, word 5, bit 5	Z111
B8506	Receive data from 2nd CB, word 5, bit 6	Z111
B8507	Receive data from 2nd CB, word 5, bit 7	Z111
B8508	Receive data from 2nd CB, word 5, bit 8	Z111
B8509	Receive data from 2nd CB, word 5, bit 9	Z111
B8510	Receive data from 2nd CB, word 5, bit 10	Z111
B8511	Receive data from 2nd CB, word 5, bit 11	Z111
B8512	Receive data from 2nd CB, word 5, bit 12	Z111
B8513	Receive data from 2nd CB, word 5, bit 13	Z111
B8514	Receive data from 2nd CB, word 5, bit 14	Z111
B8515	Receive data from 2nd CB, word 5, bit 15	Z111
B8600	Receive data from 2nd CB, word 6, bit 0	Z111
B8601	Receive data from 2nd CB, word 6, bit 1	Z111
B8602	Receive data from 2nd CB, word 6, bit 2	Z111
B8603	Receive data from 2nd CB, word 6, bit 3	Z111
B8604	Receive data from 2nd CB, word 6, bit 4	Z111
B8605	Receive data from 2nd CB, word 6, bit 5	Z111
B8606	Receive data from 2nd CB, word 6, bit 6	Z111
B8607	Receive data from 2nd CB, word 6, bit 7	Z111
B8608	Receive data from 2nd CB, word 6, bit 8	Z111
B8609	Receive data from 2nd CB, word 6, bit 9	Z111
B8610	Receive data from 2nd CB, word 6, bit 10	Z111
B8611	Receive data from 2nd CB, word 6, bit 11	Z111
B8612	Receive data from 2nd CB, word 6, bit 12	Z111
B8613	Receive data from 2nd CB, word 6, bit 13	Z111
B8614	Receive data from 2nd CB, word 6, bit 14	Z111
B8615	Receive data from 2nd CB, word 6, bit 15	Z111

Binector	Name, description	Function diag., Sheet
B8700	Receive data from 2nd CB, word 7, bit 0	Z111
B8701	Receive data from 2nd CB, word 7, bit 1	Z111
B8702	Receive data from 2nd CB, word 7, bit 2	Z111
B8703	Receive data from 2nd CB, word 7, bit 3	Z111
B8704	Receive data from 2nd CB, word 7, bit 4	Z111
B8705	Receive data from 2nd CB, word 7, bit 5	Z111
B8706	Receive data from 2nd CB, word 7, bit 6	Z111
B8707	Receive data from 2nd CB, word 7, bit 7	Z111
B8708	Receive data from 2nd CB, word 7, bit 8	Z111
B8709	Receive data from 2nd CB, word 7, bit 9	Z111
B8710	Receive data from 2nd CB, word 7, bit 10	Z111
B8711	Receive data from 2nd CB, word 7, bit 11	Z111
B8712	Receive data from 2nd CB, word 7, bit 12	Z111
B8713	Receive data from 2nd CB, word 7, bit 13	Z111
B8714	Receive data from 2nd CB, word 7, bit 14	Z111
B8715	Receive data from 2nd CB, word 7, bit 15	Z111
B8800	Receive data from 2nd CB, word 8, bit 0	Z111
B8801	Receive data from 2nd CB, word 8, bit 1	Z111
B8802	Receive data from 2nd CB, word 8, bit 2	Z111
B8803	Receive data from 2nd CB, word 8, bit 3	Z111
B8804	Receive data from 2nd CB, word 8, bit 4	Z111
B8805	Receive data from 2nd CB, word 8, bit 5	Z111
B8806	Receive data from 2nd CB, word 8, bit 6	Z111
B8807	Receive data from 2nd CB, word 8, bit 7	Z111
B8808	Receive data from 2nd CB, word 8, bit 8	Z111
B8809	Receive data from 2nd CB, word 8, bit 9	Z111
B8810	Receive data from 2nd CB, word 8, bit 10	Z111
B8811	Receive data from 2nd CB, word 8, bit 11	Z111
B8812	Receive data from 2nd CB, word 8, bit 12	Z111
B8813	Receive data from 2nd CB, word 8, bit 13	Z111
B8814	Receive data from 2nd CB, word 8, bit 14	Z111
B8815	Receive data from 2nd CB, word 8, bit 15	Z111
B8900	Receive data from 2nd CB, word 9, bit 0	Z111
B8901	Receive data from 2nd CB, word 9, bit 1	Z111
B8902	Receive data from 2nd CB, word 9, bit 2	Z111
B8903	Receive data from 2nd CB, word 9, bit 3	Z111
B8904	Receive data from 2nd CB, word 9, bit 4	Z111
B8905	Receive data from 2nd CB, word 9, bit 5	Z111
B8906	Receive data from 2nd CB, word 9, bit 6	Z111
B8907	Receive data from 2nd CB, word 9, bit 7	Z111
B8908	Receive data from 2nd CB, word 9, bit 8	Z111
B8909	Receive data from 2nd CB, word 9, bit 9	Z111
B8910	Receive data from 2nd CB, word 9, bit 10	Z111
B8911	Receive data from 2nd CB, word 9, bit 11	Z111
B8912	Receive data from 2nd CB, word 9, bit 12	Z111
B8913	Receive data from 2nd CB, word 9, bit 13	Z111
B8914	Receive data from 2nd CB, word 9, bit 14	Z111
B8915	Receive data from 2nd CB, word 9, bit 15	Z111

Binector	Name, description		Function diag., Sheet
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
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

Binector	Name, description	Function diag., Sheet
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
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

Binector	Name, description	Function diag., Sheet
Technology software S00: Limit-value monitor without filter		
B9169	Limit-value monitor without filter 1: $\lvert A \rvert < B$ 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: $\lvert A \rvert < B$ 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: $\lvert A \rvert < B$ 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: $\lvert A \rvert < B$ 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: $\lvert A \rvert < B$ 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: $\lvert A \rvert < B$ 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: $\lvert A \rvert < B$ 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
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

Binector	Name, description	Function diag., Sheet
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
B9296	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)		
B9300	USS3 / Peer3 receive data, word 3, bit 0	G172, G174
B9301	USS3 / Peer3 receive data, word 3, bit 1	G172, G174
B9302	USS3 / Peer3 receive data, word 3, bit 2	G172, G174

Binector	Name, description		Function diag., Sheet
B9303	USS3 / Peer3 receive data, word 3, bit 3		G172, G174
B9304	USS3 / Peer3 receive data, word 3, bit 4		G172, G174
B9305	USS3 / Peer3 receive data, word 3, bit 5		G172, G174
B9306	USS3 / Peer3 receive data, word 3, bit 6		G172, G174
B9307	USS3 / Peer3 receive data, word 3, bit 7		G172, G174
B9308	USS3 / Peer3 receive data, word 3, bit 8		G172, G174
B9309	USS3 / Peer3 receive data, word 3, bit 9		G172, G174
B9310	USS3 / Peer3 receive data, word 3, bit 10		G172, G174
B9311	USS3 / Peer3 receive data, word 3, bit 11		G172, G174
B9312	USS3 / Peer3 receive data, word 3, bit 12		G172, G174
B9313	USS3 / Peer3 receive data, word 3, bit 13		G172, G174
B9314	USS3 / Peer3 receive data, word 3, bit 14		G172, G174
B9315	USS3 / Peer3 receive data, word 3, bit 15		G172, G174
Technology software S00: AND elements with 3 inputs each			
B9350	Output of AND element 1	FB 120	B205
B9351	Output of AND element 2	FB 121	B205
B9352	Output of AND element 3	FB 122	B205
B9353	Output of AND element 4	FB 123	B205
B9354	Output of AND element 5	FB 124	B205
B9355	Output of AND element 6	FB 125	B205
B9356	Output of AND element 7	FB 126	B205
B9357	Output of AND element 8	FB 127	B205
B9358	Output of AND element 9	FB 128	B205
B9359	Output of AND element 10	FB 129	B205
B9360	Output of AND element 11	FB 130	B205
B9361	Output of AND element 12	FB 131	B205
B9362	Output of AND element 13	FB 132	B205
B9363	Output of AND element 14	FB 133	B205
B9364	Output of AND element 15	FB 134	B205
B9365	Output of AND element 16	FB 135	B205
B9366	Output of AND element 17	FB 136	B205
B9367	Output of AND element 18	FB 137	B205
B9368	Output of AND element 19	FB 138	B205
B9369	Output of AND element 20	FB 139	B205
B9370	Output of AND element 21	FB 140	B205
B9371	Output of AND element 22	FB 141	B205
B9372	Output of AND element 23	FB 142	B205
B9373	Output of AND element 24	FB 143	B205
B9374	Output of AND element 25	FB 144	B205
B9375	Output of AND element 26	FB 145	B205
B9376	Output of AND element 27	FB 146	B205
B9377	Output of AND element 28	FB 147	B205
Technology software S00: OR elements with 3 inputs each			
B9380	Output of OR element 1	FB 150	B206
B9381	Output of OR element 2	FB 151	B206
B9382	Output of OR element 3	FB 152	B206
B9383	Output of OR element 4	FB 153	B206

Binector	Name, description		Function diag., Sheet
B9384	Output of OR element 5	FB 154	B206
B9385	Output of OR element 6	FB 155	B206
B9386	Output of OR element 7	FB 156	B206
B9387	Output of OR element 8	FB 157	B206
B9388	Output of OR element 9	FB 158	B206
B9389	Output of OR element 10	FB 159	B206
B9390	Output of OR element 11	FB 160	B206
B9391	Output of OR element 12	FB 161	B206
B9392	Output of OR element 13	FB 162	B206
B9393	Output of OR element 14	FB 163	B206
B9394	Output of OR element 15	FB 164	B206
B9395	Output of OR element 16	FB 165	B206
B9396	Output of OR element 17	FB 166	B206
B9397	Output of OR element 18	FB 167	B206
B9398	Output of OR element 19	FB 168	B206
B9399	Output of OR element 20	FB 169	B206

Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3)		
B9400	USS3 / Peer3 receive data, word 4, bit 0	G172, G174
B9401	USS3 / Peer3 receive data, word 4, bit 1	G172, G174
B9402	USS3 / Peer3 receive data, word 4, bit 2	G172, G174
B9403	USS3 / Peer3 receive data, word 4, bit 3	G172, G174
B9404	USS3 / Peer3 receive data, word 4, bit 4	G172, G174
B9405	USS3 / Peer3 receive data, word 4, bit 5	G172, G174
B9406	USS3 / Peer3 receive data, word 4, bit 6	G172, G174
B9407	USS3 / Peer3 receive data, word 4, bit 7	G172, G174
B9408	USS3 / Peer3 receive data, word 4, bit 8	G172, G174
B9409	USS3 / Peer3 receive data, word 4, bit 9	G172, G174
B9410	USS3 / Peer3 receive data, word 4, bit 10	G172, G174
B9411	USS3 / Peer3 receive data, word 4, bit 11	G172, G174
B9412	USS3 / Peer3 receive data, word 4, bit 12	G172, G174
B9413	USS3 / Peer3 receive data, word 4, bit 13	G172, G174
B9414	USS3 / Peer3 receive data, word 4, bit 14	G172, G174
B9415	USS3 / Peer3 receive data, word 4, bit 15	G172, G174

Technology software S00: Inverters			
B9450	Output of inverter 1	FB 180	B207
B9451	Output of inverter 2	FB 181	B207
B9452	Output of inverter 3	FB 182	B207
B9453	Output of inverter 4	FB 183	B207
B9454	Output of inverter 5	FB 184	B207
B9455	Output of inverter 6	FB 185	B207
B9456	Output of inverter 7	FB 186	B207
B9457	Output of inverter 8	FB 187	B207
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

Binector	Name, description		Function diag., Sheet
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
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

Binector	Name, description	Function diag., Sheet
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
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

Binector	Name, description		Function diag., Sheet
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
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

Binector	Name, description	Function diag., Sheet
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
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

Binector	Name, description	Function diag., Sheet
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 signaling 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 converter 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.

Please note the following with respect to converters with forced air cooling:

The fan bearings are designed for a service lifetime of 30000 hours. The fans should be replaced in plenty of time in order to maintain the availability of the thyristor sets.

13.1 Procedure for updating software

Step	Action	Remarks
1	Read out and write down all parameter contents. (also note software version in r060.001 and r065.001!)	**Note:** The parameter set can be transferred to a PC or programming device by means of DriveMonitor (see also Section 15).
2	Switch off electronics power supply	
3	Connect one COM port on the PC to connector X300 on the converter	**Cable order number:** 6SX7005-0AB00 (see also Section 15.3)
4	Switch on electronics power supply AND press down the UP key on the PMU of the SIMOREG converter at the same time The SIMOREG converter switches to operating state o13.0	**Note:** A software update can be started only from the PMU panel and <u>not</u> via an OP1S or the DriveMonitor system

5 Open a DOS window on the PC and enter program call:

`HEXLOAD 7001Axxx.H86 7001Bxxx.H86 COMx`

Start the program by pressing Return

The software update is performed automatically

Note:

HEXLOAD.EXE: Loading program

7001Axxx.H86 and 7001Bxxx.H86:
Data files which contain the SIMOREG software
xxx is the SW release

COMx: COM1 or COM2

6 When the software has been updated successfully, the SIMOREG switches to operating state o13.2 for approx. 1 s

The SIMOREG converter then switches to operating state o12.9 in many cases (depending on which SW version was previously installed in the converter) for approximately 15s.

Note:

The currently programmed addressed is displayed on the PMU while the update is in progress

The current status of the update routine is displayed on the PC

7 Check the checksum:
Comparison of the value of parameter r062.001 with the checksum in the Internet under menu item "Info" (see the inside page of the cover sheet of the operation instructions).

8 Was the electronics supply disconnected while Step 6 was in progress? **?**

yes:

9b Acknowledge any fault message that may appear on the SIMOREG device

10b Restore default setting (see Section 7.4)

11b Start up the converter again (see Section 7.5)
Note:
The parameter set stored in Step 1 above can be loaded from a PC or programming device by means of DriveMonitor.

no: go to step 12

12 **End**

13.2 Replacement of components

13.2.1 Replacement of fan

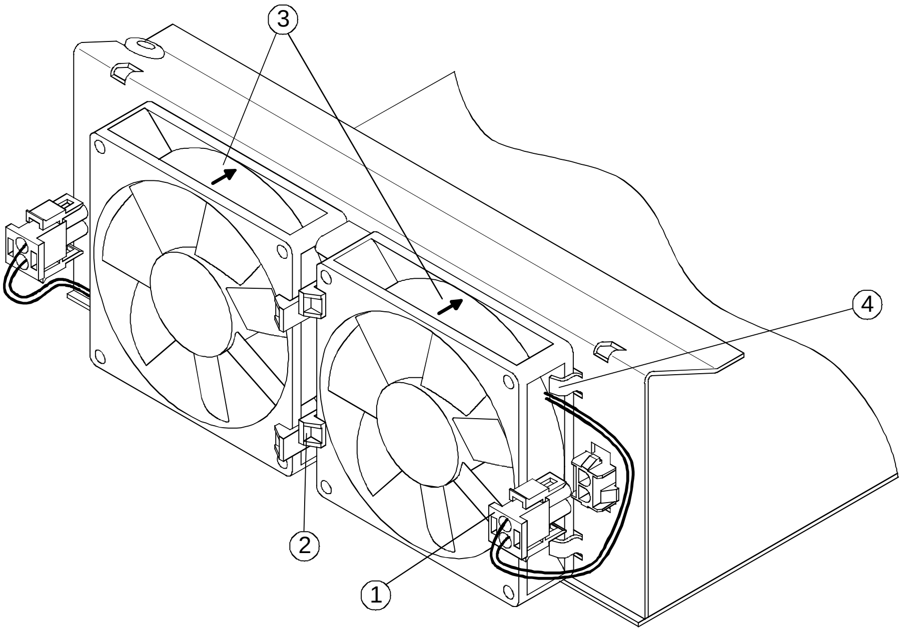
WARNING

The converter fan may be replaced only by properly qualified personnel.

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.

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

Replacement of fan on 210A to 280A converters



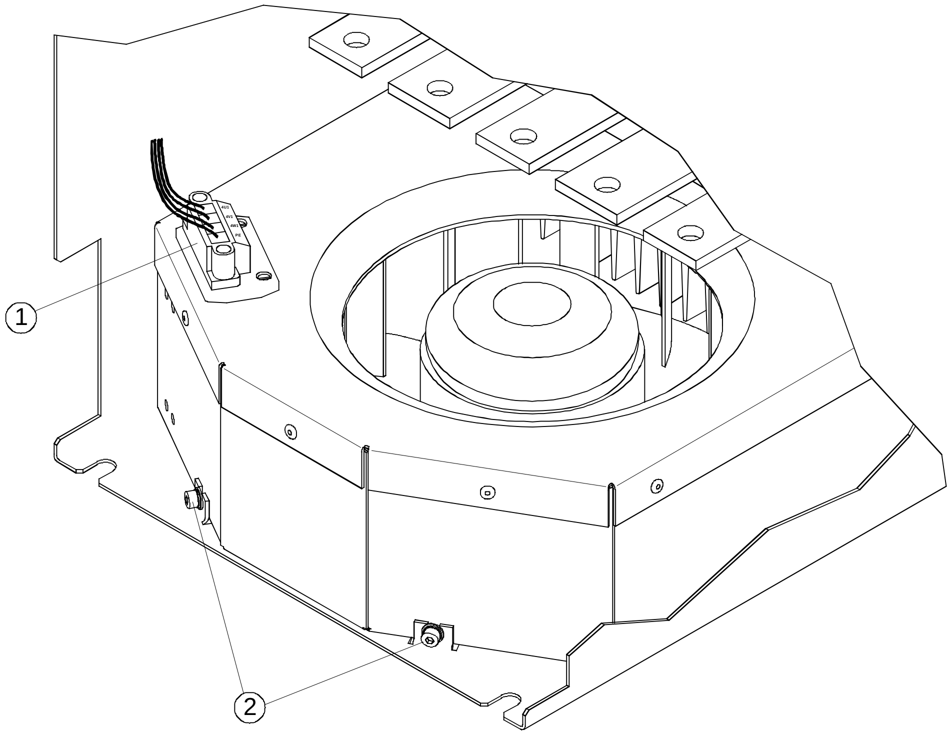
The two fans are mounted on the underside of the converter.

- Remove connector .
- Release the two retaining clips on the fan and swing fan out downwards.

Installation:

- When mounting the fan make sure it is in the correct mounting position (blowing direction upward, see arrow ③ on the fan housing).
- Insert the fan into lugs ④ and push upwards until it engages in retaining clips
- Insert connector ① again.

Replacement of fan on 400A to 850A converters



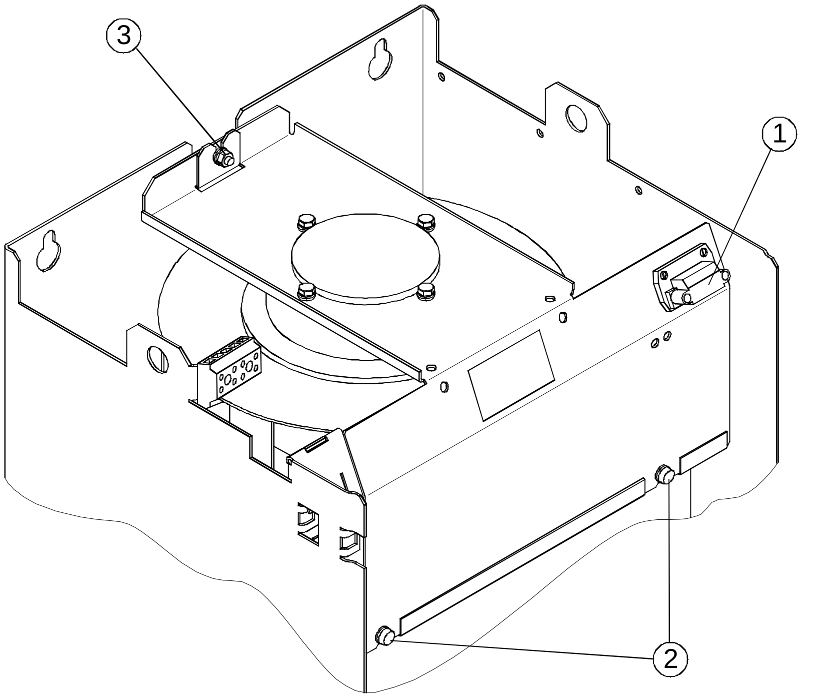
The fan is mounted on the underside of the converter.

- Remove connector ①.
- Use a T20 screwdriver to undo the two Torx screws .
- Lift the fan using the fixing straps and pull out downwards.

Installation:

- Push fan box up along the rear panel right up over the fixing clips.
- Tighten the two Torx screws with 2.5 Nm.
- Insert connector ①.

Replacement of fan on 900A to 1200A converters



The fan is mounted on top of the converter.

- Remove connector ①.
- Use a T20 screwdriver to undo the two Torx screws .
- Undo the M6 hexagonal nut ③.
- Pull fan upwards out of its guideway and then forwards to remove. Take care to protect the field module mounted on the left (risk of mechanical damage!).

Installation:

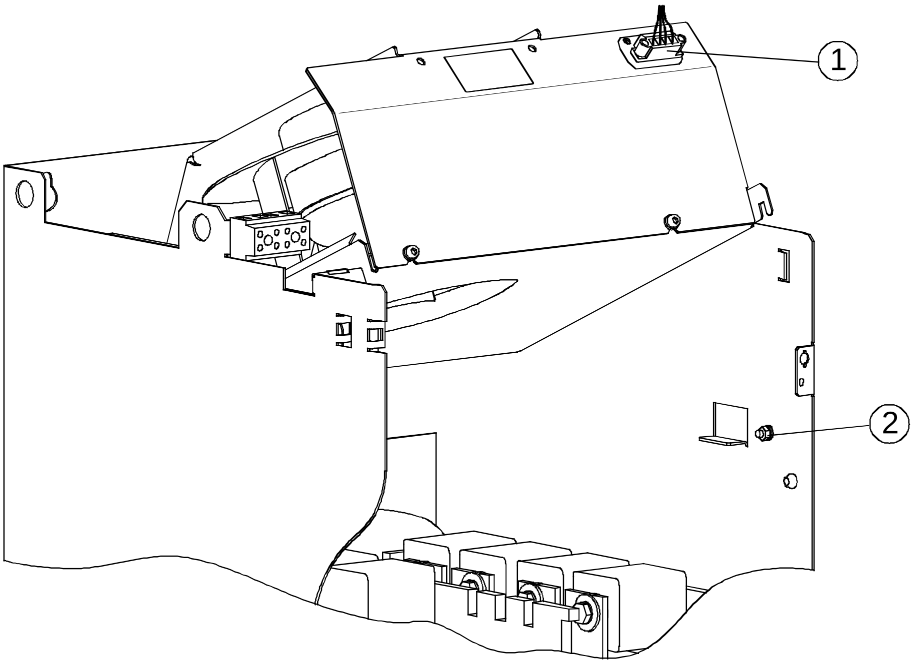
- Insert fan into guideway from above.
- Tighten the two Torx screws with 10 Nm.
- Tighten hexagonal nut M6 ③ with 10 Nm.
- Insert connector ①.

Replacement of fan on 1500A to 2200A converters

WARNING

When dismantling the fan-mounting box, please remember that it weighs 12 kg.

Non-observance of this warning can result in severe personal injury or substantial property damage.



The fan is mounted on top of the converter.

- Remove connector ①.
- Undo the M6 hexagonal nut .
- Swing fan upwards and pull it out towards you, taking care to protect the field module mounted on the left against any mechanical damage!

Installation:

- Tilting the fan from the front and upward (see Fig.), slot it into the two rear guide tabs and then tilt it downward as far as it will go.
- Tighten hexagonal nut M6 with 10 Nm.
- Insert connector ①.

13.2.2 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.

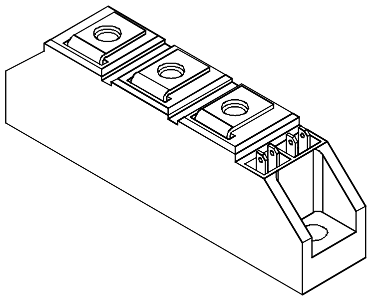
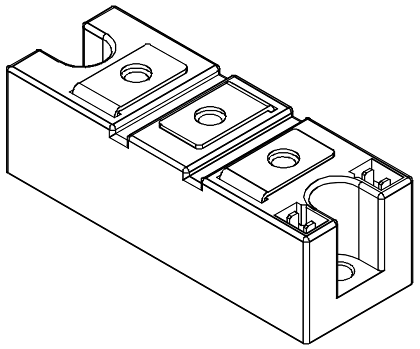
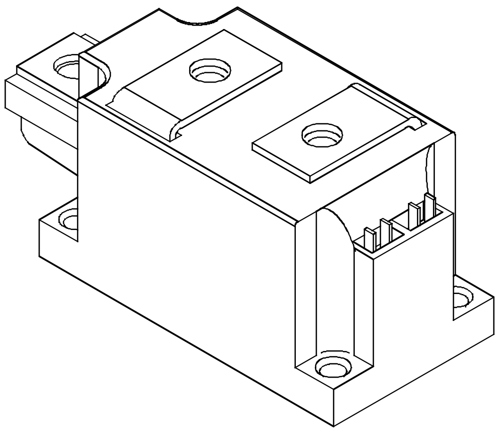
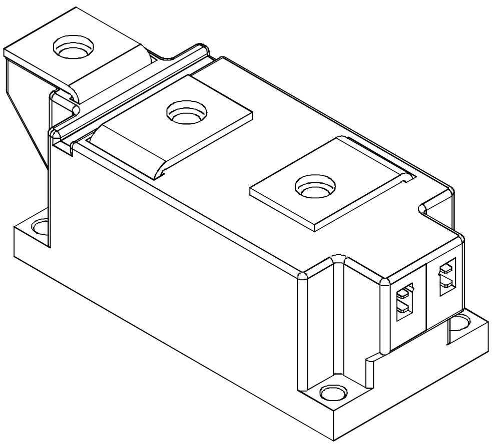
CAUTION

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.

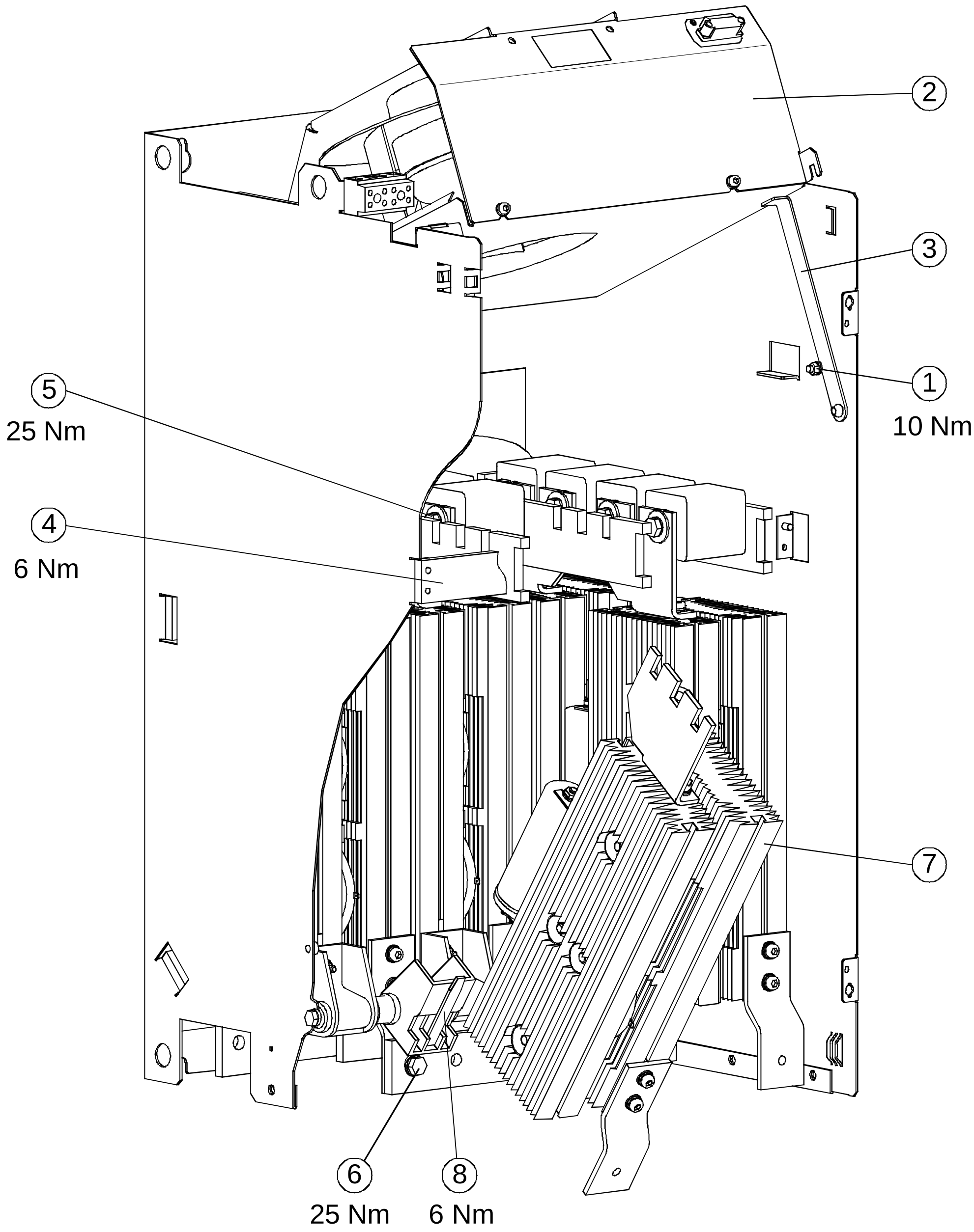
13.2.3 Replacement of diodes and thyristor modules for devices up to 1200A

The diodes and thyristor 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 thyristor 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!

Module design	
 Tightening torque on module: 3,5 Nm Tightening torque of current terminals: 3 Nm	 Tightening torque on module: 3,5 Nm Tightening torque of current terminals: 5 Nm
 Tightening torque on module: 6 Nm Tightening torque of current terminals: 12 Nm	 Tightening torque on module: 6 Nm Tightening torque of current terminals: 15 Nm

13.2.4 Replacement of fuses and thyristor assemblies on converters of 1500A and above



- Undo the M6 hexagonal nut ①.
- Swing the fan upwards and hold in place with support rail ③ .
- Remove the brace ④ with the attached protective cover by undoing the 2 M6 hexagon-head screws.
- Remove fuses ⑤ by undoing the 2 hexagon-head screws on each (M10 or M12 depending on converter model).
- Undo the M10 hexagon-head screw ⑥ and swing thyristor assembly ⑦ out towards you.
- Undo assembly locking mechanism (M6 hexagonal nut) ⑧ , and pull out thyristor assembly ⑦ upwards at an angle.
- Install the new components in the reverse order.

Caution: The fuse mounting screws are of different lengths!

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

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 (0)180 5050-222

Fax: +49 (0)180 5050-223

Email: techsupport@ad.siemens.de

Mo.-Fr.: 7:00 to 17:00 (CET)

14.1.2 Time zone America

24 Hour Hotline: +1 800 333 7421

Tel.: +1 423 461 2522

Fax: +1 423 461 2466

Email: drives.support@sea.siemens.com

Mo.-Fr.: 8:00 to 17:00 (local time: Eastern Time)

14.1.3 Time zone Asia / Australia

Tel.: +65 (0)740-7000

Fax: +65 (0)740-7001

Email: drives.support@sae.siemens.com.sg

Mo.-Fr.: 8:30 to 17:30 (local time: Singapore)

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

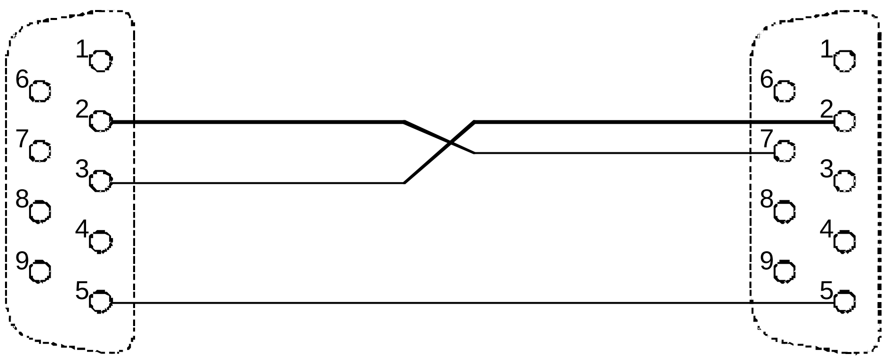
DriveMonitor\ setup\ setup.exe

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.



X300
1
2 RxD (RS232)
3 Rx+/Tx+ (RS485)
4
5 Ground
6 +5V (OP1S)
7 TxD (RS232)
8 Rx-/Tx- (RS485)
9 Ground

PC COMx socket

6RA70 X300 connector

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 SIMOVIS, 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

IMPORTANT

DriveMonitor will run under Windows95/98/Me 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	Cycoloy	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/8467615

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 know.

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, Electronics Plant, Vienna

From: Name: .... Date:

Company: ....

Address: ....

....

Tel.: ....

To: SIEMENS Office

Address: ....

....

Please pass on to
SIEMENS AG Austria
Electronics Plant, Vienna

Concerns: Comments for the 6RA70 Instruction Manual, Edition ....

The following versions have appeared so far:

Version	Internal Part No.
03	C98130-A1256-A2-03-7619
04	C98130-A1256-A2-04-7619
05	C98130-A1256-A2-05-7619
06	C98130-A1256-A2-06-7619
06.1	C98130-A1256-A2-07-7619
07	C98130-A1256-A2-08-7619
08	C98130-A1256-A2-09-7619
09	C98130-A1256-A2-10-7619

Version **09** consists of the following sections

Section		Pages	Date of edition
0	Contents	8	01.02
1	Safety information	4	12.00
2	Type spectrum	8	01.02
3	Description	30	01.02
4	Shipment, unpacking	2	01.02
5	Installation	26	01.02
6	Connections	66	01.02
7	Start-up	60	01.02
8	Function diagrams	138	01.02
9	Function descriptions	76	01.02
10	Faults / Alarms	28	01.02
11	Parameter list	178	01.02
12	List of connectors and binectors	62	01.02
13	Maintenance	10	01.02
14	Servicing	2	01.02
15	DriveMonitor	2	01.02
16	Environmental compatibility	2	12.00
17	Applications	2	01.02
18	Appendix	4	02.00

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