

SIMOTRAS HD

Operating Instructions

6SG70 Series

Microprocessor-controlled 20kW to 500kW converters for speed control of slipping motors with stator phase-angle control and electronic phase reversal



These Operating Instructions are available in the following languages:

Language	German
Order No.:	6SG7000-0BA00

Converter software version:

As these Operating Instructions went to print, SIMOTRAS HD converters were being delivered from the factory with software version **1.6** 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 SIMOTRAS HD (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 latest software version is available at the following Internet site: <http://www.siemens.at/eww/a&d/updates> (password for access: "simo1reg").

From software version 1.5, the SIMOREG software also contains the SIMOTRAS HD software.

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

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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 careful transportation, proper storage and installation as well as correct 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.

1. Trained and authorized to energize, de-energize, 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

For the purpose of this Instruction Manual and product labels, "Danger" indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.

- WARNING

For the purpose of this Instruction Manual and product labels, "Warning" indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

- CAUTION

For the purpose of this Instruction Manual and product labels, "Caution" indicates that minor personal injury or property damage can result if proper precautions are not taken.

- NOTE

For the purpose of this Instruction Manual, "Note" indicates information about the product or the respective part of the Instruction Manual which requires particular attention.

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. The following precautions should be taken in order to reduce the risk of death or injury.

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 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.
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 are at hazardous voltage levels. Even when the converter contactor is open, hazardous voltages are still present.
5. When making measurements with the power supply switched on, electrical connections must not be touched under any circumstances. Remove all jewellery from wrists and fingers. Ensure that the test equipment is in good conditions and operationally safe.
6. When working on units which are switched on, stand on an insulating surface, i.e. ensure that you are not grounded.
7. Carefully follow the relevant instructions and observe all danger, warning and cautionary instructions.
8. This does not represent a full listing of all the measures necessary for safe operation of the equipment. If you require other information or if certain problems occur which are not handled in enough detail in the information provided in the Instruction Manual, please contact your local Siemens office.



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

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

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

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

a = Conductive flooring

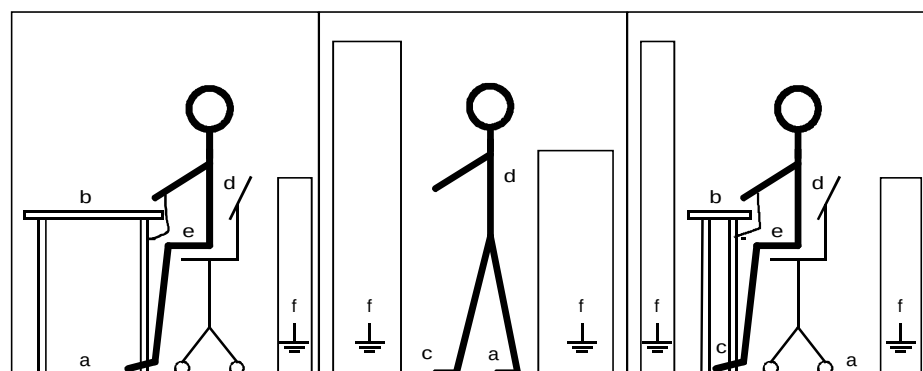
d = Anti-static overall

b = Anti-static table

e = Anti-static chain

c = Anti-static footwear

f = Earthing connections of cabinets



Seated workstation

Standing workstation

Standing/seated workstation

**WARNING**

Hazardous voltage 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 careful transportation, proper storage and installation as well as correct operation and maintenance.

2 Type spectrum

Converter order no. Type designation

6SG7050 – 0EB60 - 0	D400 / 60 Mre
6SG7052 – 0EB60 - 0	D400 / 78 Mre
6SG7055 – 0EB60 - 0	D400 / 98 Mre
6SG7060 – 0EB60 - 0	D400 / 112 Mre
6SG7062 – 0EB60 - 0	D400 / 142 Mre
6SG7065 – 0EB60 - 0	D400 / 180 Mre
6SG7070 – 0EB60 - 0	D400 / 225 Mre
6SG7072 – 0EB60 - 0	D400 / 285 Mre
6SG7076 – 0EB60 - 0	D400 / 360 Mre
6SG7080 – 0EB60 - 0	D400 / 525 Mre
6SG7082 – 0EB60 - 0	D400 / 680 Mre
6SG7085 – 0EB60 - 0	D400 / 900 Mre



D400 / 525 Mre



D400 / 142 Mre

2.1 Converter order no. code

[illegible]

2.2 Ordering information for options using codes

6 S G 7 0 - - Z

+ +

SIMOTRAS HD converter order no. with suffix Z and

codes (several codes together) and/or

plaintext (if required)

Options	Codes	Order No.
Terminal expansion module (CUD2)		6RX1700-0AK01
Operation of SIMOTRAS HD converter at temperatures of 65°C	H78	
SIMOVIS PC - PMU (RS232) connecting cable, 3m		6SX7005-0BA00
SU1 RS232 - RS485 interface converter, including mounting accessories, mains connection: 1CA 115V / 230V		6SX7005-0AA00
User-friendly operator control panel (OP1S)		6SE7090-0XX84-2FK0
AOP1 adapter for mounting OP1A in cubicle door, including 5m connecting cable		6SX7010-0AA00
PMU-OP1S connecting cable, 3m		6SX7010-0AB03
PMU-OP1S connecting cable, 5m		6SX7010-0AB05
LBA Local bus adapter for the electronics box LBA is always needed to install supplementary boards (see Section 5.2.2)		6SE7090-0XX84-4AH0
ADB Adapter board ADB is always needed to install CBC, CBP, EB1, EB2, SBP and SLB boards		6SE7090-0XX84-0KA0
EB1 Terminal expansion board ⁵⁾ (miniature-format board; LBA + ADB required)		6SX7010-0KB00
EB2 Terminal expansion board ⁵⁾ (miniature-format board; LBA + ADB required)		6SX7010-0KC00
CBP Communications board with interface for SINEC- L2-DP, (PROFIBUS) ^{1) 5)} (miniature-format board; LBA + ADB required)		6SX7010-0FF00
T300 Technology board ^{3) 4)} can only be used in temperatures of up to 50°C (not with H78 option)		6SE7090-0XX87-4AH0
Pulse encoder (retrofit) (2 x 250 pulses/revolution, 15V supply voltage)		6SG7000-2AC15
Operating Instructions for SIMOTRAS HD		
Operating instructions in German	D00	6SG7000-0BA00
Operating instructions in English	D76	6SG7000-0BA76
Operating Instructions and SIMOVIS in all the above languages available on CD-ROM	D64	6SG7000-0CD00

The optional boards listed below, along with various others, have not been officially released and may only be used in consultation with the appropriate SIEMENS department:

Options	Codes	Order No.
SBP Pulse encoder evaluation board 1) 2) 5) (miniature-format board; LBA + ADB required)		6SX7010-0FA00
SLB SIMOLINK board 1) 5) (miniature-format board; LBA + ADB required)		6SX7010-0FJ00
CBC Communications board with interface for CAN protocol 1) 5) (miniature-format board; LBA + ADB required)		6SX7010-0FG00

1) The EB1, EB2 and CBP 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 spare part
- as a retrofit kit: board with connectors and Short Guide when the board is ordered as an option

Board	Order number of board (w/o accessories)	Order number of retrofit kit
EB1	6SE7090-0XX84-0KB0	6SX7010-0KB00
EB2	6SE7090-0XX84-0KC0	6SX7010-0KC00
CBP	6SE7090-0XX84-0FF0	6SX7010-0FF00

The retrofit kit must be ordered to install boards in the SIMOTRAS HD 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 SIMOTRAS HD converter. These adapters are available under separate order numbers.

- 2) A pulse encoder evaluation circuit is a standard component of the basic SIMOTRAS HD 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 SIMOTRAS HD converter. The adapter is available under a separate order number.
- 4) This board may only be used in consultation with the appropriate SIEMENS department.
- 5) LBA and ADB are available under separate order numbers

3 Description

3.1 Applications

SIMOTRAS HD converters in the 6SG70 series are fully digital compact converters and have been developed for regulating three-phase lifting gear motors with slipring rotors in the output range up to 580 kW and for higher-level control of the drive.

For

- lifting gear
- slewing gear
- luffing gear
- trolley travel gear
- travel gear
- auxiliary-range gearboxes

The benefits are:

- very efficient drive unit solutions in older systems
- extremely simple retrofitting resulting in significant improvements to existing systems
- low modernization costs as existing components such as motors, resistors, cables and cabinets can continue to be used
- fast, variable and user-friendly solution with low system standstill times
- very cost-effective solution for new systems
- low requirements for contactor controls and external interlocks, as important control functions are already integrated
- little planning and configuration work required
- cost-saving due to short assembly and commissioning times thanks to connection-ready compact converter technology
- very smooth travel, which helps prevent system wear
- very high level of control quality by utilizing the particular electrical advantages of the slipring motor
- very high level of control dynamics with the use of stator phase-angle control
- all standard lifting components and interfaces can be used
- no special technologies required!

3.2 Design

Series 6SG70 SIMOTRAS HD 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 SIMOTRAS HD converters 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 SIMOTRAS HD 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 and English can be selected as the display languages.

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

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

The power section is constructed of isolated thyristor modules. The heatsink is thus electrically isolated. 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.

3.3 Mode of operation

3.3.1 Converter design

SIMOTRAS HD is a fully controllable, three-phase thyristor power controller which uses compact converter technology. The converter is used to adjust and control three-phase motors with slipring rotor for lifting gear drives. It is suitable for single and multi-motor drives.

Two additional thyristor modules in the shunt arm of the power section facilitate the torque switchover and thus the 4Q operation of the drive. Using the auto-reversing stage, the phase sequence on the converter output is electronically reversed. Depending on the load conditions, the converter functions in plug braking mode (braking) or it drives the machine in the other direction of rotation (driving). A driving cycle that is both highly dynamic and gentle is possible because the conventional stator contactor is no longer required.

The voltage on the motor is adjusted using the stator phase-angle control from three inverse-parallel thyristor pairs. In this process, the supply frequency of the motor is not changed; it is always identical to the relevant mains frequency.

The thyristors are controlled by the gating unit. This generates line-synchronous firing pulses. The control electronics are separated from the line potential by ignition transducers. The operating states are displayed on the unit via the 7-segment display and LEDs or via the optional OP1S operator control panel.

All converter settings (e.g. controller parameters, limit values, etc.) are saved in non-volatile memory in the converter. The adjustment is made digitally via the converter control panel or via the optional OP1S control panel. The values can therefore be easily reproduced at any time.

SIMOTRAS HD combines two traditional procedures for adjusting the speed of asynchronous machines:

- changing the motor voltage using the stator phase-angle control
- gradient of motor characteristic curve using variable rotor resistances

This combination permits excellent control response where the advantages of both procedures are exploited and the disadvantages are largely avoided. Both procedures are described below.

3.3.2 Speed control using stator phase-angle control

The amplitude of the fundamental wave of the supply voltage is changed using the stator phase-angle control. With a constantly ascending ramp for the setpoint voltage from zero to maximum activation, the control angle and therefore the voltage time-area are continually increased. This increases the motor voltage (U_M) continually and the drive is thereby slowly accelerated. The motor torque increases proportionally to U_M^2 .

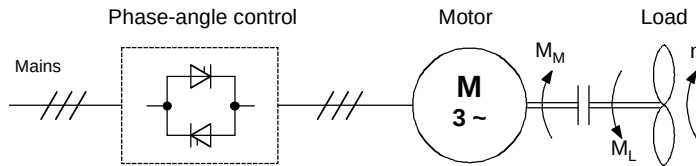
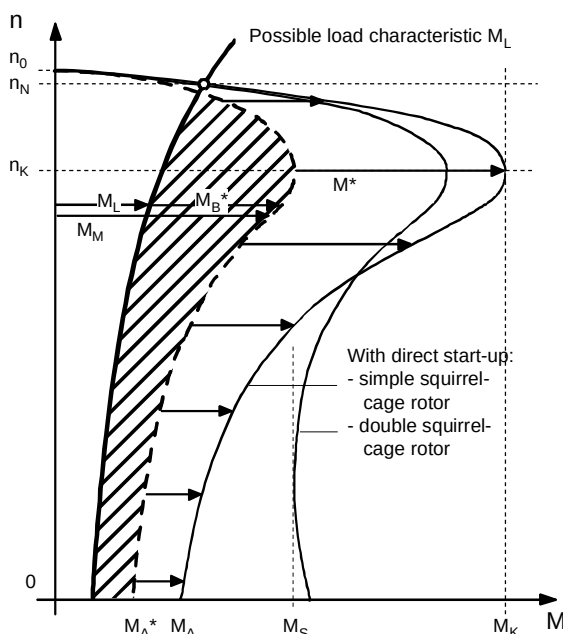


Figure 3.3.2.1 Simplified drive diagram with stator phase-angle control and asynchronous machine under load



Motor characteristics

- n_0 = Synchronous speed
- n_N = Speed at nominal working point
- n_K = Speed at pull-out torque
- M_K = Pull-out torque of simple squirrel-cage rotor
- M_S = Torque at dip
- M_A = Start-up torque of simple squirrel-cage rotor without stator phase-angle control
- M_L = Load torque
- M_M = Motor torque
- M_A^* = Start-up torque with stator phase-angle control
- M^* = Temporary motor characteristic
- M_B^* = Acceleration torque

Figure 3.3.2.2 Simplified characteristic curve of the asynchronous machine with stator phase-angle control for a direction of rotation/torque direction

- M^* = temporarily effective motor characteristic (dotted line) for a single squirrel-cage motor with stator phase-angle control
- M_B^* = Acceleration torque of the drive provides the speed ramp-up. Derived from the present difference $M_M - M_L$. The acceleration torque M_B effective across the entire range is shown as the shaded area in the figure.
- M_A^* = Start-up torque of the motor set by the stator phase-angle. In order to start, M_A^* must be larger than the load torque M_L .

3.3.3 Speed control by changing the rotor resistance levels

The torque can be influenced by switching on an additional ohmic resistance in the rotor circuit in the asynchronous motor. To do this, however, an asynchronous machine with a slipping rotor is required. Starting with the characteristic curve for a squirrel-cage motor, the gradients of the speed-torque curves increase as the resistance in the rotor circuit increases. The level of the pull-out torque M_K remains constant.

This means that at a specific load torque M_L , the various constant speeds n_2 , n_3 or n_4 can be set. If the load changes, the speed increases as well.

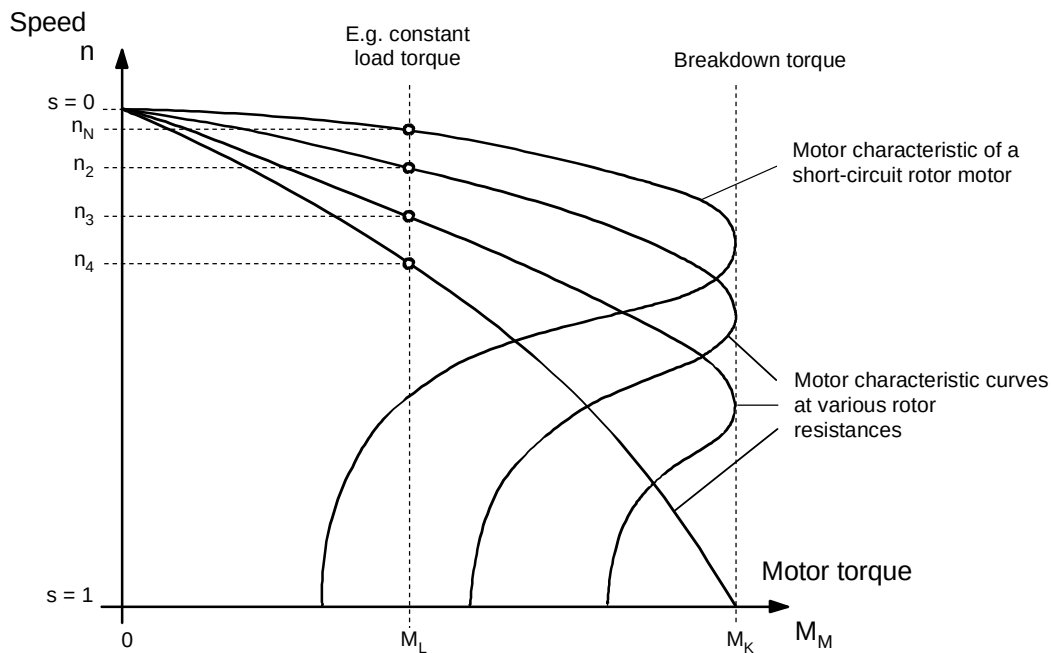


Figure 3.3.3.1 Speed-torque characteristic curves at different rotor resistances

When changing the speed using additional rotor resistances, the

$$\text{Rotor output } P_{2V} = \text{rotor power input } P_d \cdot \text{slip } s$$

is largely converted into heat in the external resistor. This prevents excessive heating of the motor when running for extended periods at low speed.

3.3.4 Method of operation of electronic phase reversal with plug braking

The drive starts up with the positive speed and stabilizes at point a. A constant load profile is assumed during this process. If a lower setpoint or a setpoint with the opposite polarity is connected when in this state, the SIMOTRAS HD will be switched to counter-torque operation. The thyristors that are currently conducting for the clockwise rotating field are first blocked. The thyristors for the anti-clockwise rotating field are then fired. This changes the phase sequence on the output terminals to produce a new direction of rotation, point b.

The motor then starts plug braking and reduces its speed.

A slip value $s = 2$ exists on the machine immediately following the switchover from motor operation at point a with the speed $n = n_N$ to braking operation at point b. With a direct switchover at full supply voltage, the motor current would now be greater than the start-up current (slip $s=1$, maximum current). SIMOTRAS HD therefore automatically reduces the motor voltage at this point, thereby limiting the maximum current.

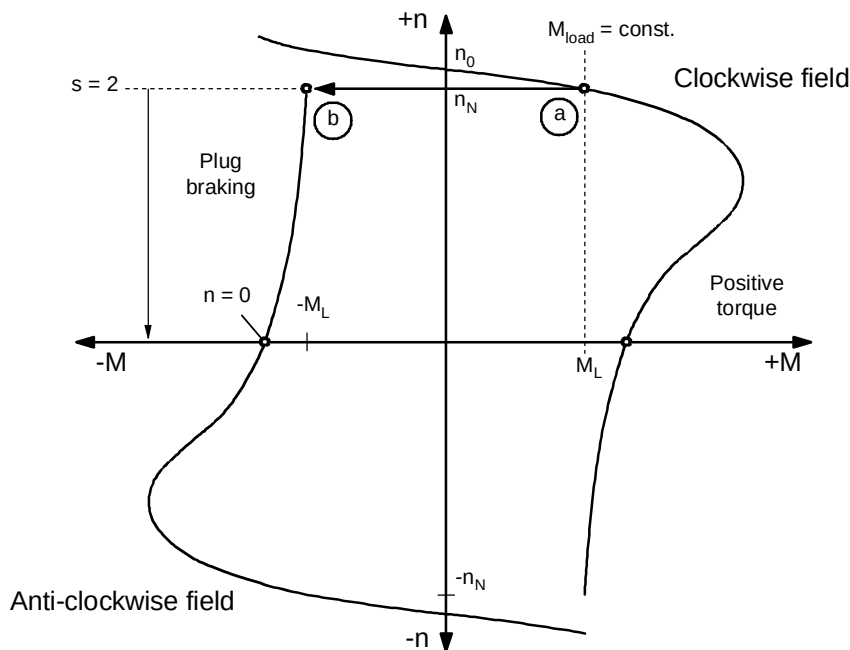
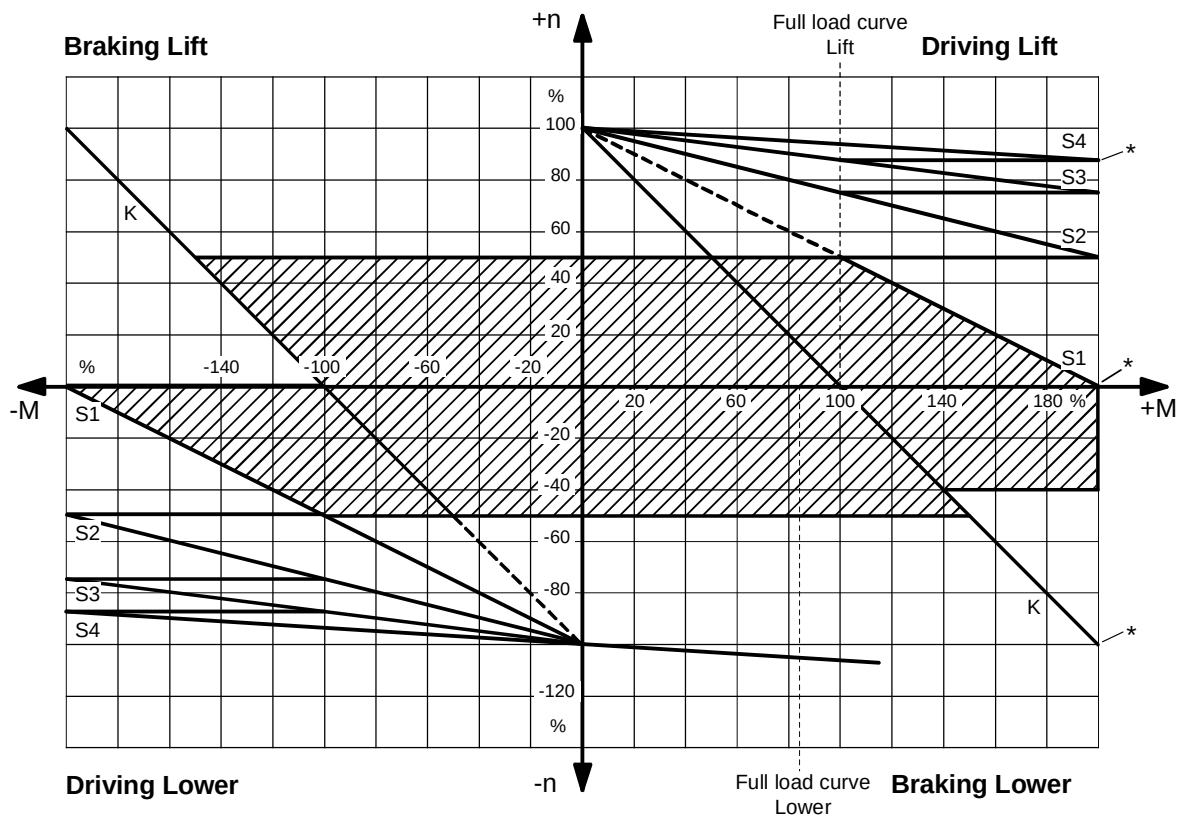


Figure 3.3.4.1 Speed-torque characteristic curves at phase reversal

3.3.5 SIMOTRAS HD – control characteristics for lifting gear



..... SIMOTRAS HD control range

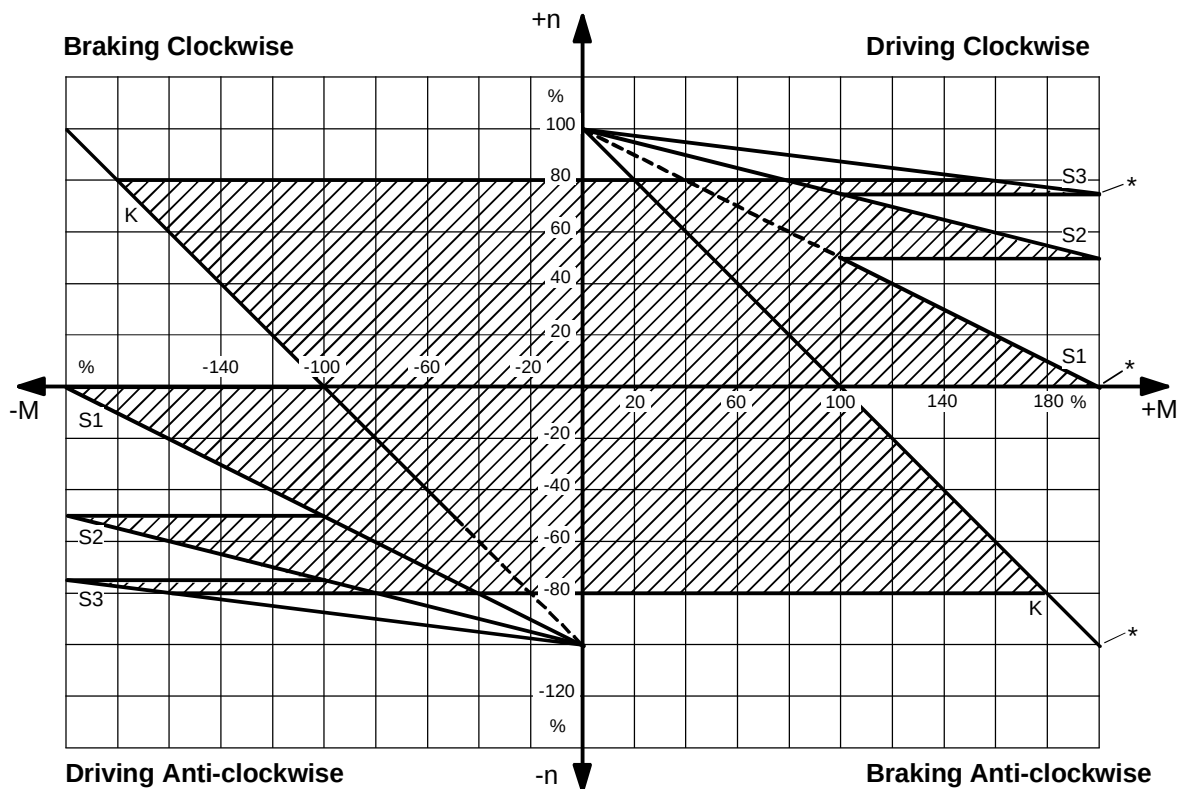
K Characteristic curves for counter-torque operation (plug braking), i.e. delay lowering with overhauling loads or delay lifting when active counter-torque operation requested

S2, S3, S4 Characteristic curves for open-loop operation

* Use of current limiting (e.g. $I_{max} = 2 \cdot I_N$)

Up to 4 rotor resistance switching stages can be provided. With less than 4 stages, the upper stages (S3 / S4) remain free.

3.3.6 SIMOTRAS HD – control characteristics for travel gear



..... SIMOTRAS HD control range

K Characteristic curves for counter-torque operation (plug braking)

S3 Characteristic curve for open-loop operation

* Use of current limiting (e.g. $I_{max} = 2 \cdot I_N$)

Up to 4 rotor resistance switching stages can be provided. With less than 4 stages, the upper stages (S3 / S4) remain free.

3.4 Technical data

60A to 180A converters, 3AC 110V to 500V

Order No.		6SG70 . . - 0EB60-0					
		50	52	55	60	62	65
Rated supply voltage power section	V	3AC 110V –10% to 3AC 500V +10%					
Rated frequency	Hz	50 / 60 Hz Converters self-adapt to the frequency of the available supply voltage in the range from 45 to 65 Hz.					
Rated current of	A	60	78	98	112	142	180
Rated electronics supply voltage	V	2AC 380 (-25%) to 460 (+15%); I _n =1A or 1AC 190 (-25%) to 230 (+15%); I _n =2A (– 35% for 1min)					
Fan rated supply voltage	V	-	-	DC 24 V internal			
Overload capability		20 s duration: I = 2*I _n then 70 s duration: I = I _n then 60 s duration: I = 0 A (cycle time 150 s)					
Power loss at rated current (approx.)	W	272	306	386	439	500	630
Minimum load	A	3	6	6	6	7	7
Operational ambient temperature at rated current	°C	0 to 45 self-cooled		0 to 40 forced-cooled ¹⁾			
Upper limit temperature with current derating	°C	55		50			
Cooling air requirement	m ³ /h	-		100			
Sound pressure level	dBA	-		40			
Storage and transport temperature	°C	-25 to +70					
Installation altitude above sea level		≤ 1000 m at rated current max. 3500m with voltage and current reduction ²⁾					
Environmental class DIN IEC 721-3-3		3K3					
Degree of protection DIN 40050 IEC 144		IP00					
Dimensions		See dimension drawings					
Weights (approx.)	kg	16	16	16	16	17	17

Explanation at end of list of tables

225A to 900A converters, 3AC 110V to 500V

Order No.		6SG70 . . - 0EB60-0					
		70	72	76	80	82	85
Rated supply voltage power section	V	3AC 110V –10% to 3AC 500V +10%					
Rated frequency	Hz						
		50 / 60 Hz					
		Converters self-adapt to the frequency of the available supply voltage in the range from 45 to 65 Hz.					
Rated current of	A	225	285	360	525	680	900
Rated electronics supply voltage	V	2AC 380 (-25%) to 460 (+15%) I _n =1A or 1AC 190 (-25%) to 230 (+15%) I _n =2A (– 35% for 1min)					
Fan rated supply voltage	V	3 AC 400 ±15% 50Hz				3 AC 400 ±10% 50Hz	
		3 AC 460 ±10% 60Hz				3 AC 460 ±10% 60Hz	
Fan rated current	A	0.24				1.1	
Overload capability		20 s duration: I = 2*I _n then 70 s duration: I = I _n then 60 s duration: I = 0 A (cycle time 150 s)					
Power loss at rated current (approx.)	W	839	1020	1300	1827	2890	3550
Minimum load	A	10	10	10	15	15	15
Operational ambient temperature at rated current	°C	0 to 40 forced-cooled ¹⁾					
Upper limit temperature with current derating	°C	50					
Cooling air requirement	m ³ /h	570				1400	2400
Sound pressure level	dBA	73				88	
Storage and transport temperature	°C	-25 to +70					
Installation altitude above sea level		≤ 1000 m at rated current max. 3500m with voltage and current reduction ²⁾					
Environmental class DIN IEC 721-3-3		3K3					
Degree of protection DIN 40050 IEC 144		IP00					
Dimensions		See dimension drawings					
Weights (approx.)	kg	30	30	30	45	85	137

Explanation at end of list of tables

42A to 125A controllers, 3AC 110V to 500V (H78)

Order No.		6SG70 . . - 0EB60 - 0-Z ...Z=H78					
		50	52	55	60	62	65
Rated supply voltage power section	V	3AC 110V –10% to 3AC 500V +10%					
Rated frequency	Hz						
		50 / 60 Hz					
		Converters self-adapt to the frequency of the available supply voltage in the range from 45 to 65 Hz.					
Rated current of	A	42	55	70	80	100	125
Rated electronics supply voltage	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 for fans	V	-	-	DC 24 V internal			
Overload capability		20 s duration: I = 2*I _n then 70 s duration: I = I _n then 60 s duration: I = 0 A (cycle time 150 s)					
Power loss at rated current (approx.)	W	205	230	288	322	365	445
Minimum load	A	3	6	6	6	7	7
Operational ambient temperature at rated current	°C	+65					
Cooling air requirement	m ³ /h	-		100			
Sound pressure level	dBA	-		40			
Storage and transport temperature	°C	-25 to +70					
Installation altitude above sea level		≤ 1000 m at rated current max. 5000m with voltage and current reduction ²⁾					
Environmental class DIN IEC 721-3-3		3K3					
Degree of protection DIN 40050 IEC 144		IP00					
Dimensions		See dimension drawings					
Weights (approx.)	kg	16	16	16	16	17	17

Explanation at end of list of tables

150A to 700A converters, 3AC 110V to 500V (H78)

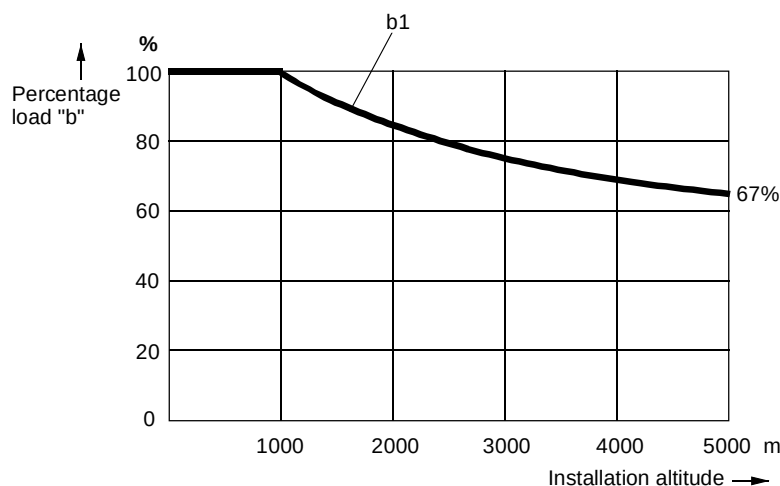
Order No.		6SG70 . . - 0EB60 - 0-Z ...Z=H78					
		70	72	76	80	82	85
Rated supply voltage power section	V	3AC 110V –10% to 3AC 500V +10%					
Rated frequency	Hz						
		50 / 60 Hz					
		Converters self-adapt to the frequency of the available supply voltage in the range from 45 to 65 Hz.					
Rated current of	A	150	200	250	365	475	700
Rated electronics supply voltage	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 for fans	V	3 AC 400 ±15% 50Hz				3 AC 400 ±10% 50Hz	
		3 AC 460 ±10% 60Hz				3 AC 460 ±10% 60Hz	
Fan rated current	A	0,24				1,1	
Overload capability		20 s duration: I = 2*I _n then 70 s duration: I = I _n then 60 s duration: I = 0 A (cycle time 150 s)					
Power loss at rated current (approx.)	W	595	731	895	1280	2146	2865
Minimum load	A	10	10	10	15	15	15
Operational ambient temperature at rated current	°C	+65					
Cooling air requirement	m ³ /h	570				1400	2400
Sound pressure level	dBA	73				88	
Storage and transport temperature	°C	-25 to +70					
Installation altitude above sea level		≤ 1000 m at rated current max. 3500m with voltage and current reduction ²⁾					
Environmental class DIN IEC 721-3-3		3K3					
Degree of protection DIN 40050 IEC 144		IP00					
Dimensions		See dimension drawings					
Weights (approx.)	kg	30	30	30	45	85	137

Explanation at end of list of tables

1) Load values as a function of coolant temperature (refer to P077 in Section 11)

Ambient temperature or coolant temperature	Change in load values (percentage reduction "a")	
	in devices with self-cooling	in devices with enhanced air cooling
+40°C		– 0 %
+45°C	0 %	– 5 %
+50°C	– 6 %	– 10 %

2) Load values as a function of installation altitude (refer to P077 in Section 11)



Curve b1: Reduction factor of load values at installation altitudes above 1000 m

Permitted continuous current

Operating the converter continuously at the rated supply current I_n is permitted. The limit temperature of the thyristors will be reached.

It is not possible to accelerate out of this operating state, i.e. to increase the current!

The current should therefore be reduced before accelerating so the converter can cool down.

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.

Requirement for reliable isolation $\Rightarrow$ degree of pollution 2 for boards and power section.

Only non-conductive pollution occurs. Occasional conductivity due to moisture condensation must, however, be expected.

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

VDE 0113 T1

Electrical equipment on industrial machines (where applicable).

VDE 0160 Section 5.3.1.1.2 and 5.3.1.1.3, EN 50178

Regulations for equipping electrical power systems with electronic equipment.

Use of cables and insulated wiring in electrical power systems.

EN61000-4-2 and EN61000-4-4

Noise immunity

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

Mechanical stressing

3.6 Abbreviations

2nd CB Communications board

PKW Parameter ID value

PZD Process data

TB Technology board

ZSW Status word

NC not connected

4 Shipment, unpacking

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

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

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

5 Installation



CAUTION

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

The converter must be lifted using suitable equipment and under the instruction of appropriately qualified personnel.

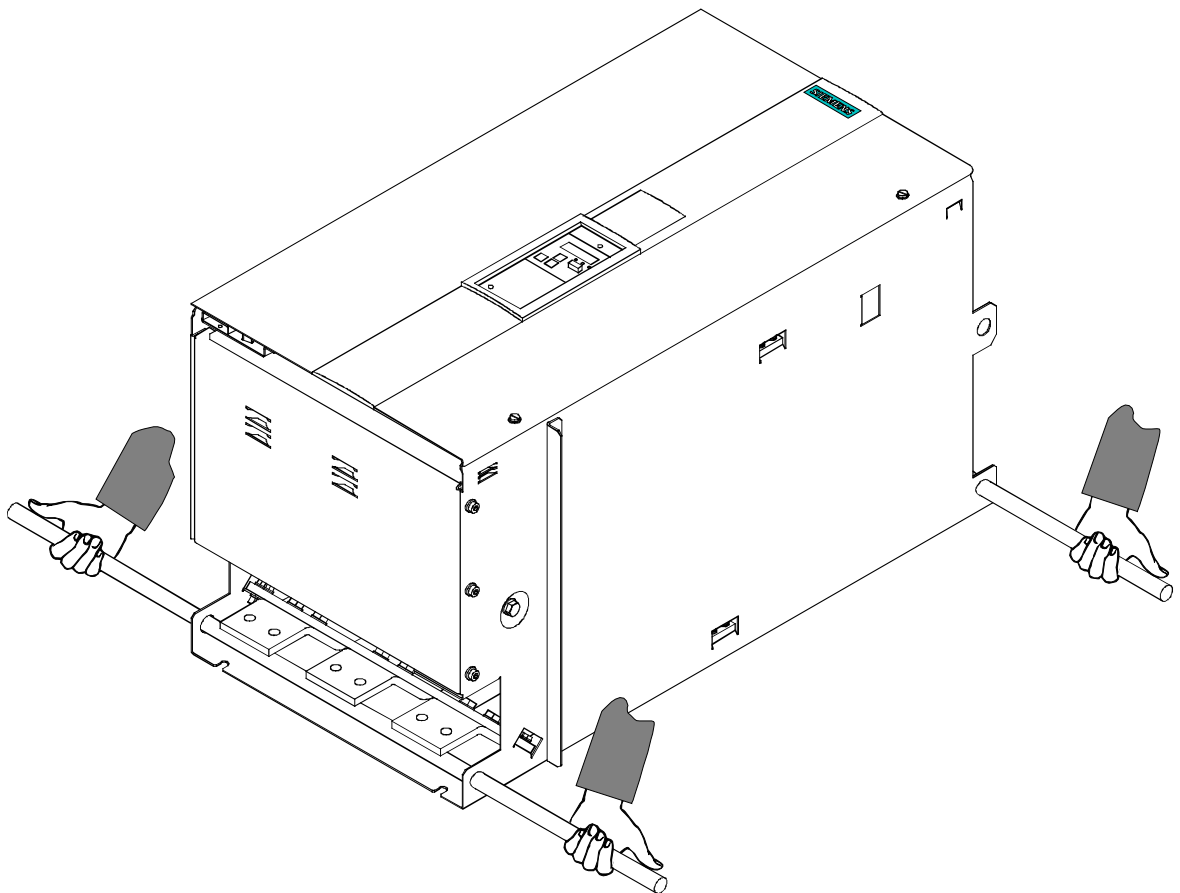
To preclude the risk of deformation damage to the housings of D400 / 680 – 900 Mre converters, the lifting lugs used to raise them must not be subjected to any horizontal forces.



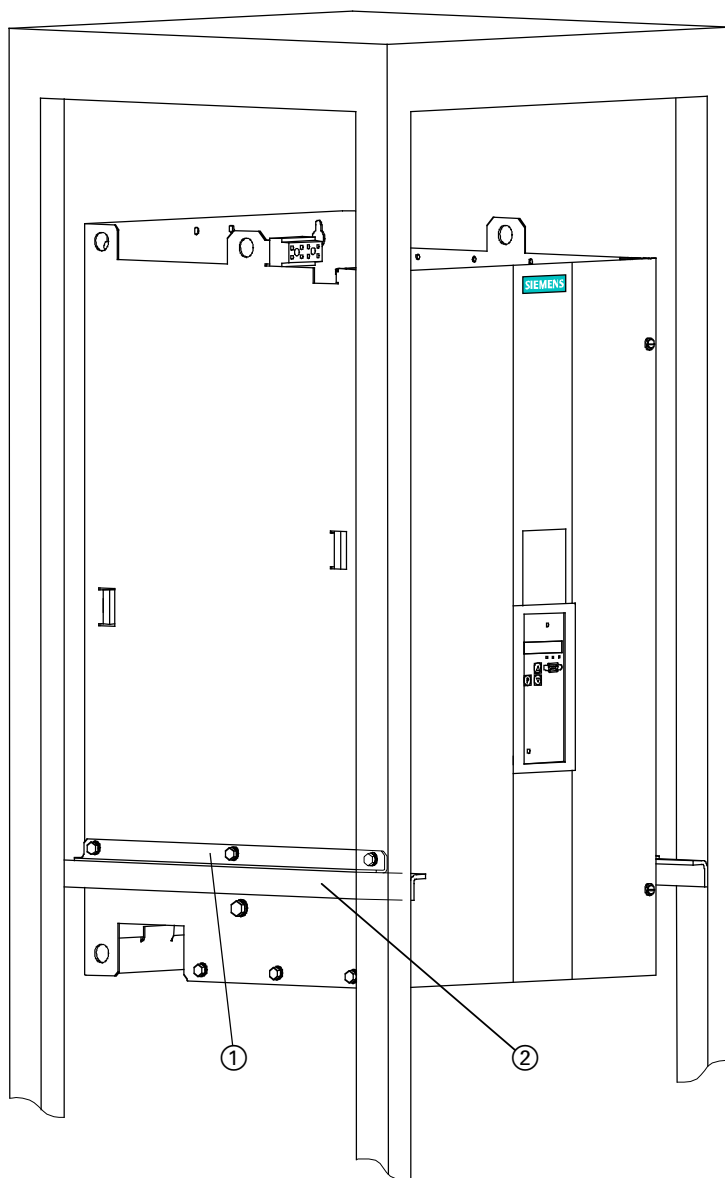
The user is responsible for installing the converter, motor, transformer as well as other equipment according to safety regulations (e.g. DIN, VDE), as well as all other relevant national or local regulations regarding cable dimensioning and protection, grounding, isolating switch, overcurrent protection,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

Possible lifting method for D400 / 900 Mre converters



Cubicle mounting of D400 / 900 Mre converters



- These converters are supplied with 2 fixing angles ①. These can be bolted to the SIMOTRAS HD 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 ② (not included in scope of supply) in the control cubicle.
- The converters must be bolted to the cubicle rear panel in 4 places.

5.1 Dimension drawings

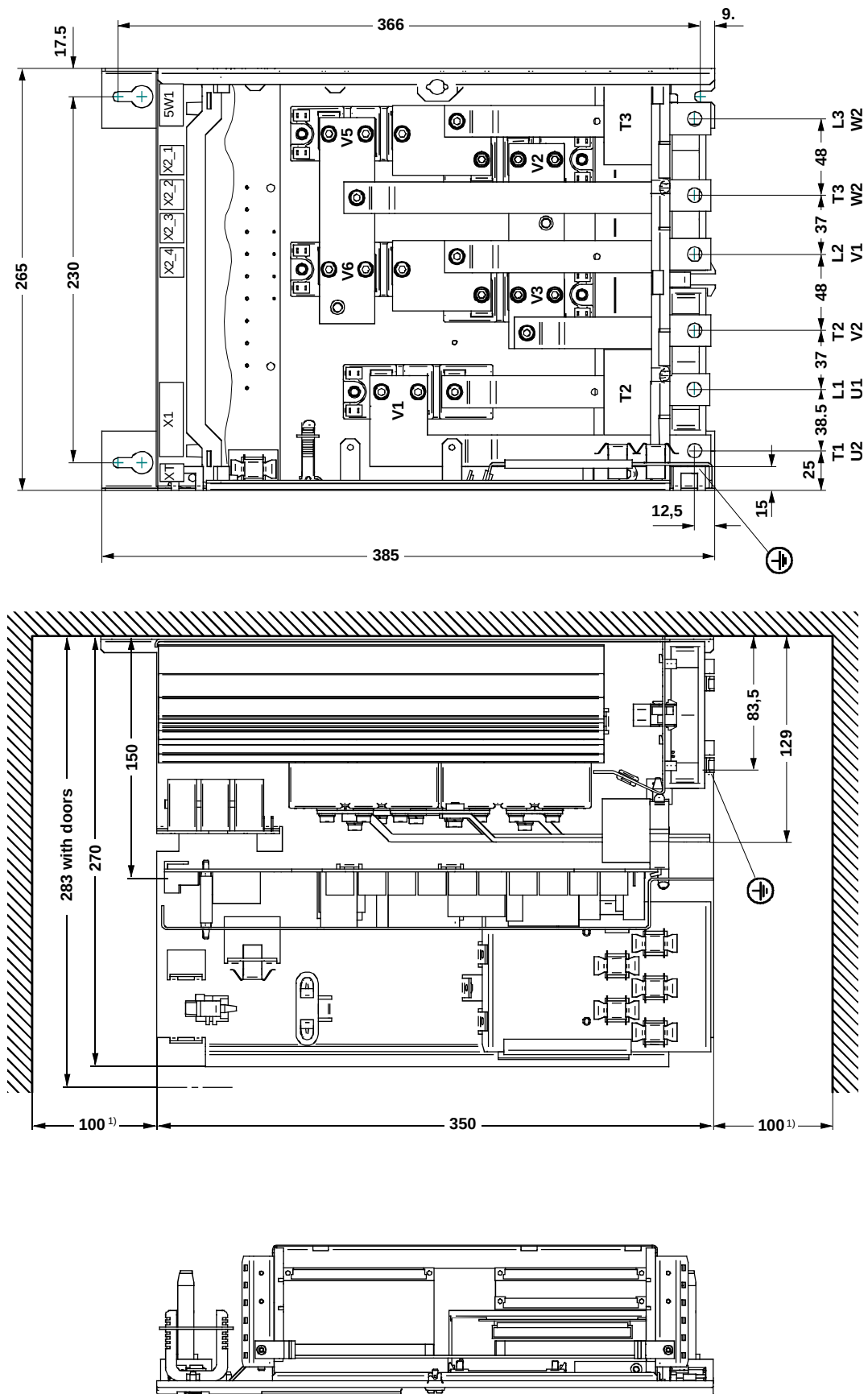


WARNING

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.

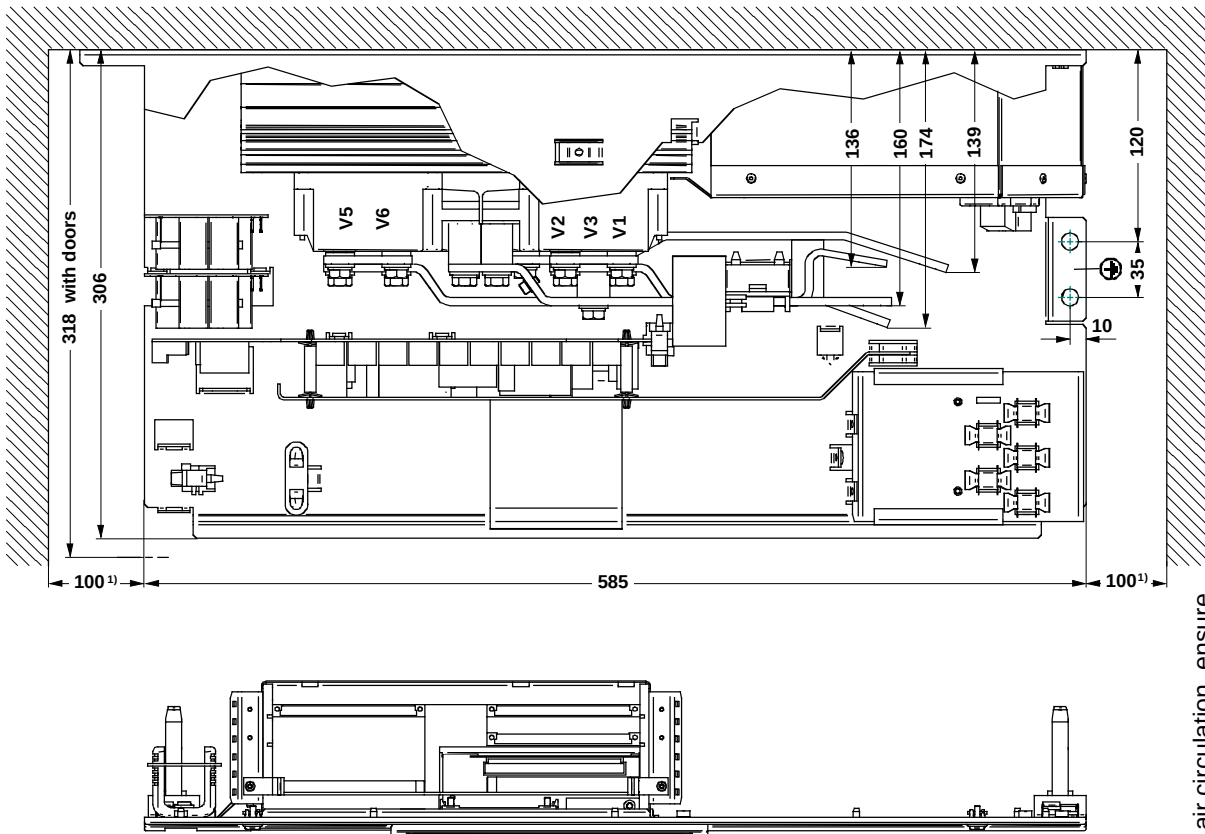
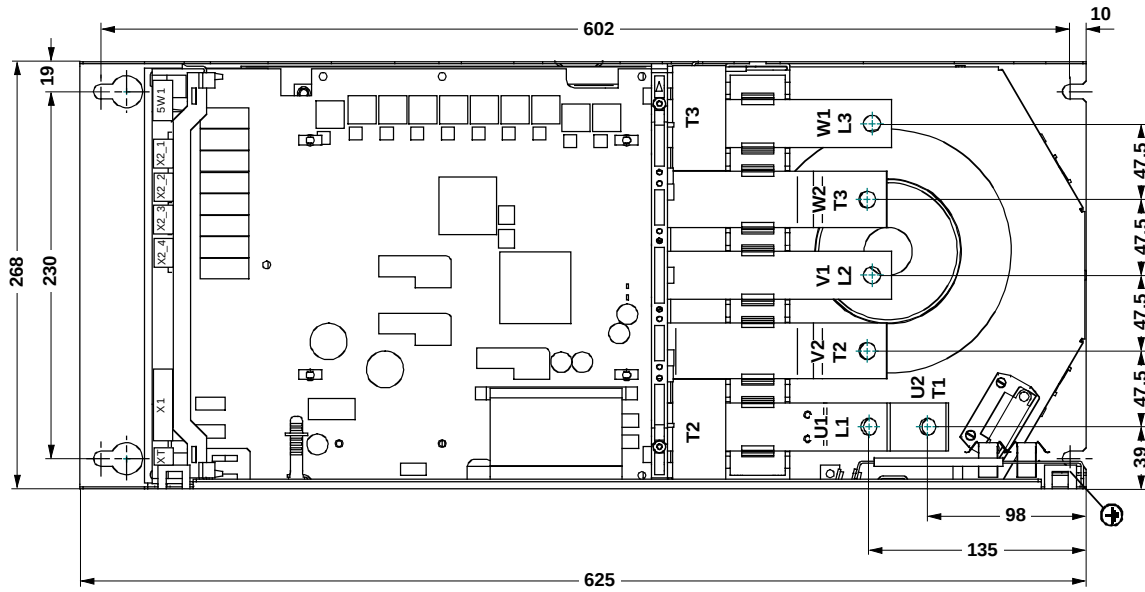
The converter may overheat if this clearance is not provided!

D400 / 60 - 180 Mre converters



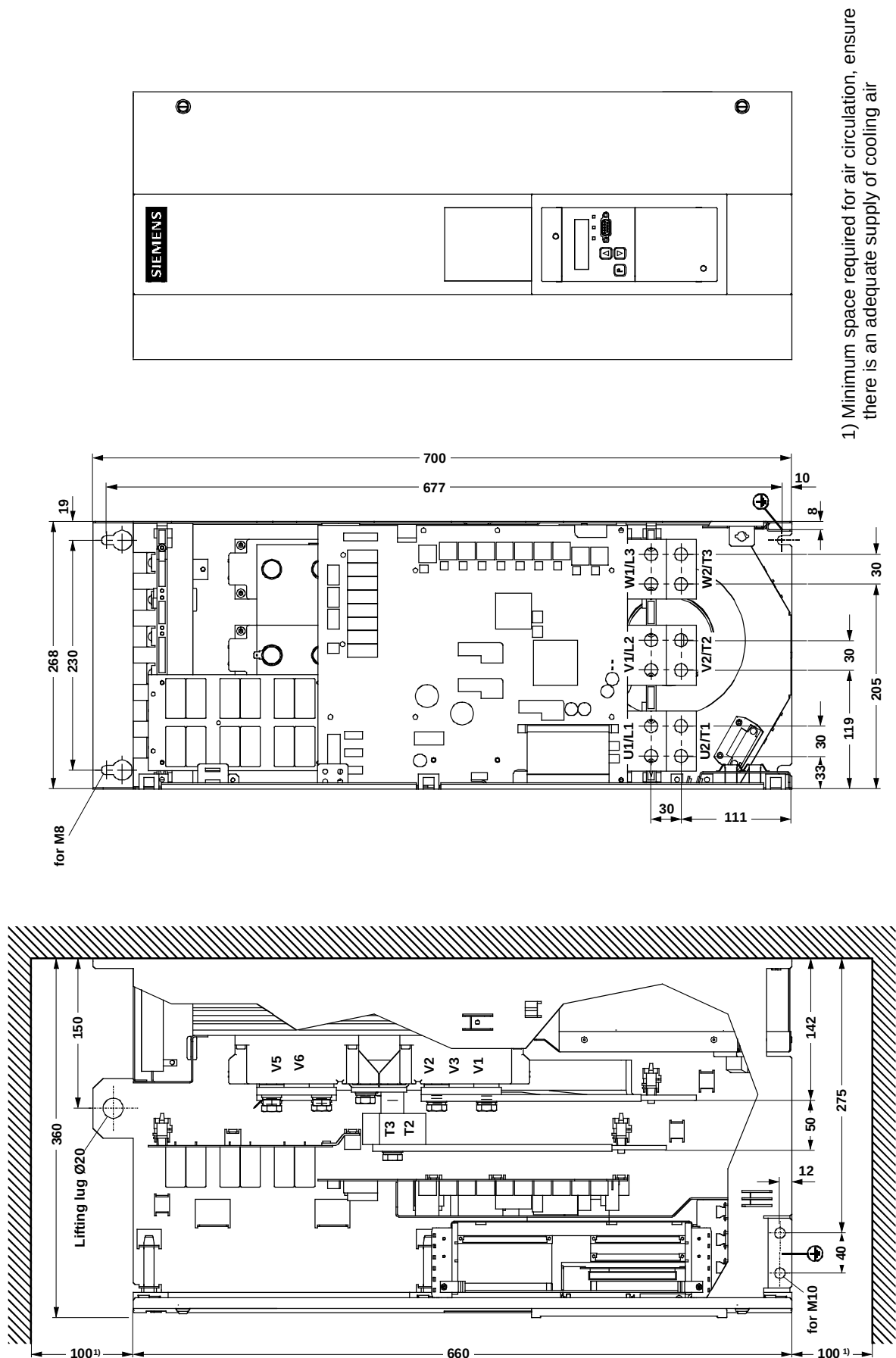
1) Minimum space required for air circulation, ensure there is an adequate supply of cooling air

D400 / 225 - 360 Mre converters



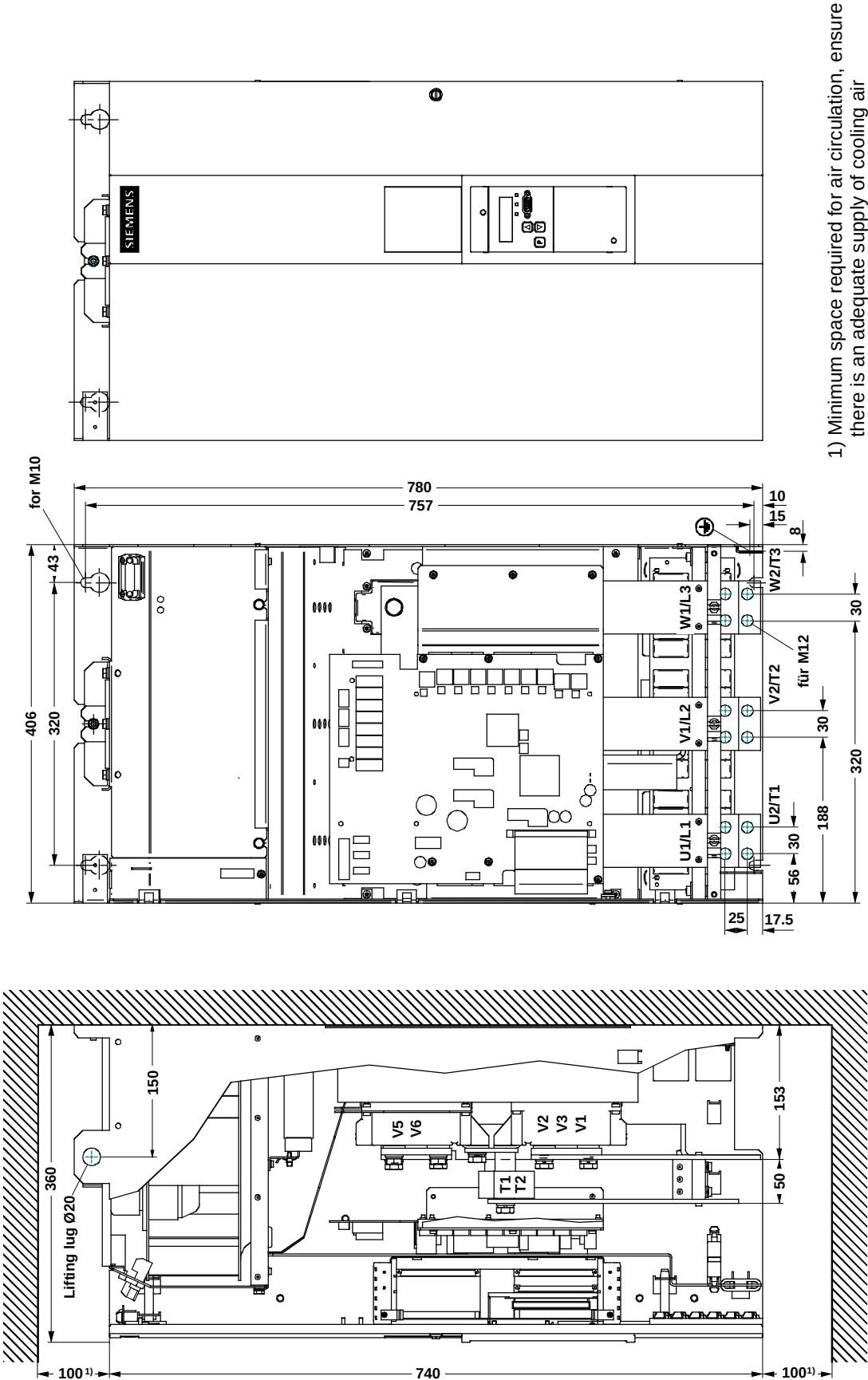
- 1) Minimum space required for air circulation, ensure there is an adequate supply of cooling air

D400 / 525 Mre converters



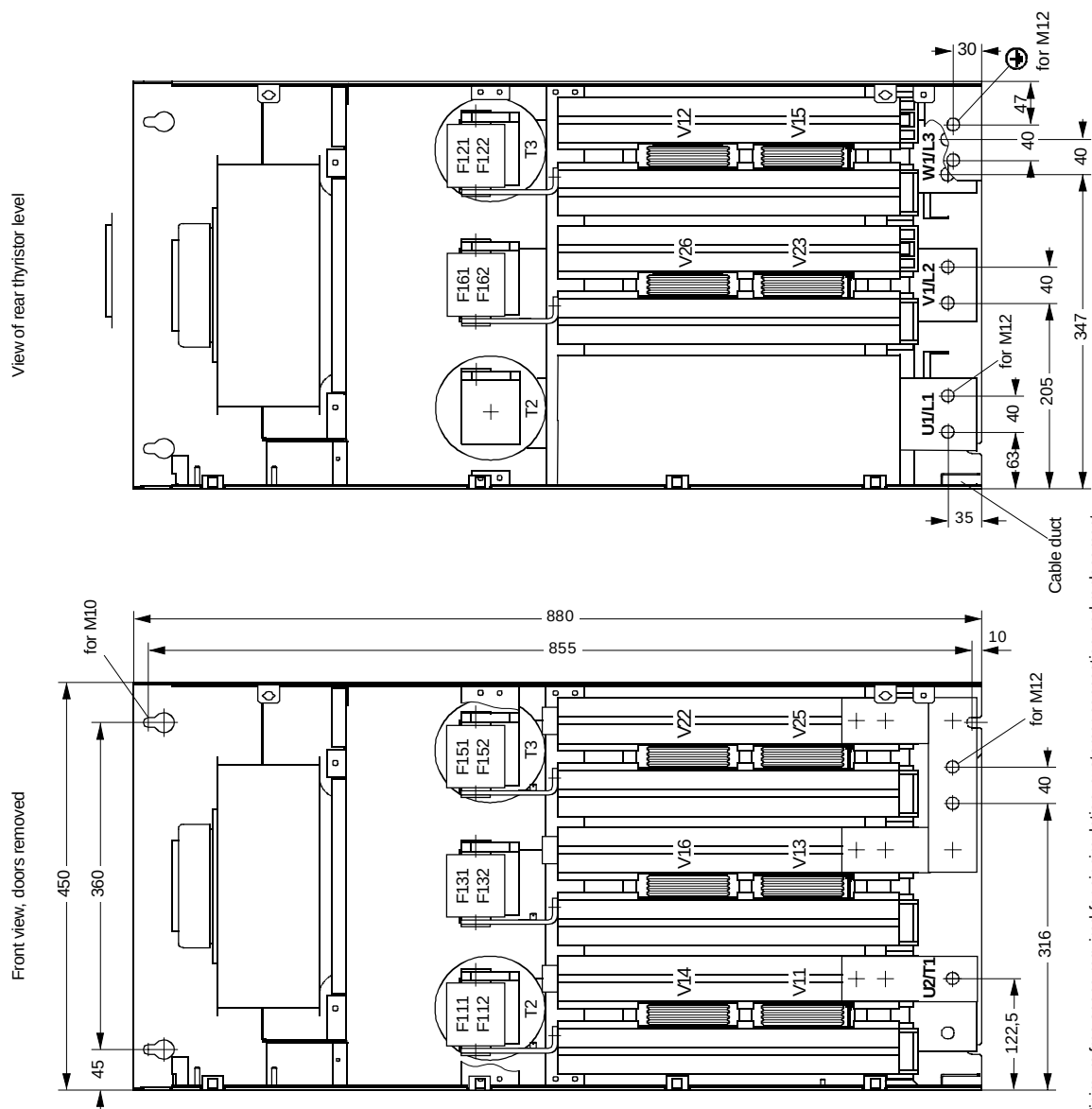
1) Minimum space required for air circulation, ensure there is an adequate supply of cooling air

D400 / 680 Mre converters

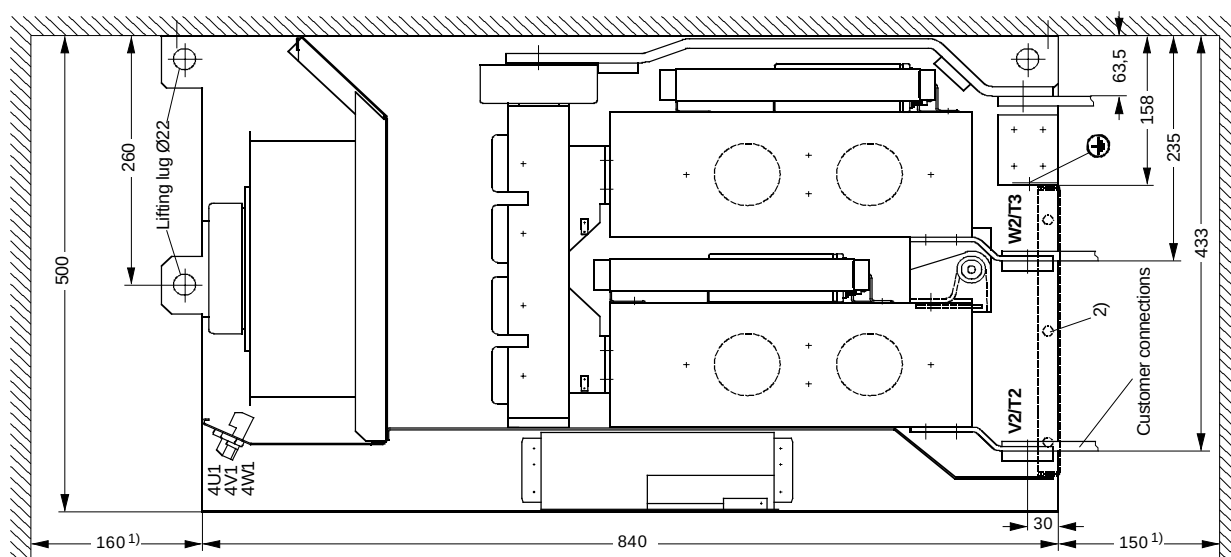


1) Minimum space required for air circulation, ensure there is an adequate supply of cooling air

D400 / 900 Mre converters

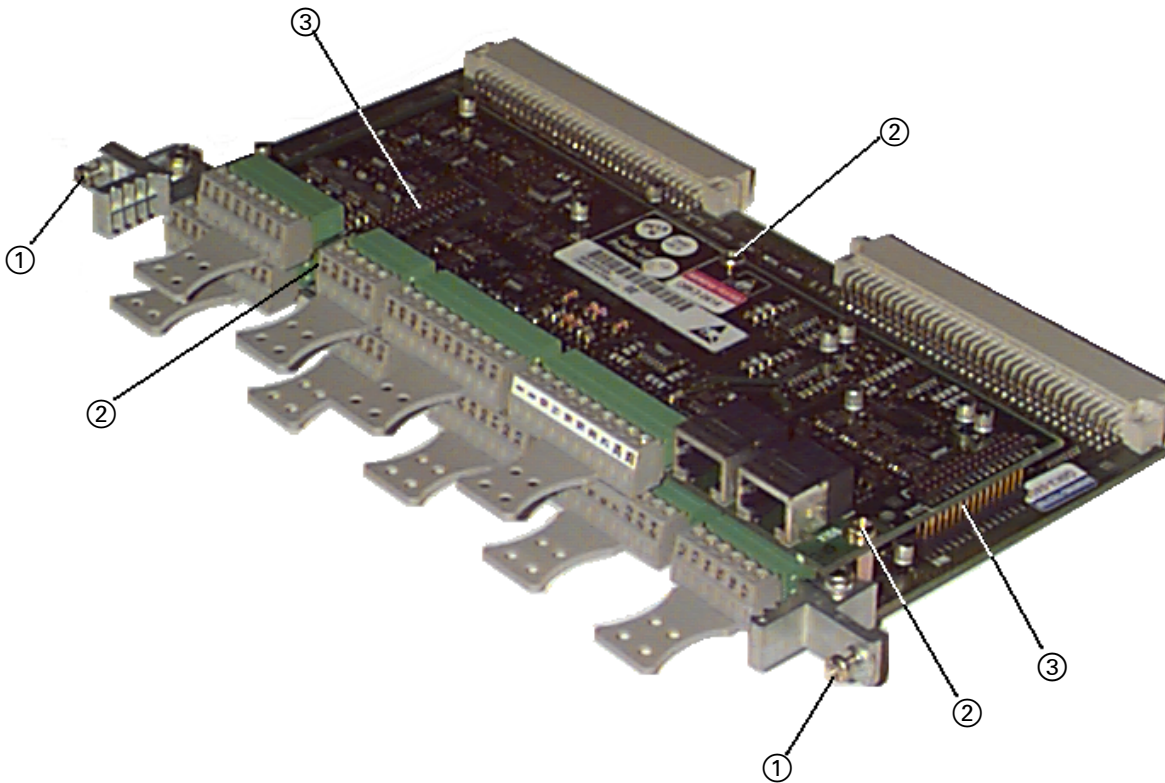


- 1) Minimum free space required for air circulation, customer connection and replacement of fan. Ensure there is an adequate supply of cooling air
- 2) Remove transportation plate before start-up by undoing the six M6 hexagon-head screws!



5.2 Mounting options

5.2.1 Terminal expansion board CUD2



- Remove electronics board CUD1 from the electronics box by undoing the two fixing screws ①.
- Attach the 3 supplied hexagon-head studs at position ② on the CUD1 electronics board.
- Position board CUD2 in such a way that the two plug connectors ③ are properly contacted. 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.
- Secure board CUD2 in position using the supplied screws and retaining elements ②.
- Insert electronics board CUD1 into electronics box and tighten up the two fixing screws ① again as instructed.

5.2.2 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.

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

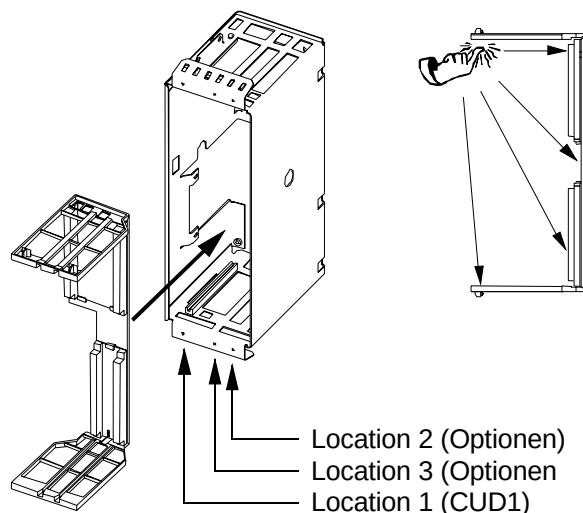
PCBs contains electrostatically sensitive devices. Before touching a PCB, the person carrying out the work must himself be electrostatically discharged. The simplest way of doing this is to touch an electrically conductive earthed object, e.g. socket outlet earth contact.

5.2.2.1 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 SIMOTRAS HD converter, one must be installed in the electronics box to accommodate the optional board.

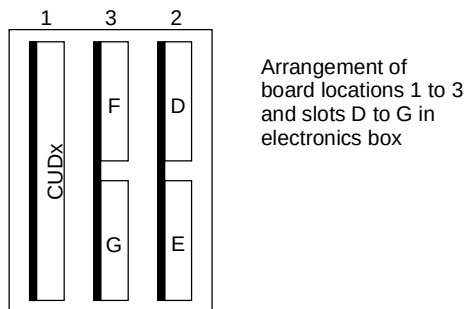
How to install an LBA local bus adapter in the electronics box:

- ◆ 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.



5.2.2.2 Mounting of optional supplementary boards

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



Supplementary boards may be inserted in any slots subject to one restriction, i.e. that board location 2 is filled before location 3.

NOTE

- ◆ A technology board must always be installed in board location 2 of the electronics box.
- ◆ If a technology board is used in conjunction with a communications board, then the communications board must be fitted in slot G (miniature-format boards CBP and CBC) or slot 3 (large-format boards CB1 and CB2).
- ◆ 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 (CBP 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).

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

5.3 Pulse encoder with fitting accessory 6SG7000 – 2AC15

The actual speed value can be measured by this pulse encoder in both directions of rotation. It is particularly recommended for retrofitting work on the motor shaft (normally on the non-drive end). The pulse evaluation and 15 V – power supply EW provided directly from the SIMOTRAS HD unit (see figure for connection). The encoder cable may only be extended using a shielded cable. In order to simplify fitting to the motor shaft, three connection pins with different threads (M5, M6, M8) are supplied. The cable length on the pulse encoder is 2 m; ferrules should be fitted to the ends of the cables.

Encoder type: IG 06 – ABX – 250 – E1/2,0 – MZ – PP – W04 – 12

Technical data: see user information enclosed with the encoder



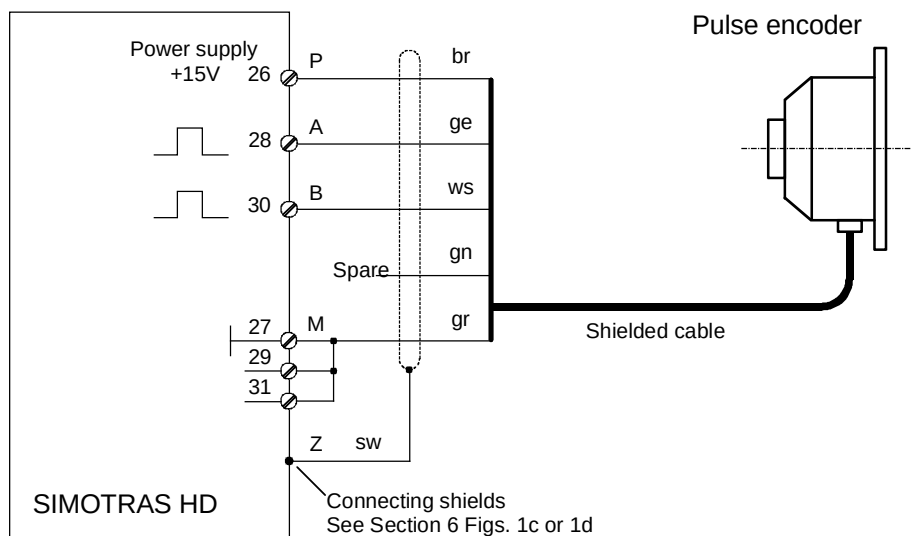
WARNING



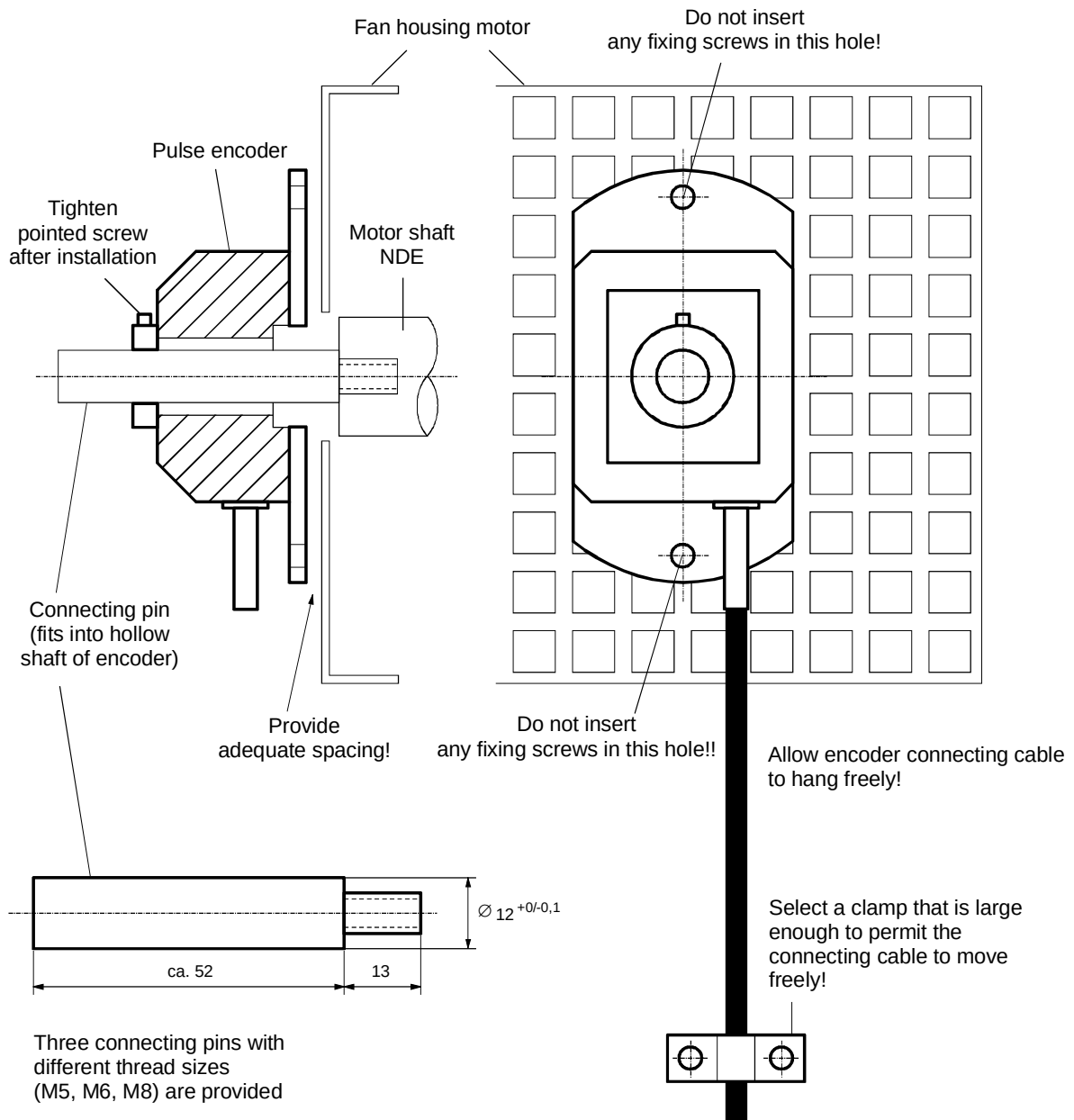
The connecting pin is mechanically connected to the motor shaft; carelessness may result in severe personal injury or substantial property damage.

The mechanical and electrical connection of the encoder may only be carried out by qualified personnel.

Connecting the pulse encoder



Recommended way of fitting the pulse encoder

Do not use force!

How to fit the pulse encoder

- Fit connecting pin to the centre on the non-drive end of the motor shaft.
- Screw in the connecting pin with an application of screw locking compound. The pin must not cause any “wobble” when the shaft is rotating.
- The connecting pin must not show signs of any burr before attaching the pulse encoder as otherwise the pin will not fit into the hollow shaft on the encoder.
- Undo the pointed screws and fit the pulse encoder onto the pin as shown in the assembly diagram.

Caution:

Do not use force! Fit the pulse encoder without using force as otherwise the supports on the encoder may be damaged.

- The encoder must not be connected to the motor housing. Do not put any screws into the fixing holes!

Note:

The motor shaft may move in an axial direction as the motor accelerates and decelerates; this will cause the shaft to push itself out of the motor bearing. For this reason, there must be no fixed connection between the encoder and the motor housing.

- Position the pulse encoder and fix to the motor shaft using the two pointed screws. The encoder should now be “floating” without exerting any pressure on the connecting pin.
- Check that the pulse encoder is attached in such a way that the connecting cable is suspended and can move freely.
- Feed the connecting cable through a clip as far down as possible in order to prevent left/right movements. The cable should be able to move up and down.
- As the pulse encoder can move freely, rocking movements along the axial and radial axes can be compensated. These rocking movements have no effect on the actual speed measuring process.

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.

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

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



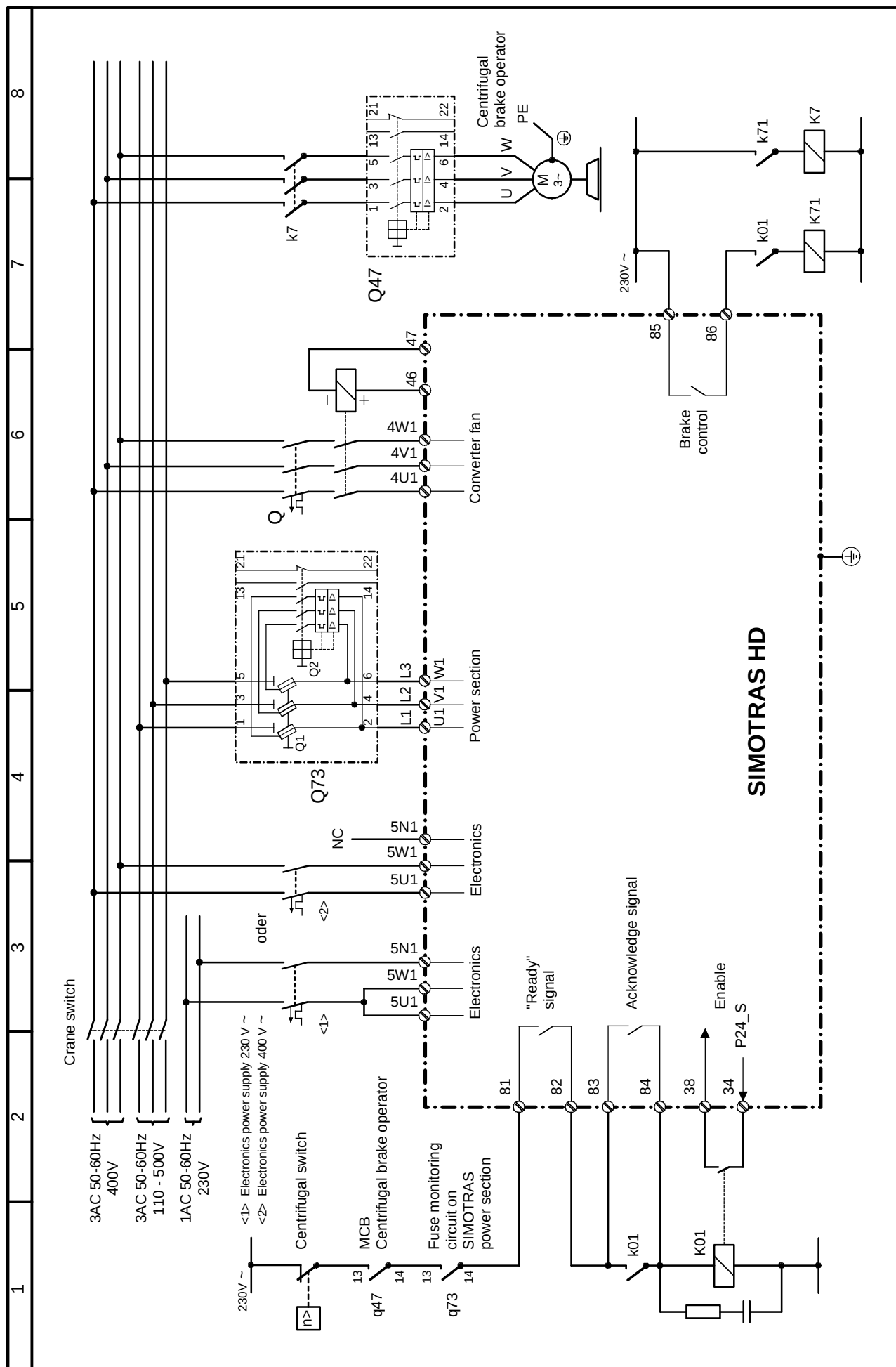
The snubber capacitors continue to carry hazardous voltage for up to 2 minutes after isolation from the supply. For this reason, the converter must not be opened for at least two minutes after switch-off.

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, SIMOTRAS 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.

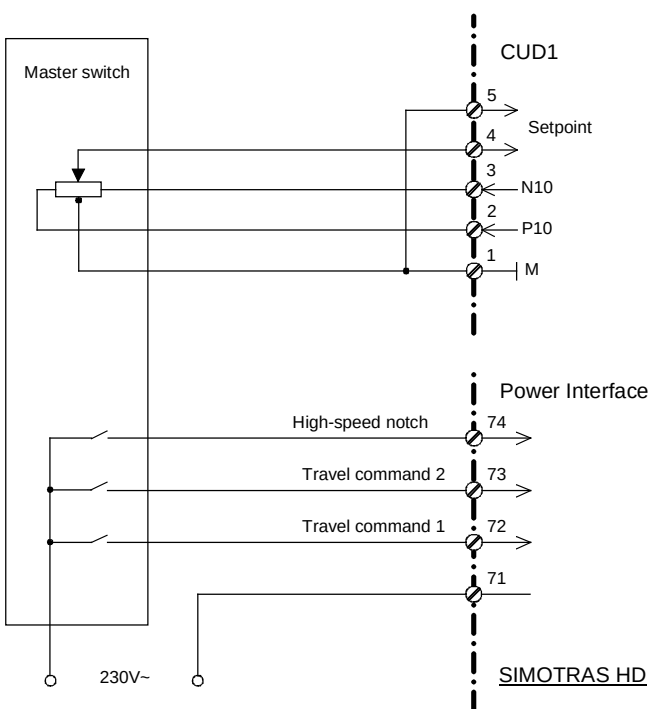
These converters contain hazardous rotating machinery (fans) and control rotating mechanical components (drives). Death, serious bodily injury or substantial property damage may occur if the instructions in the relevant operating manuals are not observed.

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



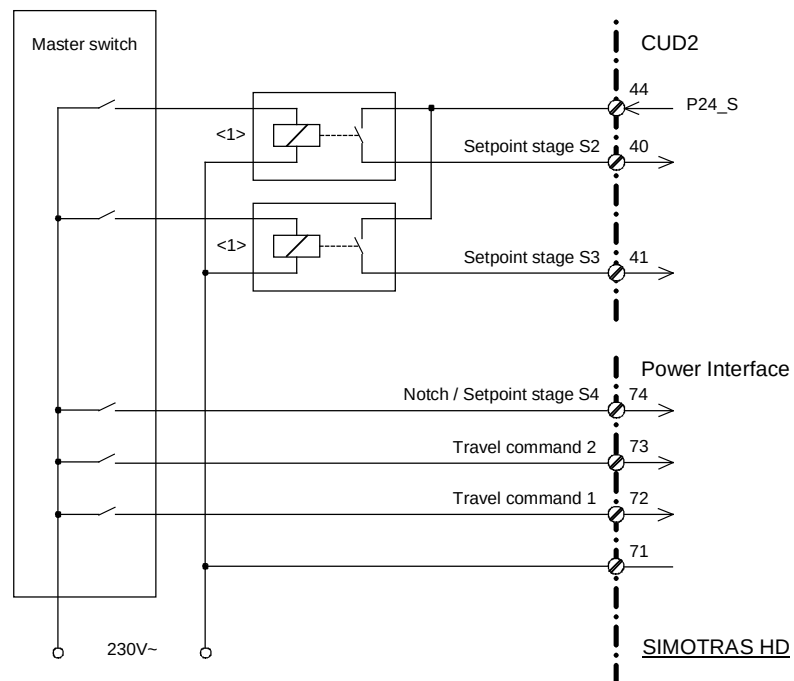
Connection of Master Switch

Master switch with setpoint potentiometer



4 stage master switch

(see also Section 8, Sheet G13)



<1> e.g. input coupling element
SIEMENS order no. 3TX7002-2BF02

Note: A relay with hard gold plated contacts should be used.

Drive-specific (crane) control

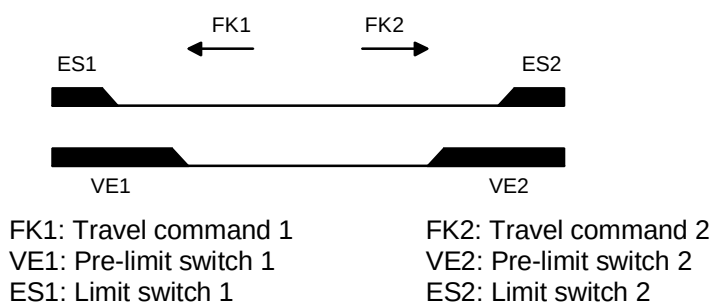
The drive-specific (crane) control is integrated in the SIMOTRAS HD converter. It is made up of the freely assignable function blocks (technology software S00). The freely assignable function blocks are shown in Section 8, sheets B1 to B24. In the factory settings for the relevant parameters, these function blocks are connected to the drive-specific (crane) controls as shown in Section 8, sheets K1 to K18.

The drive-specific (crane) control has been designed to simplify the switchover between the master switch with setpoint potentiometer and the 4-stage master switch:

U251 = 0: Master switch with setpoint potentiometer
 U251 = 1 4 stage master switch

The control functions can be entered via the terminals or PROFIBUS (SINEC L2 DP). If a T300 technology board and/or a CBP board is inserted, the control functions are automatically entered from the T300 or from PROFIBUS. The terminals 36, 37, 39 and 72 to 79 have no function. The bit assignments for the control inputs on the PROFIBUS are shown on sheets K4 and K5 in Section 8.

The following diagram shows the arrangement of the pre-limit switches and the limit switches, together with the direction of the travel command as required for operating the crane control.



6.2 Installation instructions for proper EMC installation of drives

NOTE

These installation instructions do not purport to handle or take into account all of the equipment details or versions or to cover every conceivable operating situation or application. If you require more detailed information, or if special problems occur, which are not handled in enough detail in this document, please contact your local Siemens office.

The contents of these installation instructions are not part of an earlier or existing agreement or legal contract and neither do they change it. The actual purchase contract represents the complete liability of the ASI 1 Variable-Speed Drives Group of Siemens AG. The warrant conditions, specified in the contract between the two parties, is the only warranty which will be accepted by the ASI 1 Variable-Speed Drives Group. The warranty conditions specified in the contract are neither expanded nor changed by the information provided in the installation instructions.

6.2.1 Fundamental principles of EMC

6.2.1.1 What is EMC

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

Thus, different items of equipment must not adversely affect one another.

6.2.1.2 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 noise source and a noise receiver. For example, the power section of a converter must be regarded as a noise source and the control section as a noise receiver.

6.2.1.3 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.

SIMOTRAS HD 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 6.2.2.3).

6.2.1.4 Using SIMOTRAS HD in an industrial environment

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

SIMOTRAS HD 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. In most cases fuses will also be required. Limit values can only be maintained if these components are installed and mounted in the correct way. In order to limit the mains-borne radiated noise according to limit value "A1", the appropriate radio interference suppression filter is required in addition to the converter itself. Without an RI suppression filter, the noise radiated by a SIMOTRAS HD converter 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 crane system have noise immunity for industrial environments, it is not necessary for each drive to meet limit value "A1" in its own right.

6.2.1.5 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 operate. 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.

6.2.1.6 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 (μ V) between 150 kHz and 500 kHz and max. 73 dB (μ V) (9 mV or 4.5 mV) between 500 kHz and 30 MHz.

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

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

6.2.2 Proper EMC installation of drives (installation instructions)

6.2.2.1 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 differ widely 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.

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

Rule 8

Signal and power cables must be routed separately from one another (to prevent noise from being coupled in). 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 (ground²⁾) 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

Unshielded motor cables may be used in SIMOTRAS HS drive systems.

The line supply cable must be routed at a distance of at least 20 cm from the motor cables (stator, rotor). Use a metal partition if necessary.

Footnotes:

1) Signal cables are defined as:

Digital signal cable:	Analog signal cable.:
Pulse encoder cables	e.g. ± 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:

Section 6.2.2.3 shows how RI suppression filters are arranged in the SIMOTRAS HD system. The specified sequence for installing the filters must be observed. Fuses for semiconductor protection are selected according to Section 6.4.

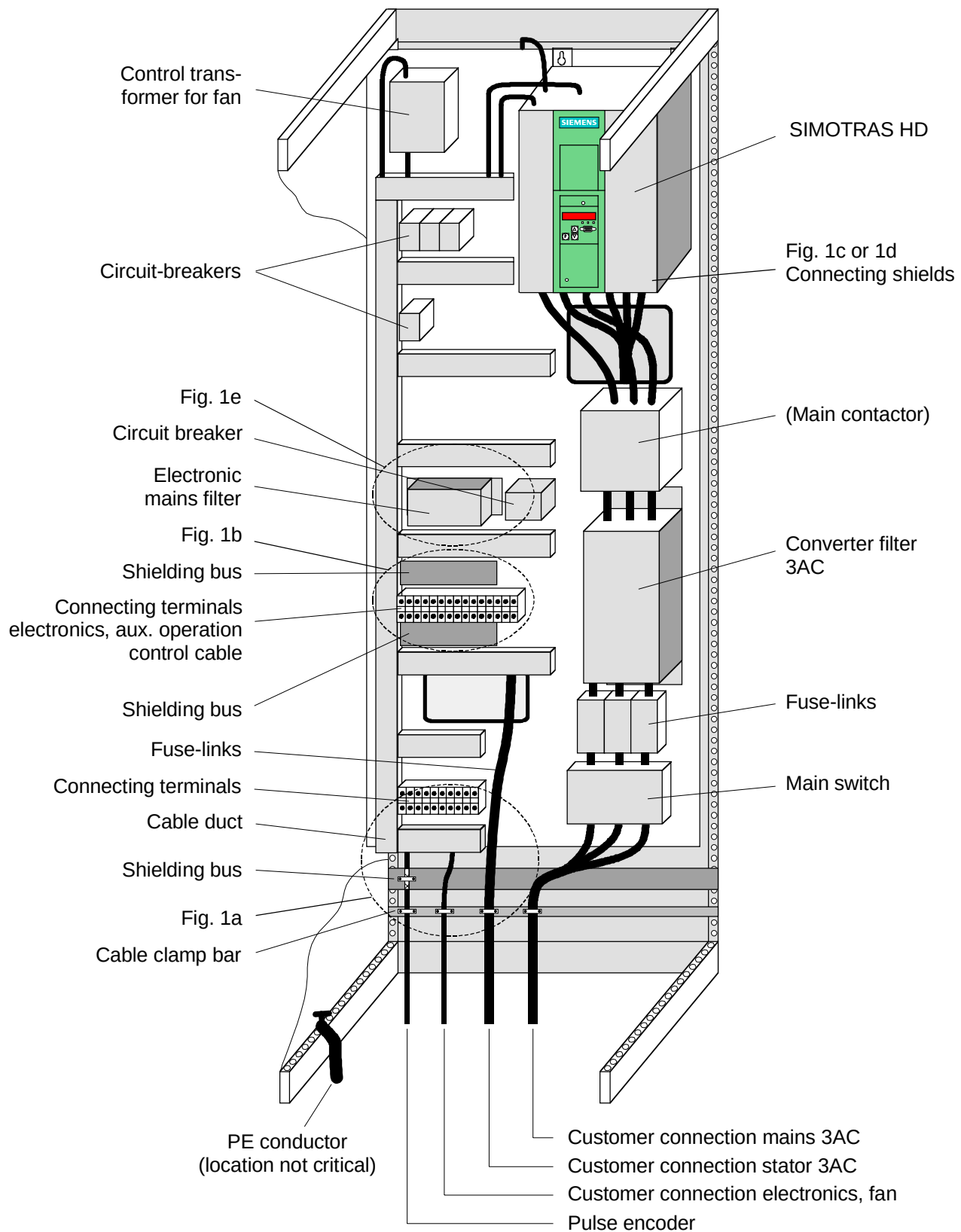


Fig. 1: Example of a cabinet design with a SIMOTRAS HD

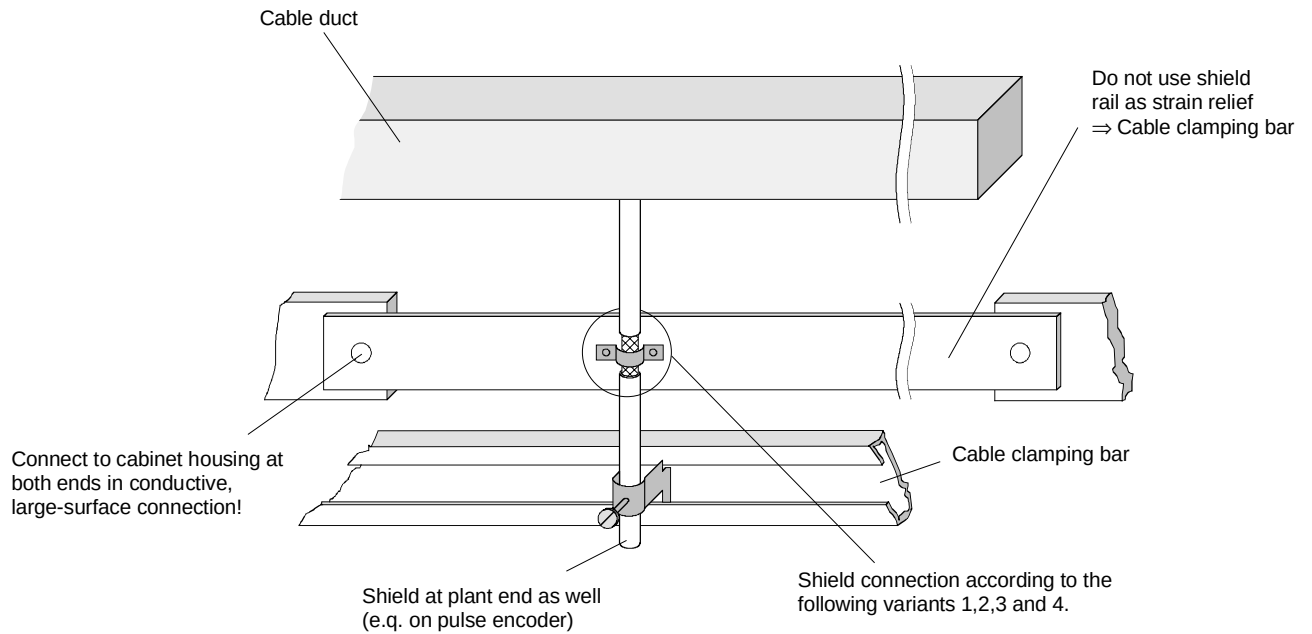


Fig. 1a: Shield at cable entry point to cabinet

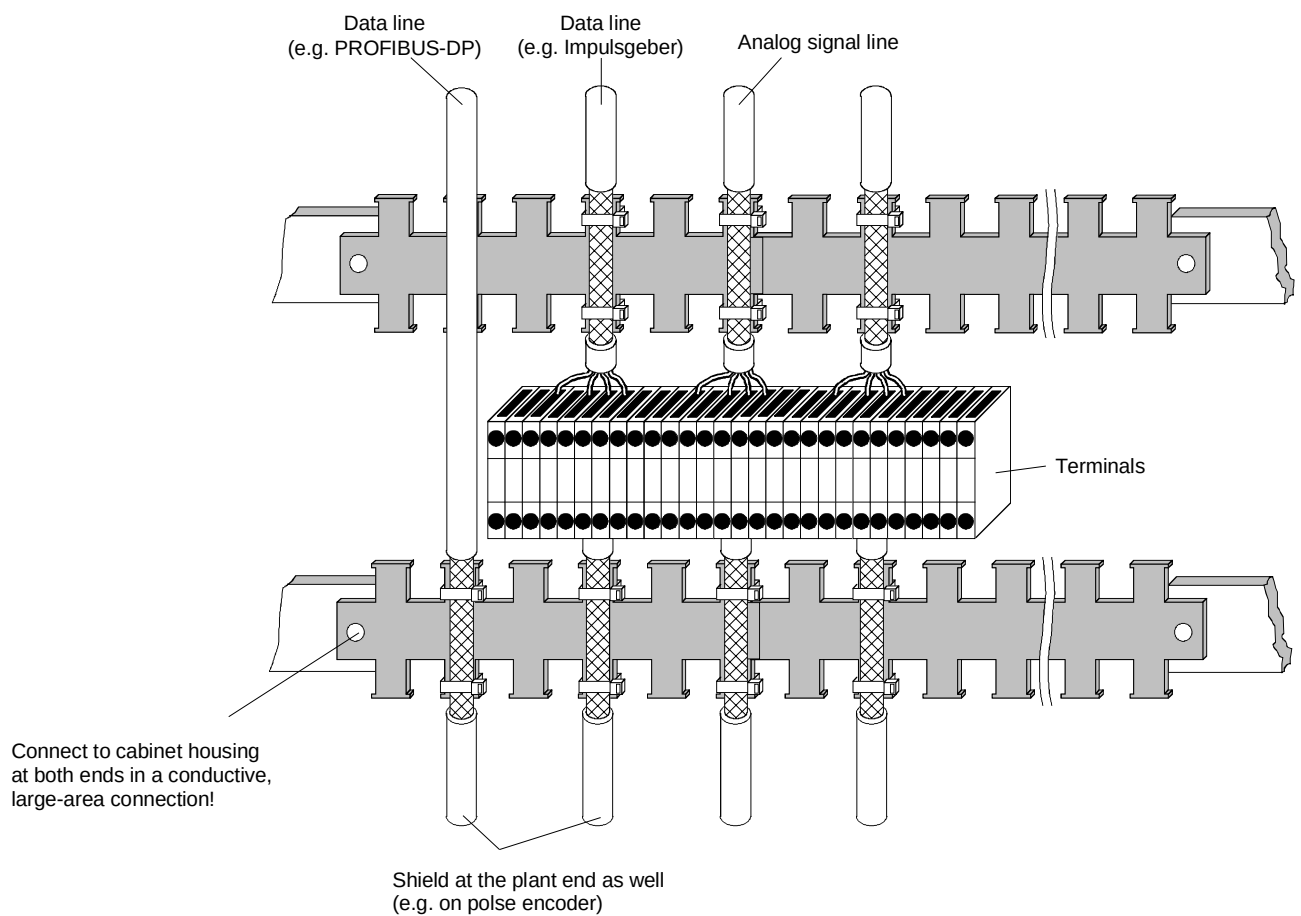


Fig. 1b: Shielding in the cabinet

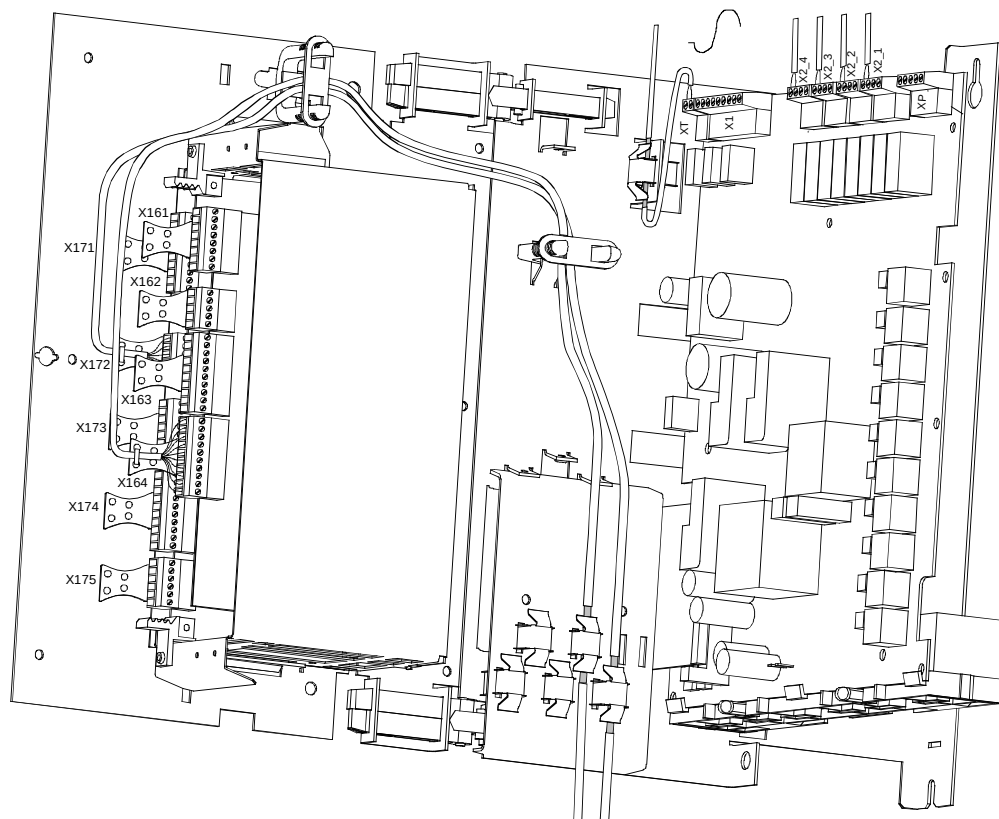


Fig. 1c: Connecting shields on a SIMOTRAS HD D400 / 60-280 Mre converter

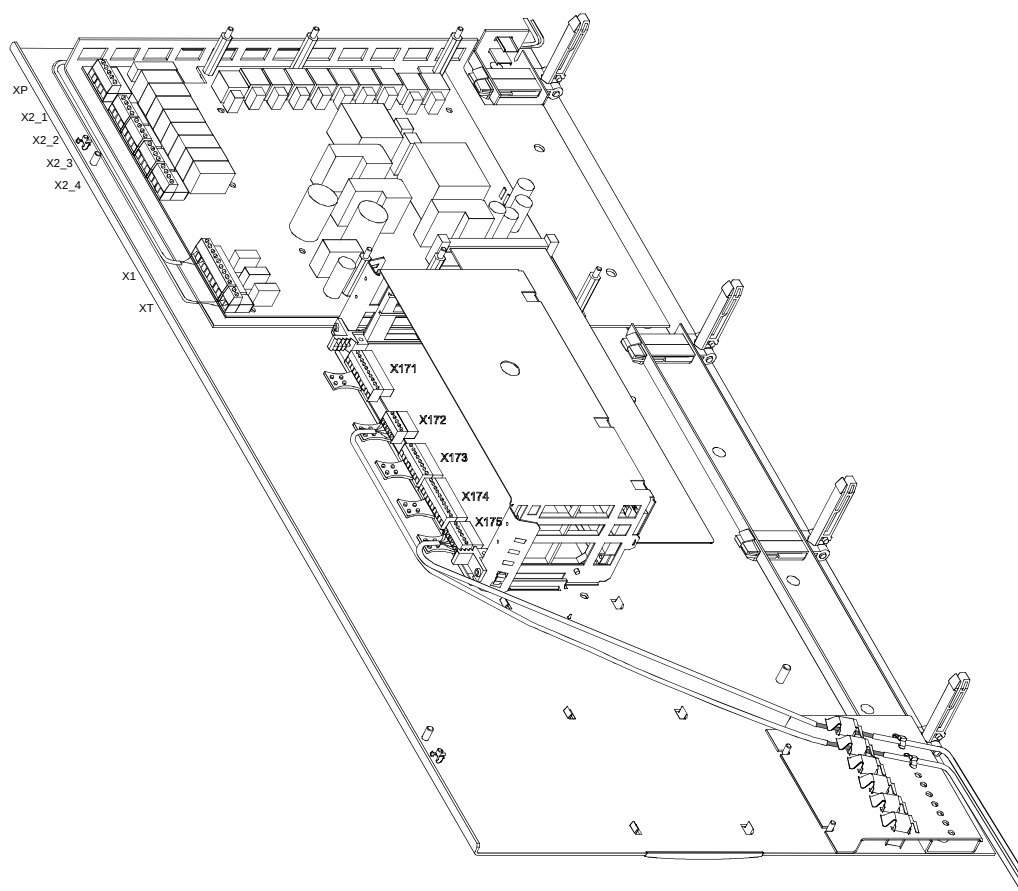


Fig. 1d: Connecting shields on a SIMOTRAS HD D400 / 900 Mre converter

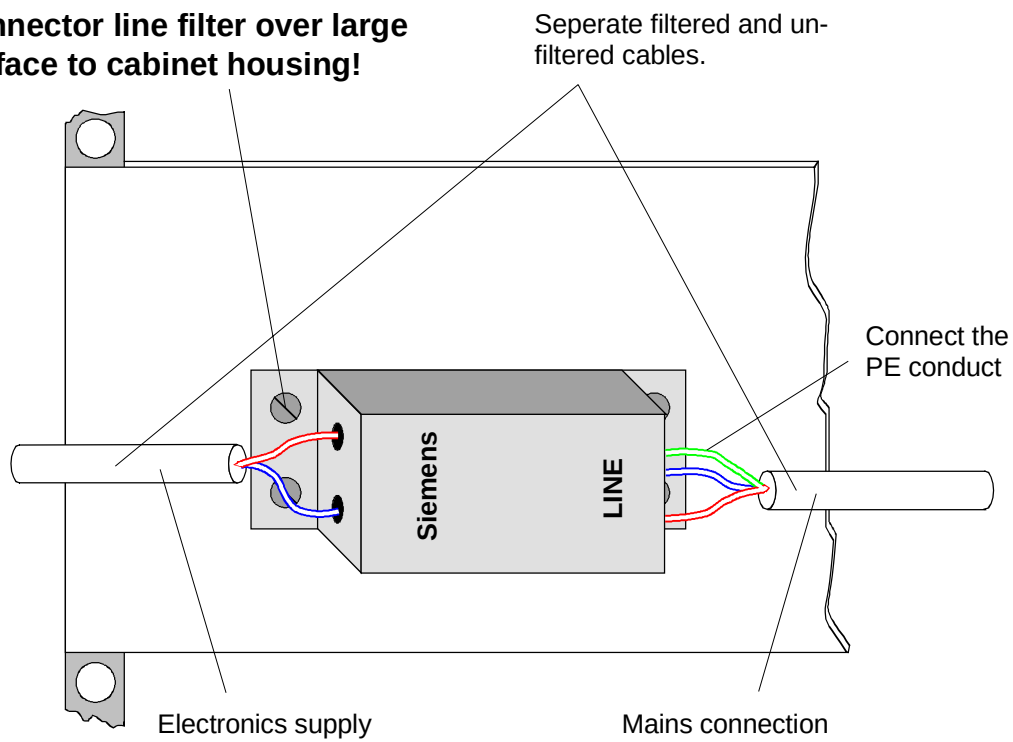
Connector line filter over large surface to cabinet housing!

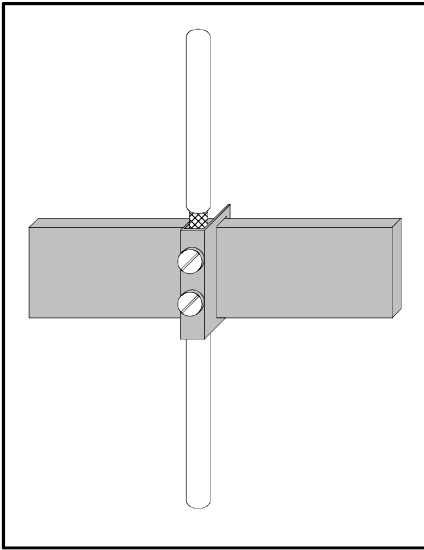
Fig. 1e: Line filter for SIMOTRAS HD 6SG70 electronics power supply

Note:

Rule 12 in Section 6.2.2.2 shows why it is necessary to install a line filter.

Shield connections:

Variant 1:



Variant 2:

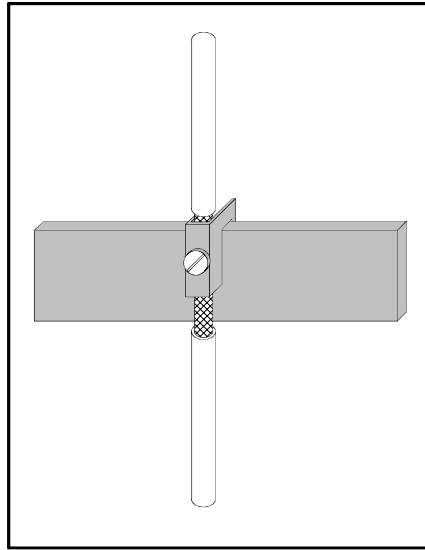


Fig. 2a: Terminal on copper busbar, max. cable diameter 15 mm

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

Important !

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

Note:

Connecting 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:

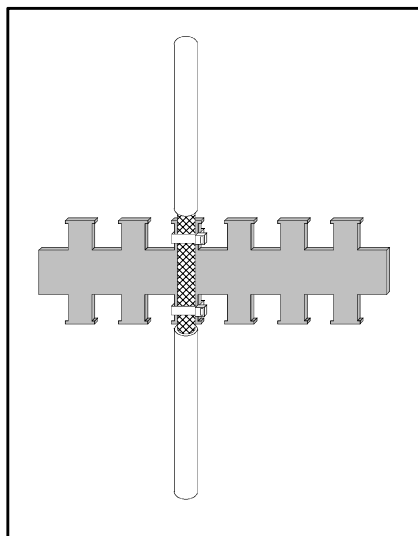


Fig. 2c: Metallized tubing or cable ties on a bare metal comb-type/serrated rail

Note:

Comb-type rail:
Item No. J48028

Ordering address:

SIEMENS AG ANL A443 KA
Günther-Scharowsky-Str. 2
Betriebe Süd
91058 Erlangen
Germany

Variant 4:

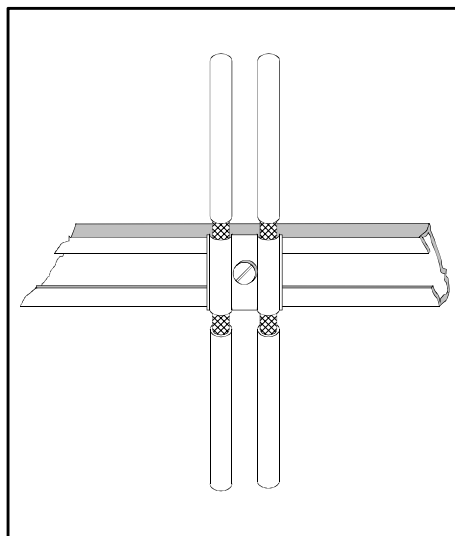


Fig. 2d: Clamp and metallic mating piece on a cable clamping rail

Note:

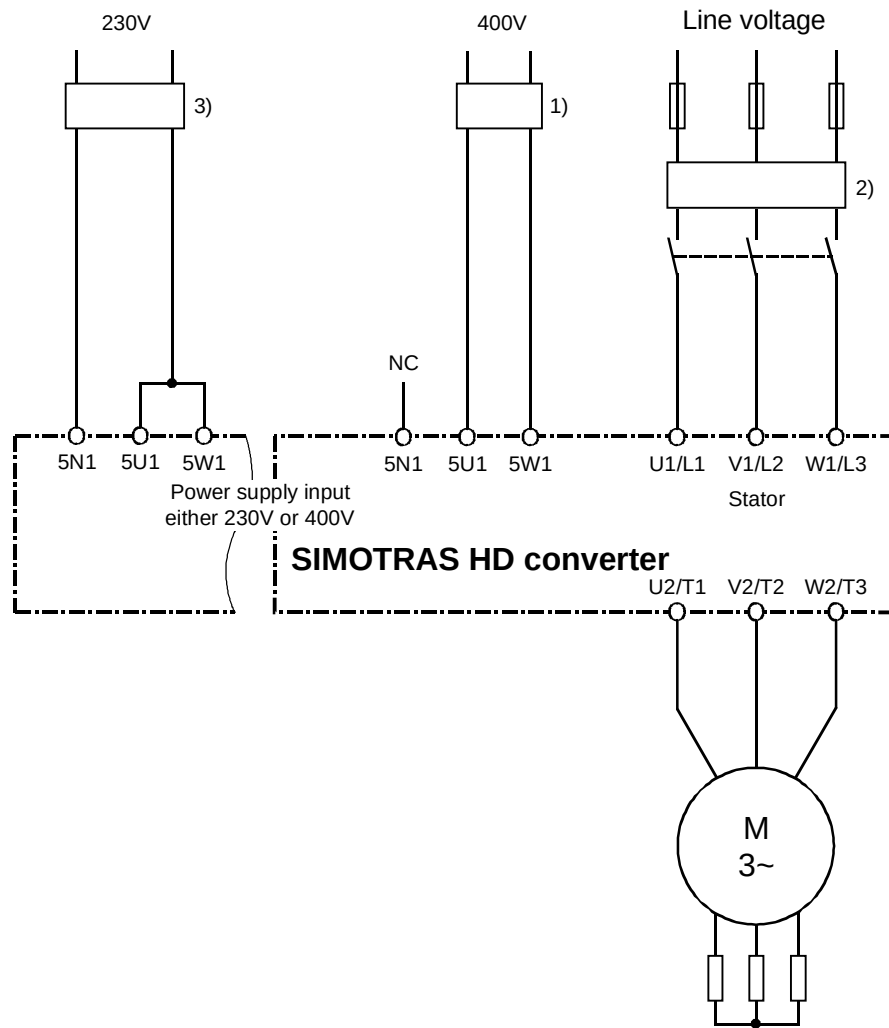
Siemens 5VC55... cable clamps;
Clamping rails in various sizes:
Item No. K48001 to 48005

Ordering address:

SIEMENS AG ANL A443 KA
Günther-Scharowsky-Str. 2
Betriebe Süd
91058 Erlangen
Germany

6.2.2.3 Arrangement of components for converters

Arrangement of filters



- 1) The filter for the electronics power supply is dimensioned for 1.1 A.
- 2) The filter for the stator circuit is dimensioned for the rated motor current.
- 3) The filter for the electronics power supply is dimensioned for 2 A.

6.2.2.4 List of recommended RI suppression filters

Rated current RI suppression filter (A)	RI suppression filter Order number	Terminal cross- section (mm ²)	Ground (kg)	Dimensions HxWxD (mm)
36	6SE7023-4ES87-0FB0	25	3,7	245x101x86
80	6SE7027-2ES87-0FB0	50	9,5	308x141x141
120	6SE7031-0ES87-0FA0	50	10	348x171x141
180	6SE7031-8ES87-0FA0	95	13	404x171x141
500	6SE7033-7ES87-0FA0	Connecting lug	49	590x305x154
1000	6SE7041-0ES87-0FA0	Connecting lug	90	840x465x204

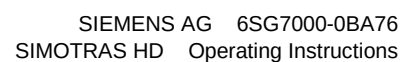
Important technical data of RI suppression filters:

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 filters, please refer to the Operating Instructions:

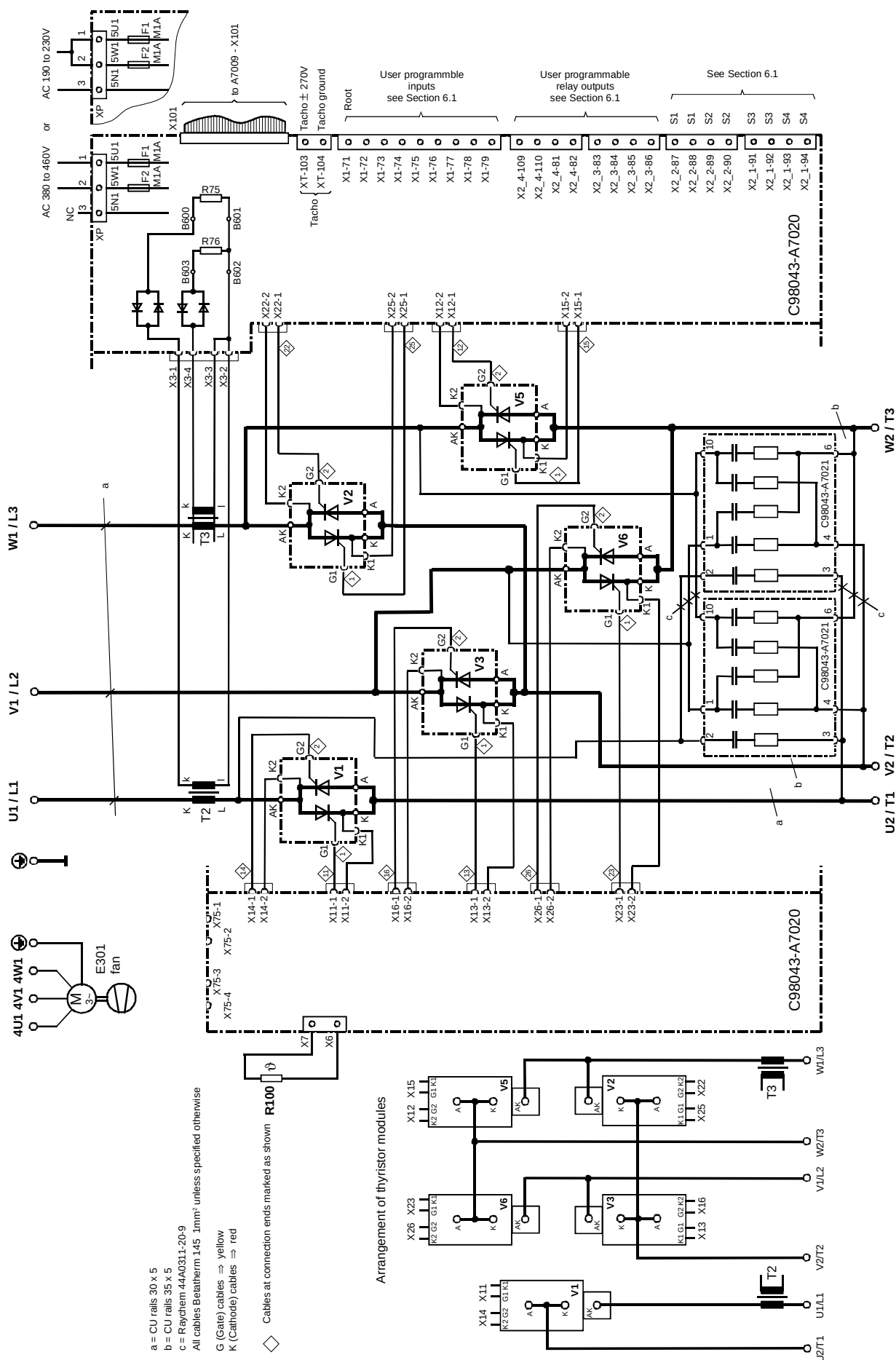
SIMOVERT Master Drives RI Suppression Filters EMC Filters, Order number: 6SE7087-6CX87-0FB0.

D400 / 60 - 180 Mre converter (order no. 6SG7050 - 6SG7065)
see technical data in Section 3.4



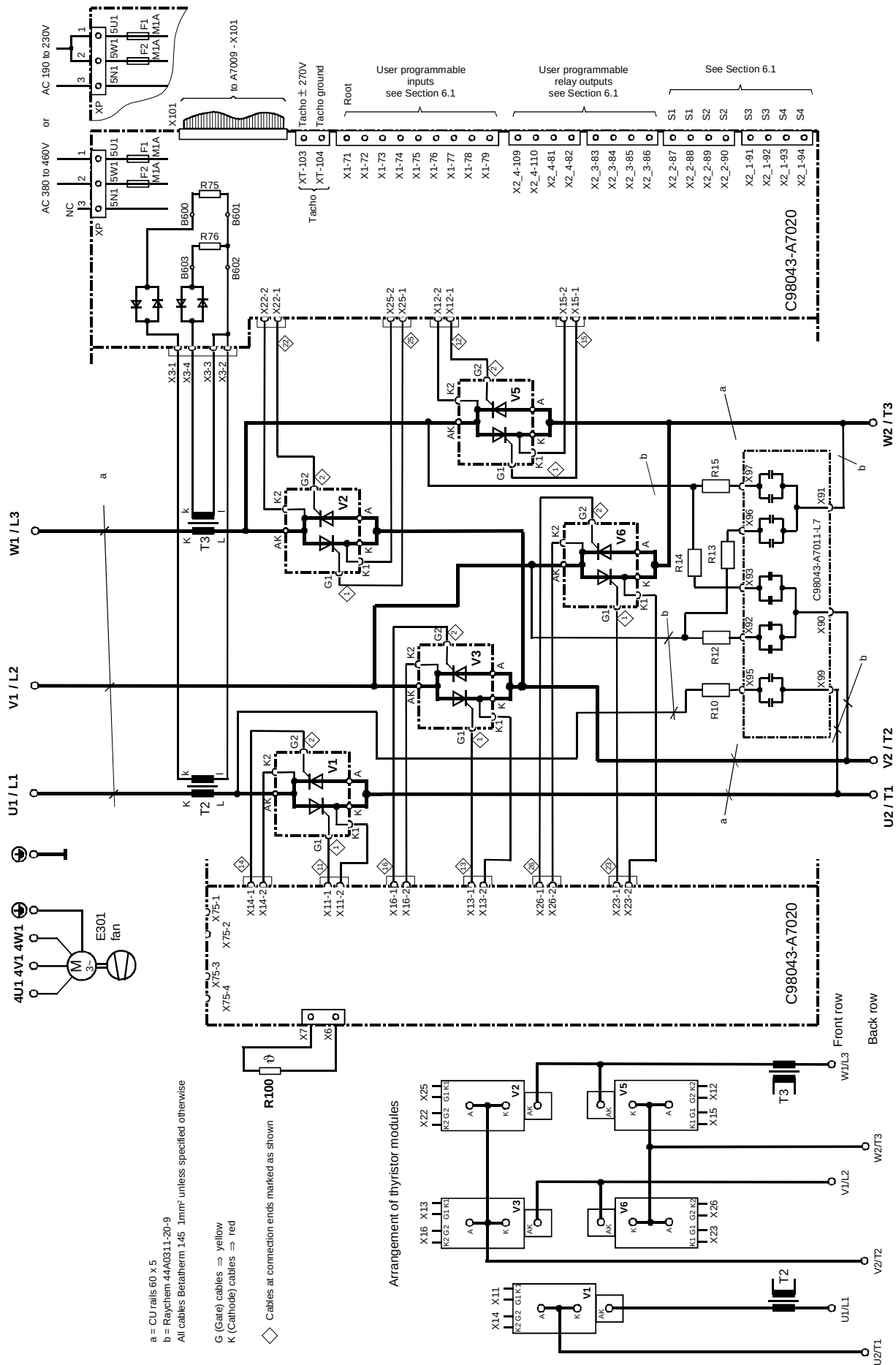
D400 / 225 -360 Mre converter (order no. 6SG7070 - 6SG7076)

see technical data in Section 3.4



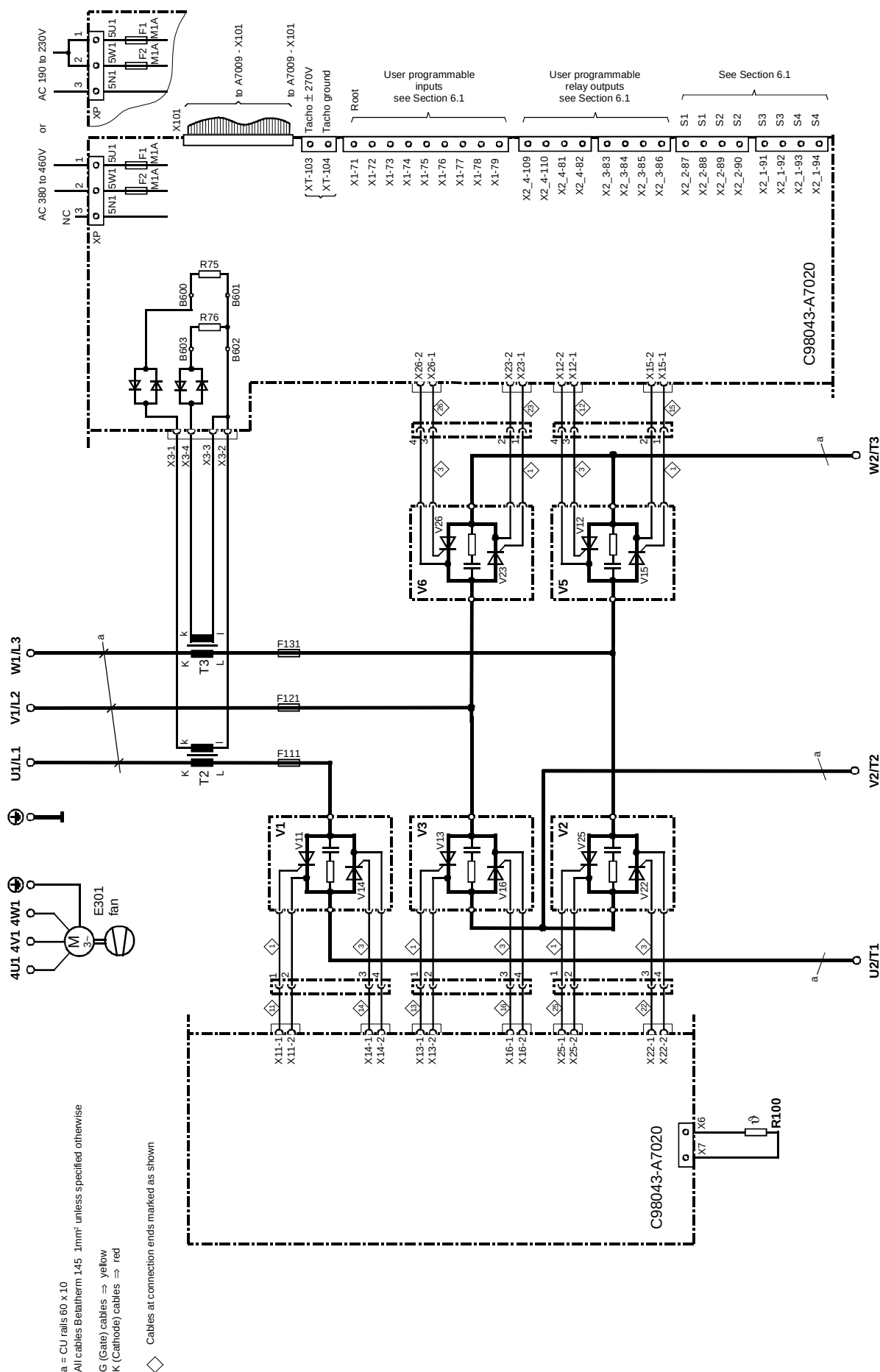
D400 / 525 -680 Mre converter (order no. 6SG7080 - 6SG7082)

see technical data in Section 3.4



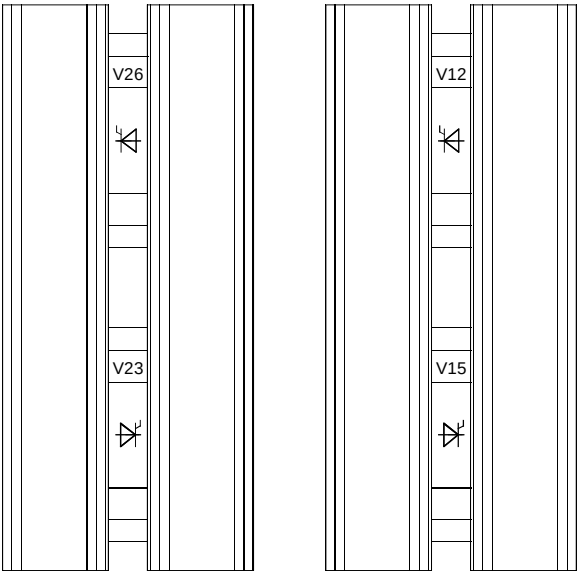
D400 / 900 Mre converter (order no. 6SG7085)

see technical data in Section 3.4

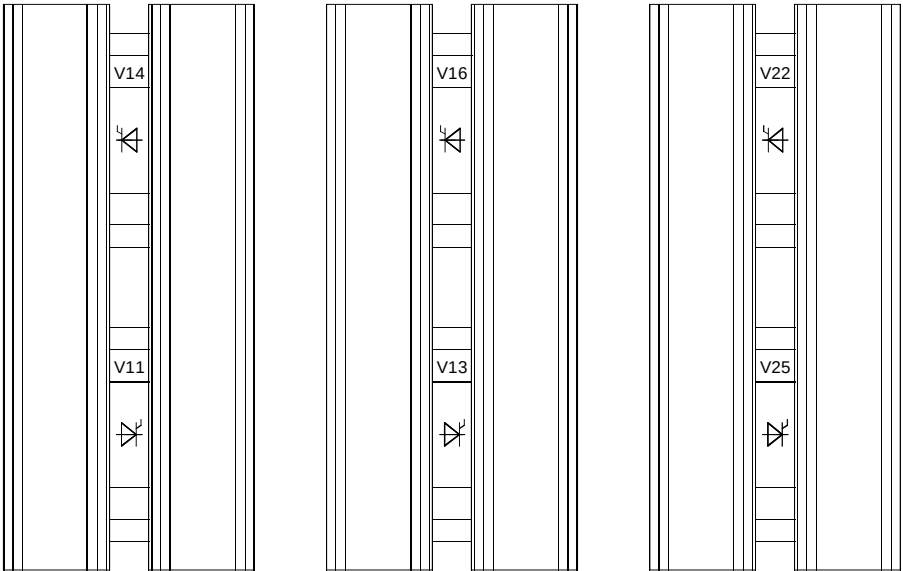


Arrangement of thyristor blocks

Rear level



Front level



6.4 Fuses

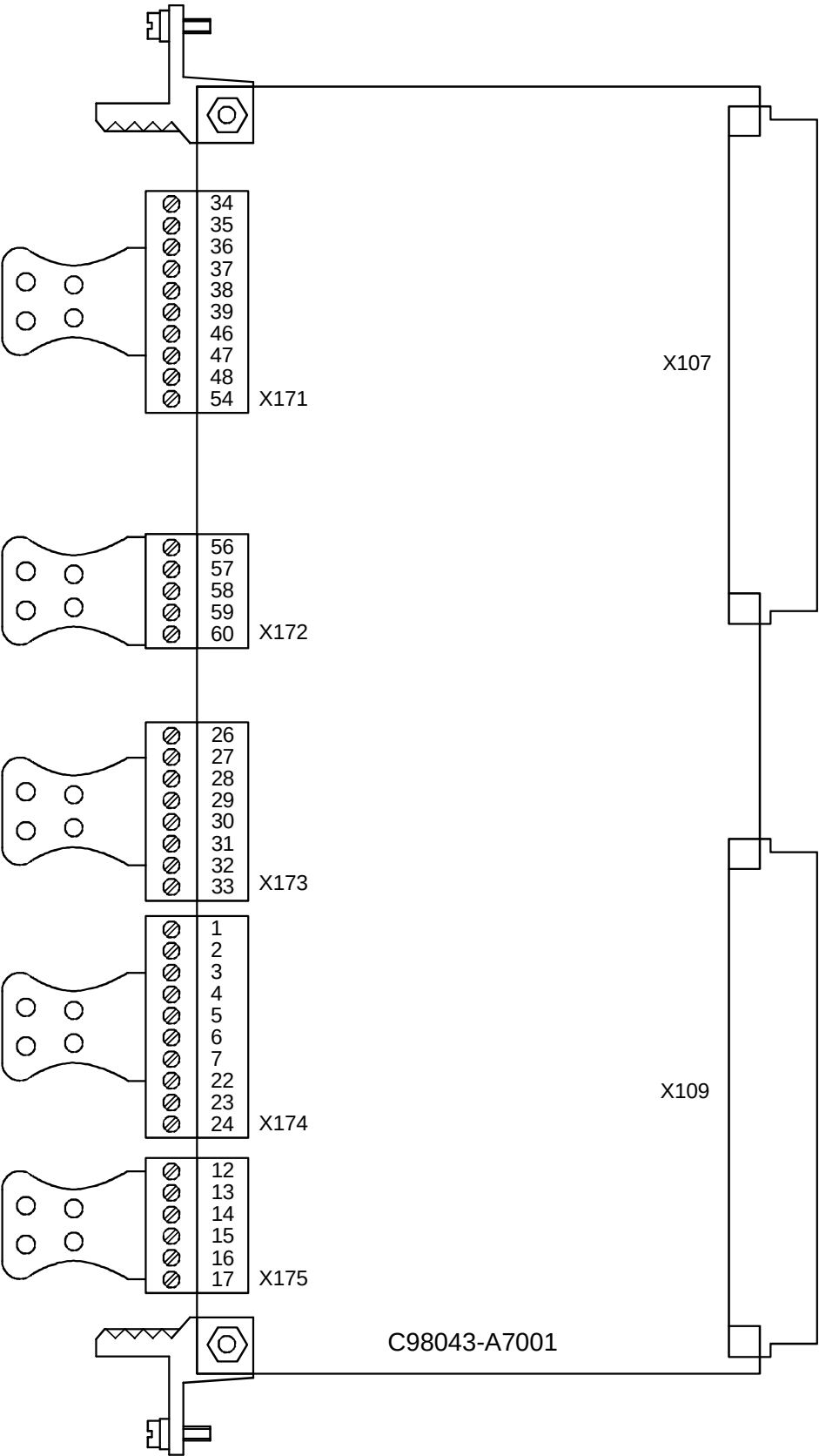
For technical data, configuring data and dimension drawings, please refer to Catalog DA94.1.

Converter Order No.	Rated current of		Line fuses 3	
	Standard	Option H78	Order No.	Rated current/ voltage A / V
	A	A		
6SG7050-0EB60	60	42	3NE1820-0	80 / 690
6SG7052-0EB60	78	55	3NE1021-0	100 / 690
6SG7055-0EB60	98	70	3NE1022-0	125 / 690
6SG7060-0EB60	112	80	3NE1024-0	160 / 690
6SG7062-0EB60	142	100	3NE1224-0	160 / 690
6SG7065-0EB60	180	125	3NE1225-0	200 / 690
6SG7070-0EB60	225	150	3NE1227-0	250 / 690
6SG7072-0EB60	285	200	3NE1331-0	350 / 690
6SG7076-0EB60	360	250	3NE1332-0	400 / 690
6SG7080-0EB60	525	365	3NE1435-0	560 / 690
6SG7082-0EB60	680	475	3NE13340-8	900 / 690
6SG7085-0EB60	900	700	6RY1702-0BA01 ¹⁾	1250 / 660

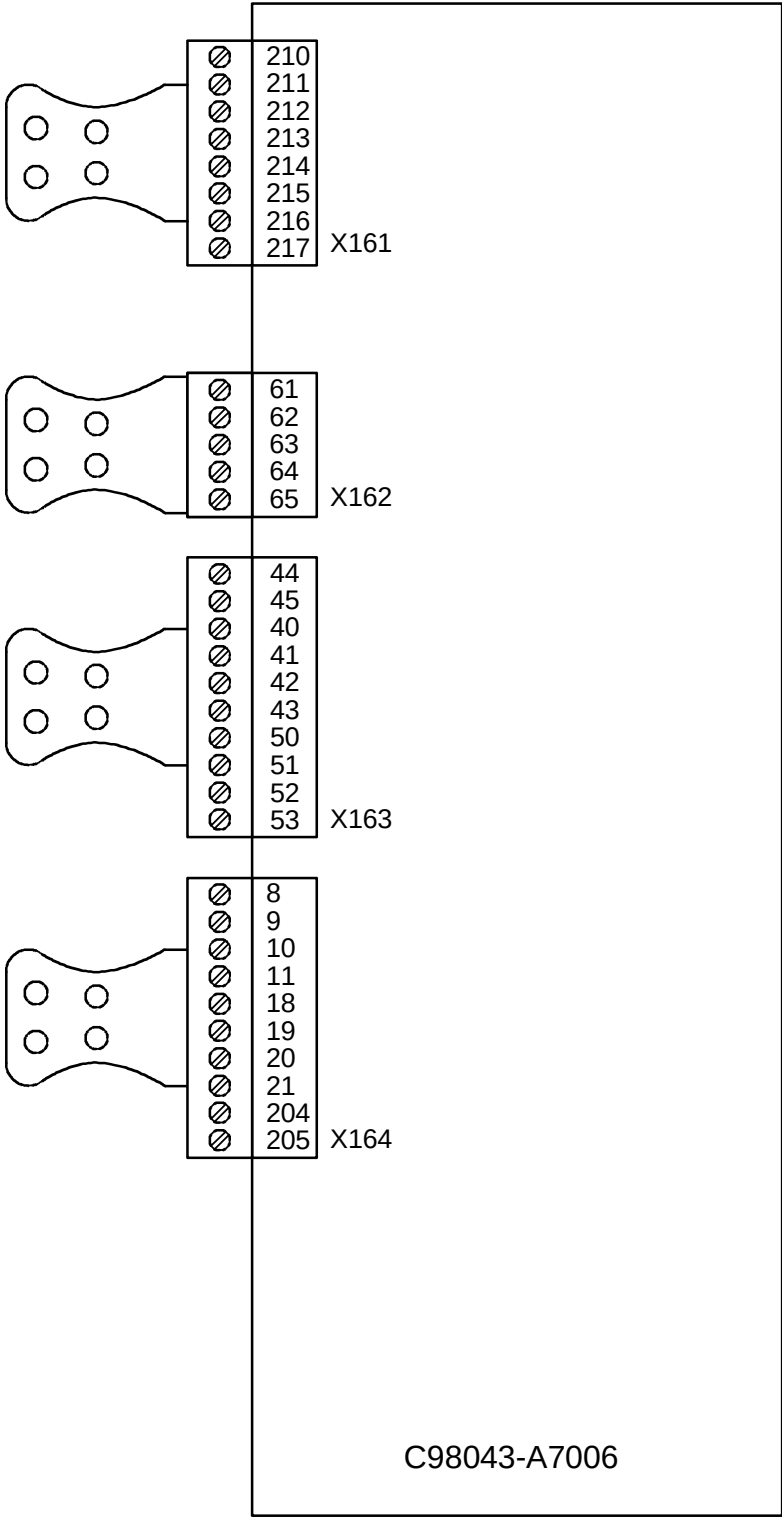
1) Fuses are included in converter, external semiconductor fuses are not needed.

6.5 Terminal arrangement

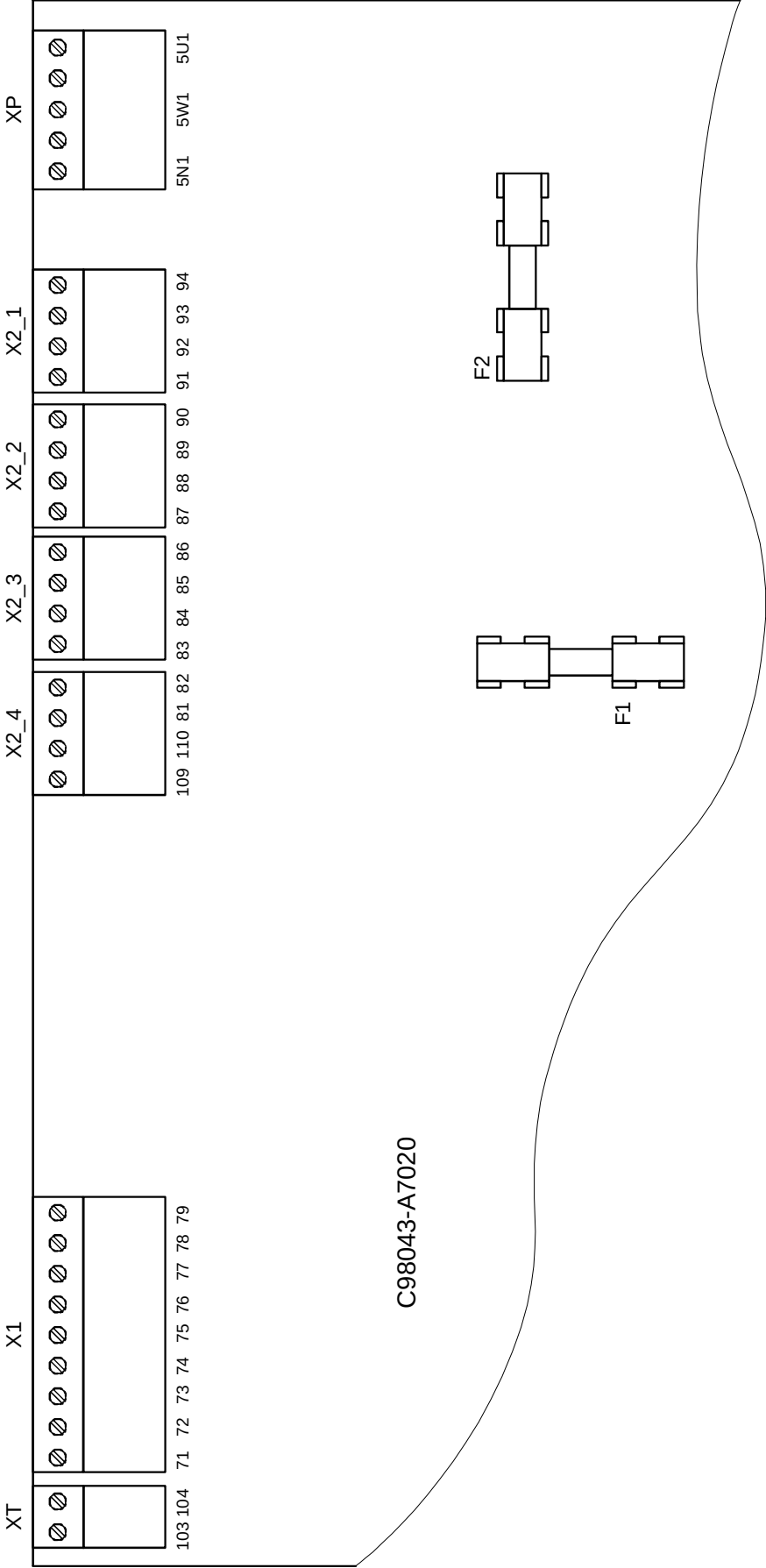
Electronics module SIMOTRAS HD C98043-A7001 (CUD1)



Module C98043-A7006 (CUD2)

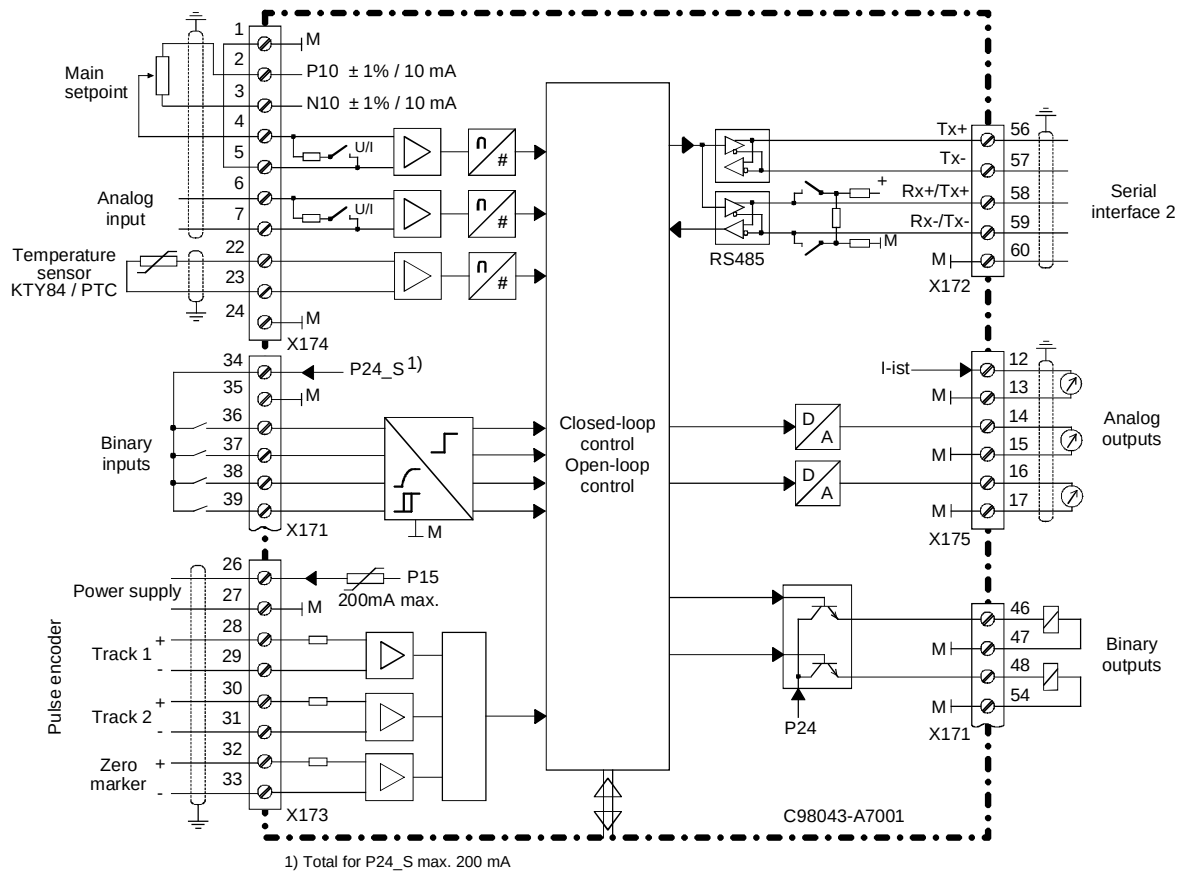


Module C98043-A7010

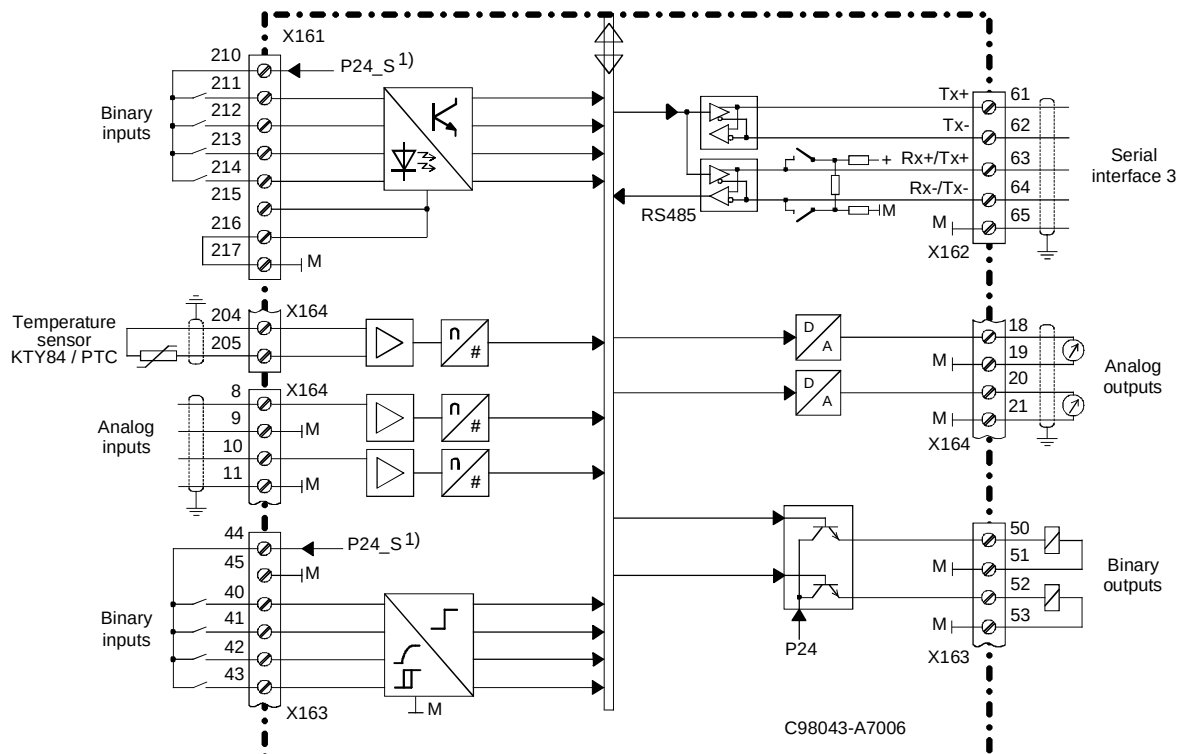


6.6 Terminal assignments

6.6.1 Overview of terminal connections on the C98043-A7001 (CUD1) electronics module



6.6.2 Overview of terminal connections on the optional C98043-A7006 (CUD2) terminal expansion module



6.6.3 Terminal description



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:

- D400 / 60 -180 Mre converters

U1, V1, W1: Through-hole for M8 (3x20 copper bus)
U2, V2, W2: Through-hole for M8 (5x20 copper bus)
- D400 / 225 -360 Mre converters

U1, V1, W1: Through-hole for M10 (5x30 copper bus)
U2, V2, W2: Through-hole for M10 (5x35 copper bus)
- D400 / 525 -680 Mre converters

Through-hole for M12 (5x60 copper bus)
- D400 / 900 Mre converters

U1, V1, W1: Through-hole for M12 (10x60 copper bus)
U2, V2, W2: 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.

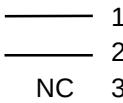
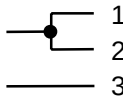
PE conductor connection: Minimum cross-section 10mm². (see Section 5.1 for connection options).

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
Supply input	U1 (L1) V1 (L2) W1 (L3)	} see technical data in Section 3.4
PE conductor		
Motor connection	U2 (T1) V2 (T2) W2 (T3)	

Electronics power supply

Terminal type: Type 49 plug-in terminal
Maximum cross-section 1.5mm², finely stranded

Function	Connection	Terminal XP	Connection values/Remarks
Incoming supply 400V	 1 2 NC 3	5U1 5W1 5N1	2AC 380V (-25%) to 460V (+15%); I _n =1A (– 35% for 1min) Internal fusing using F1, F2 on the C98043-A7020 module
or			
Incoming supply 230V	 1 2 3	5U1 5W1 5N1	1AC 190V (-25%) to 230V (+15%); I _n =2A (– 35% for 1min) Internal fusing using F1, F2 on the C98043-A7020 module

NOTE

In the case of line voltages which exceed the tolerance range specified in Section 3.4, the electronics supply voltage 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 power section is to be set in parameter P078.

Fan

(for forced-cooled converters ≥ 225A)

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	4U1 4V1 4W1	3AC 400 to 460 For further details, see technical data in Section 3.4
PE conductor	⊕	Fan can be switched via external contactor relay 3TH2031-0FB4 (Siemens), triggered by CUD1 module, terminals X171 / 46, 47



WARNING



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

Check: Check that the fan is rotating in the direction of the arrow!

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

XT, X1, X2_1 to X2_4

MSTB2.5 plug-in terminal
Maximum connection cross-section 2.5mm²

Analog inputs - setpoint inputs, reference voltage (see also Section 8, sheet G5)

Function		Terminal X174	Connection values/Remarks
Reference	M	1	} ±1% at 25°C (stability 0.1% per 10°K); 10mA short-circuit-proof
	P10	2	
	N10	3	
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 G5)

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 G22)

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

Characteristic data of pulse encoder 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):
 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):
 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 permitted 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 15V 5V		Rated input voltage 15V 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 $T_{\min}$:

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

L_G = phase error

f_p = pulse frequency

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

This formula applies only if the encoder pulse/pause 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 SIMOTRAS converter over the largest possible surface area.

Temperature sensor inputs (see also Section 8, Sheet G41)

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

Analog outputs (see also Section 8, Sheet G7)

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

Binary inputs (see also Section 8, Sheet G2)

Function	Terminal X171	Connection values/Remarks
Supply Ground digital M	34 35	24V DC, short-circuit proof max. load 200mA (terminals 34, 44 and 210 combined), internal supply referred to internal ground H signal: +13V to +33V L signal: – 33V to +3V or terminal open 8.5mA at 24V
Select input binary 1	36	
Power On / Shutdown1 = power on / 0 = shutdown)	37	
Enable operation1 = enable controller / 0 = disable controller)	38	
Select input binary 2	39	

Binary outputs (see also Section 8, Sheet G4)

Function	Terminal X171	Connection values/Remarks
Select output binary 1 Ground M	46 47	H signal: +19V to +30V L signal: 0V to +2V short-circuit proof 100mA Internal snubber circuit (free-wheeling diode)
Select output binary 2 Ground M	48 54	H signal: +19 to +30V L signal: 0 to +2V short-circuit proof 100mA Internal snubber circuit (free-wheeling diode)

Serial interface 1 RS232 (9-pin SUBMIN D connector)

(see also Section 8, Sheet G29)

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 centre or room.

Serial interface 2 RS485 (see also Section 8, Sheets G30 and G32)

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 $\Rightarrow$ 600m
For transmission rate =93.75kBd $\Rightarrow$ 1200m

The following must be observed: DIN 19245 Part 1

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

Control inputs (see also Section 6.1 and Section 8, Sheets G9 and G10)

Function	Terminal X1	LED	Connection values/Remarks
LS - Control voltage connection Common connection for control inputs	71		230V AC / 8 mA
Control input In the factory setting, the parameter is wired as the input for " <u>Travel command 1</u> " – FK1 for crane control	72	H72	230V AC / 8 mA
Control input In the factory setting, the parameter is wired as the input for " <u>Travel command 2</u> " – FK2 for crane control	73	H73	230V AC / 8 mA
Control input In the factory setting, the parameter is wired as the input for <u>Notch</u>)	74	H74	230V AC / 8 mA
Control input In the factory setting, the parameter is wired as the input for " <u>Pre-limit switch 1</u> " – VE1	75	H75	230V AC / 8 mA
Control input In the factory setting, the parameter is wired as the input for " <u>Pre-limit switch 2</u> " – VE2	76	H76	230V AC / 8 mA
Control input In the factory setting, the parameter is wired as the input for " <u>Limit switch 1</u> " – LS1	77	H77	230V AC / 8 mA
Control input In the factory setting, the parameter is wired as the input for " <u>Limit switch 2</u> " – LS2	78	H78	230V AC / 8 mA
Control input In the factory setting, the parameter is wired as the input for the <u>Acknowledge key</u>)	79	H79	230V AC / 8 mA

Control outputs (electrically isolated relay outputs) (see also Section 8, Sheets G4 and G11)

Function	Terminal X2_4	LED	Connection values/Remarks
Control output In the factory setting, the parameter is wired as the output " <u>No fault</u> "	109 110	H109	Load capability: =250V AC, 4A; $\cos\Phi=1$ =250V AC, 2A; $\cos\Phi=0,4$ =30V DC, 2A
Control output In the factory setting, the parameter is wired as the output " <u>No fault</u> "	81 82	H81	

Function	Terminal X2_3	LED	Connection values/Remarks
Control output In the factory setting, the parameter is wired as the output " <u>Acknowledgement</u> "	83 84	H83	Load capability: =250V AC, 4A; $\cos\Phi=1$ =250V AC, 2A; $\cos\Phi=0,4$ =30V DC, 2A
Control output In the factory setting, the parameter is wired as the output " <u>Brake contactor</u> "	85 86	H85	

Function	Terminal X2_2	LED	Connection values/Remarks
S1 - "Rotor contactor stage 1" Relay signal "Switch rotor contactor S1"	87 88	H87	Load capability: =250V AC, 4A; $\cos\Phi=1$ =250V AC, 2A; $\cos\Phi=0,4$ =30V DC, 2A
S2 - "Rotor contactor stage 2" Relay signal "Switch rotor contactor S2"	89 90	H89	

Function	Terminal X2_1	LED	Connection values/Remarks
S3 - "Rotor contactor stage 3" Relay signal "Switch rotor contactor S3"	91 92	H91	Load capability: =250V AC, 4A; $\cos\Phi=1$ =250V AC, 2A; $\cos\Phi=0,4$ =30V DC, 2A
S4 - "Rotor contactor stage 4" Relay signal "Switch rotor contactor S4"	93 94	H93	

Options:**Terminal expansion** (C98043-A7006)

Terminal type: Plug-in terminal (screw-type)
Max. connection cross-section 1.5mm²

Binary inputs, fault and alarm messages (see also Section 8, Sheet G42)

Function	Terminal X161	Connection values/Remarks
Supply for binary inputs	210	24V DC, short-circuit proof max. load 200mA (terminals 34, 44 and 210 combined)
Binary input	211	H signal: +13V to +33V L signal: – 33V to +3V or terminal open Input resistance = 2.8 kΩ
Binary input	212	
Binary input	213	
Binary input	214	
Ground for binary inputs	215	can be isolated from internal ground
Ground for binary inputs	216	(open wire jumper between terminals 216 and 217)
M	217	

Binary inputs (see also Section 8, Sheet G3)

Function	Terminal X163	Connection values/Remarks
Supply	44	24V DC, short-circuit proof max. load 200mA (terminals 34, 44 and 210 combined), internal supply referred to internal ground
Ground digital M	45	
Select input binary 2	40	H signal: +13V to +33V
Select input binary 3	41	L signal: – 33V to +3V or terminal open
Select input binary 4	42	8.5mA at 24V
Select input binary 5	43	

Binary outputs (see also Section 8, Sheet G4)

Function	Terminal X163	Connection values/Remarks
Select output binary 3	50	H signal: +19 to +30V L signal: 0 to +2V short-circuit proof 100mA
Ground M	51	Internal snubber circuit (free-wheeling diode)
Select output binary 4	52	H signal: +19 to +30V L signal: 0 to +2V short-circuit proof 100mA
Ground M	53	Internal snubber circuit (free-wheeling diode)

Analog inputs (see also Section 8, Sheet G6)

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

Analog outputs, temperature sensor input (see also Section 8, Sheets G8 and G41)

Function	Terminal X164	Connection values/Remarks
Select output analog 1	18	0. . . ±10V, max. 2mA short-circuit proof
Ground analog M	19	
Select output analog 2	20	Resolution ±11bit
Ground analog M	21	
Temperature sensor input	204 205	Sensor acc. to P490 Index 2

Serial interface 3 RS485 (see also Section 8, Sheets G31 and G33)

Function	Terminal X162	Connection values/Remarks
TX+	61	RS485, 4-wire send cable, positive differential input
TX-	62	RS485, 4-wire send cable, negative differential input
RX+/TX+	63	RS485, 4-wire receive cable, positive differential input, 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.

7 Start-up

7.1 General safety information for start-up



DANGER



Before commencing with start-up on the converters, make sure that the transparent terminal cover is mounted in the correct position (see Section 5.1).

NOTE

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 fibres).

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.

A hazardous voltage may be present at the signalling relays in the customer 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 power section is disconnected from the power supply. 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.

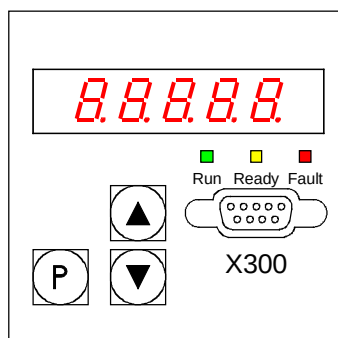
7.2 Operator control panels

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 UP keys to switch a fault message and alarm to the background (see Section 10, Fault Messages and Alarms)
 - P and DOWN 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 (Ml, 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	rxxx, Pxxx	(0)xxx
	Uxxx, nxxx	2xxx
Technology board parameter	Hxxx, dxxx	1xxx
	Lxxx, cxxx	3xxx

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

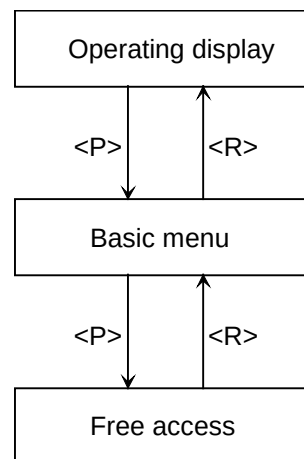
This automatic skipping over missing numbers does not work for technology board parameters. In this case, the numbers of existing parameters must be entered directly.

The OP1S switches to **Operating 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 operating 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).



The following values are displayed in the operating display of the SIMOTRAS 6SG70.

1 st line	Actual motor current value r019	0	Bus addr.
2 nd line	# Actual speed controller value r025		
3 rd line	* Speed setpoint r028		
4 th line	Operating state r059		

Steuerbits vom Bedienfeld OP1S:

(see also function diagram "OP1S operating display" (Section 8, Sheet Z12) and the OP1S operating instructions)

Data are exchanged between the OP1S and SIMOTRAS 6SG70 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	Inching	Bit 8	B2108
Reverse	Enable positive direction of rotation	Bit 11	B2111
	Enable negative direction of rotation	Bit 12	B2112
Increase key	Increase motorized potentiometer	Bit 13	B2113
Decrease key	Decrease motorized potentiometer	Bit 14	B2114

*) These binectors (control bits) are available for all control tasks (when parameterized accordingly), but are not normally used with SIMOTRAS 6SG70 converters.

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 S00 technology software of the basic unit with the parameters of an optional supplementary board (e.g. T300).

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, 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 operating display state and indicating the current operating status of the SIMOTRAS 6SG70 (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 operating 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.

CAUTION!

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

- The appropriate access authorization is set in key parameter P051, e.g. "40" (see Section 11, "Parameter List").
 - The converter is the correct operational state. Parameters with characteristic "offline" cannot be changed when the converter is in the "Run" (online) state. To change parameters with this characteristic, switch the converter to the $\geq 0.1.0$ 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. After pressing P and the DOWN key, 1 is displayed briefly followed by "08,173". The rightmost digit 3 is the 1st digit of the parameter value.

After pressing P and the UP key, 2 is displayed briefly followed by "208,17". The rightmost digit 7 is the 2nd digit of the parameter value.

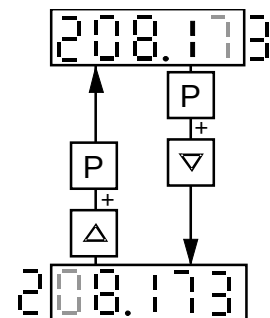


Fig. 7.1 Shifting the PMU display for parameter values with more than 4 digits

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	00	□009
	Technology	d000 or c000		
Setting parameters	Basic unit	P05 or U05	00	-2.08
	Technology	H002 or L002		

Table 7.1 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 Restore factory setting

Restore parameter value to default (factory) setting.

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.

NOTE

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 **SIMOVIS** 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.

7.5 Notes to be read before switching on



DANGER



Make sure that no persons, machines or other objects are endangered when the drive unit is started up! This should also cover the possibility of a malfunction.

Malfunctions or faults may occur as the result of connections becoming loose over time due to the vibration of machines or the switching of power contactors. You should therefore check the connections in your cubicle.

Frequent causes of malfunctions and faults are incorrect settings or carelessness during the start-up procedure. It is often only a minor factor that causes a malfunction.

The following tasks should be completed before starting the converter for the first time:

1. The SIMOTRAS HD must be disconnected from the power supply on all poles.
2. Check the connections, the protective measures and the converter earth.
3. Check the supply voltage in the power section (max. 500 V AC).
4. Check the control voltage (max. 250 V AC).
5. Connect and set the motor protection element (motor protection switches, motor protection relays), if PTC connected – check thermistor detector.
6. Check supply voltage to the three phase asynchronous motor (star or delta connection).
7. Check converter connector is securely connected.
8. Check the motor shaft moves freely with the brake released.
9. Rotation of the motor in either direction must not cause any damage.
10. Ensure that no persons are within the drive operating area.

7.6 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.

NOTE

The start-up procedure described below applies in situations where the SIMOTRAS HD converter is connected to the system in accordance with the suggested connection plan. If this is not the case, additional or other measures may be required in certain instances.

7.6.1 Access authorization

- P051 Key parameters
 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

7.6.2 Adjustment of converter rated currents

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

$$\frac{\text{max. motor current}}{\text{rated converter current}} < 0,5$$

7.6.3 Adjustment to actual converter supply voltage

- P078 Rated RMS value of actual voltage applied in SIMOTRAS HD (in Volts)

7.6.4 Input of motor data

The motor data as given on the motor rating plate must be entered in parameters P100 and P114.

- P100 Rated motor current (in amps)
- P114 Thermal time constant of motor (in minutes)
- P490.001 Temperature sensor on terminals 22/23 for monitoring the motor temperature
- 0 No temperature sensor
 - 1 KTY84
 - 2 PTC thermistor with $R_n=600\Omega$ 1)
 - 3 PTC thermistor with $R_n=1200\Omega$ 1)
 - 4 PTC thermistor with $R_n=1330\Omega$ 1)
 - 5 PTC thermistor with $R_n=2660\Omega$ 1)
- 1) PTC thermistor according to DIN 44081 / 44082 with specified R at rated response temperature. 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).
- P491 Alarm temperature (factory setting = 20°C)

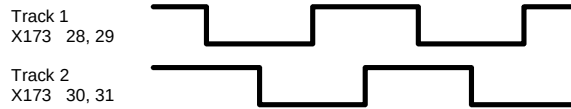
7.6.5 Actual speed sensing data

7.6.5.1 Operation with pulse encoder

(often present when retrofitting existing systems)

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

P140 = 1. Pulse encoder type 1
Encoder with two pulse tracks mutually displaced by 90°



P141 Number of pulses of pulse encoder (pulses per revolution)

P142 = 1: Pulse encoder outputs 15V 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.

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%.

7.6.5.2 Operation with analog tacho

(used in new systems)

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

P741 Setting of tachometer voltage at maximum speed (approx. 8V to +270.00V)

7.6.6 Speed setpoint data

7.6.6.1 Operation with analog setpoint (U251=0)

P700 = 0: Voltage input (+-10V)

1: Current input (0 to 20 mA)

2: Current input (4 to 20 mA)

P401 Normalization

speed setpoint that must be attained under control by master switch (in %).

with lifting gear: approx. 60%

with travel gear: up to 100%

Note: Limit value for zero-delay angle (U628), see also Section 7.6.14

7.6.6.2 Operation with 4 stage master switch (U251=1)

U251=1: Use setpoint of 4-stage master switch

U665	speed setpoint in “slow” stage	factory setting 10%
U666	speed setpoint in “medium” stage	factory setting 25%
U667	speed setpoint in “fast” stage	factory setting 40%
U668	speed setpoint in “full” stage	factory setting 100%

7.6.7 Selection of basic technological functions

Current limits

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

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

7.6.8 Setting the current controller loop

Formula:

The factory setting for the current controller parameter can normally be left as it is:

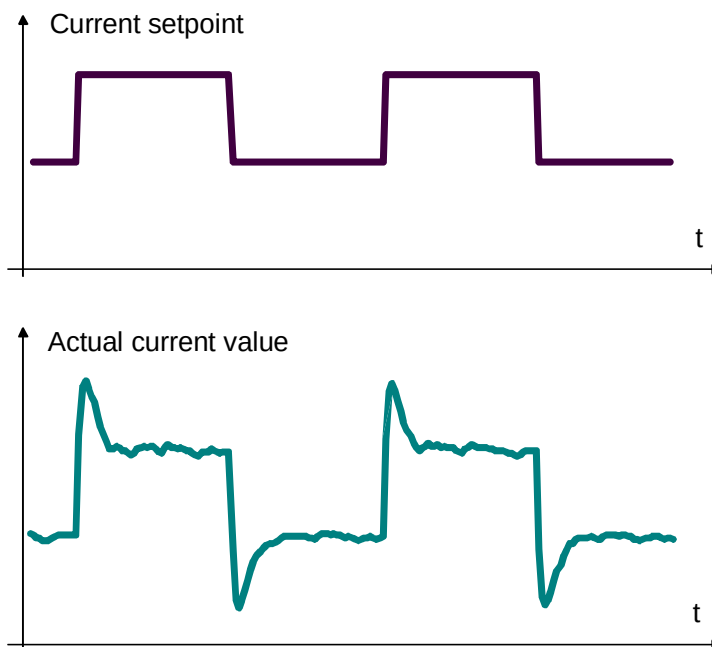
P155 = $K_p = 0,2$ P156 = $T_n = 20$ ms

Optimizing the current controller:

With the motor fully braked, enter the current setpoint increments and record the step response from the current controller loop.

Rotor stage S1 is active

- Fully brake the motor and interrupt the supply voltage to the brake contactor.
- P084 = 2 (current-controlled operation)
current setpoint from square wave generator (P500 = 203, factory setting)
- Parameterize square wave generator:
P480 = 20,0 % (step level 1)
P481 = 1.0 s (duration of step)
P482 = 10.0 % (step level 2)
P483 = 1.0 s (duration of step)
- Enter first setpoint stage from master switch (i.e. a travel command).
- Trace the stator current on the actual current value output (X175 terminals 12 and 13, 5V is the rated current for the SIMOTRAS HD) using an oscilloscope. The oscillogram will display the step response of the current controller loop.



- The following settings affect the current controller loop:
P155 Controller gain Kp
P156 Reset time Tn
The control response becomes "softer" if a longer reset time is set.
- Move master switch to zero position (i.e. cancel travel command).
- Following current controller optimization:
P084 = 1 (reset to operation under closed-loop speed control)
- Reconnect power supply to brake contactor.

7.6.9 Checking direction of rotation of the motor

- Enter first setpoint stage from master switch (i.e. a travel command).
- If the drive accelerates or is running at maximum speed:
Reverse the phase sequence of the motor output or the polarity of the tachometer connection.
- For lifting gear:
positive setpoint = mechanical "Lift" direction of rotation
negative setpoint = mechanical "Lower" direction of rotation
For travel gear:
positive setpoint = forwards / right,
negative setpoint = backwards / left
If this is not the case, reverse the phase sequence of the motor output and the polarity of the tachometer connection
- Set speed setpoint to medium speed, e. g. nset = +5V = +50% (lift)
- Check the actual lifting speed using parameter r025 (display +50%).

7.6.10 Setting the speed control loop

Formula:

The following settings will normally produce a stable control response:

P225 Controller gain Kp = 3 to 10
P226 Reset time Tn = 0.150 to 0.500 s

Optimizing the speed control loop:

Enter the speed setpoint steps without a ramp-function generator and record the step response for the speed control loop.

- Parameterize square wave generator:
P480 = 5.0 % (step level 1)
P481 = 2.0 s (duration of step)
P482 = 0.0 % (step level 2)
P483 = 2.0 s (duration of step)
P625 = 203 (use square wave generator instead of the setpoint from the master switch)

Rotor stage S1 is active

- Enter first setpoint stage from master switch (i.e. a travel command).

- Trace the actual speed value (X175 terminals 14 and 15) on an oscilloscope. The oscillogram will display the step response of the speed control loop.

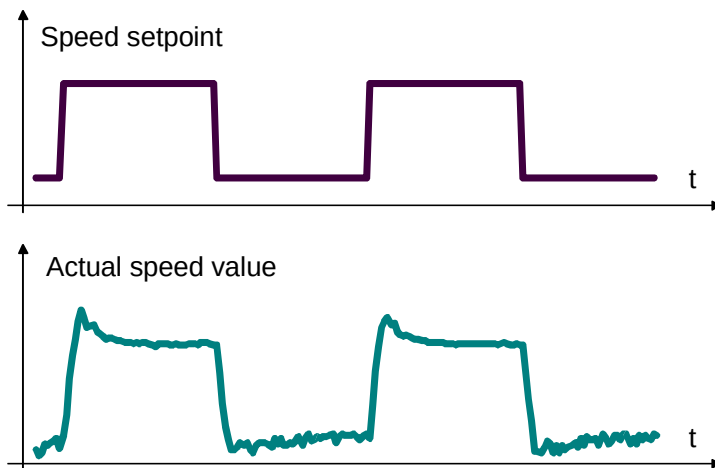


Fig.7.6.10.1 Step response of speed control loop without ramp-function generator, ideal shape

- The following settings affect the speed control loop:
 - P225: Controller gain K_p
 Setting too low a gain results in an inaccurate speed correction to the setpoint (remaining control deviation)
 Setting too high a gain may result in speed instability. The drive will tend to vibrate.
 Increase the gain using P225 until the first signs of instability occur, then slightly reduce the value of P225.
 - P226: Reset time T_n
 The control response becomes "sharper" by shortening the reset time.
 - P200: Smoothing of actual speed value (tachometer voltage) factory setting: 10 ms.
 Excessive smoothing can produce instability in the speed control loop.
- After optimizing the speed controller, reset to master switch setpoint P625=170
- Other:
 - P158: Smoothing of current setpoint (speed controller output)
 P157 = 0: Smoothing (P158) only active following torque direction reversal
 P157 = 1 Smoothing (P158) always active
 - P227: Droop
 The speed controller is not inflexible, i.e. it does permit small deviations to the setpoint as the load increases.
 At a load level that produces the rated converter current, a control deviation according to the percentage set in P227 will be permitted

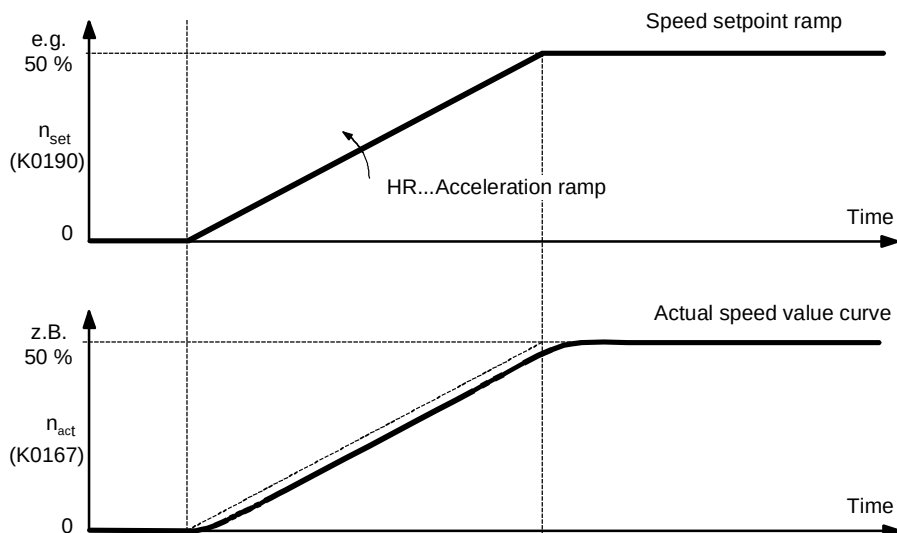


Fig.7.6.10.2 Step response of speed control loop with ramp-function generator

7.6.11 Setting the ramp times of the ramp-function generator

- Increase the speed setpoint in stages.
- Set the ramps for the ramp-function generator to provide optimum drive acceleration. Set the transition roundings for the ramp-function generator such that there are no jerking motions when reaching or leaving the setpoint.

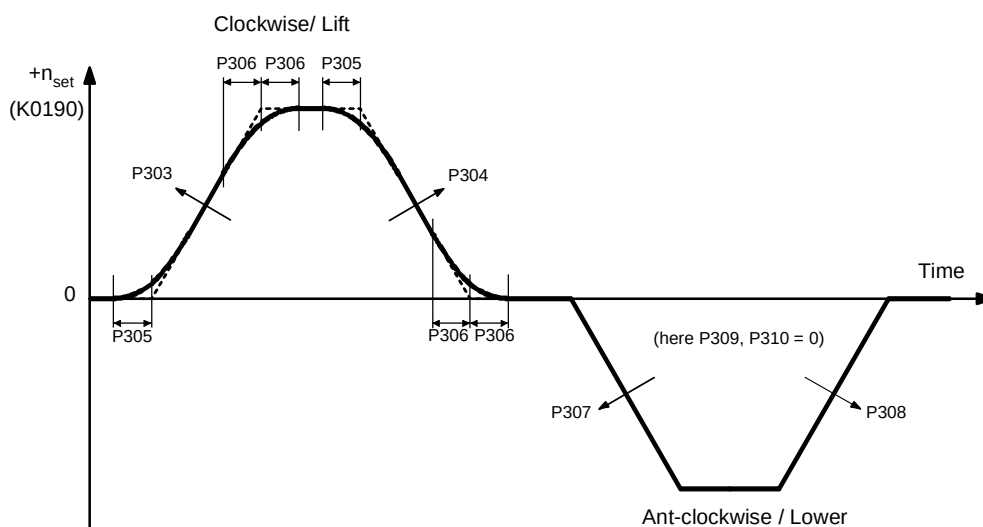


Fig.7.6.11.1 Setting the ramp times of the ramp-function generator

Clockwise = lift, forward/right	Anti-clockwise – lower, backwards/left
P303: Ramp-up time	P307: Ramp-up time
P304: Ramp-down time	P308: Ramp-down time
P305: Lower transition rounding	P309: Lower transition rounding
P306: Upper transition rounding	P310: Upper transition rounding

7.6.12 Setting the brake control

The following actions take place after **specifying a travel command**:

1. The firing pulse and the controller are enabled
 2. The "Release brake" signal is output
 3. The ramp-function generator starts to ramp up
- P087 (with a negative value) can be used to delay the "Release brake" signal in relation to the enabling of the firing pulse and the controller until the motor has definitely been excited and torque has developed.
 - Parameter P319 can be used to delay the ramping up of the ramp-function generator in relation to the enabling of the firing pulse and the controller using until the brake has definitely been released (no start-up with brake still closed).

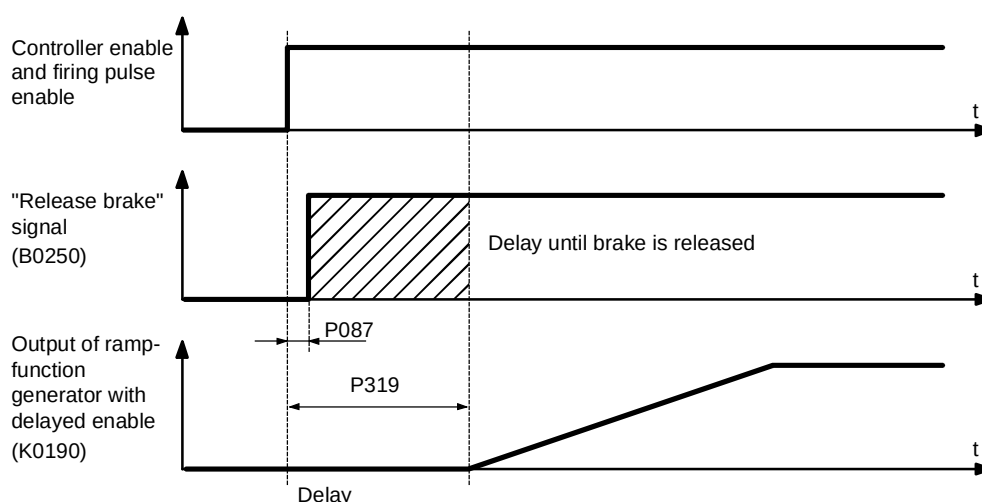


Fig. 7.6.12.1 Time characteristic following input of travel command

Setting information:

- Set the delay time using parameter P319 so that the setpoint is not enabled via the ramp-function generator until the brake has actually been released.

Caution: If the value of P319 is too low, the drive will run against the brake for a while!
If the value of P319 is too high, there will be an unnecessarily long delay after the master switch is activated!

The following actions take place after **cancelling a travel command**:

1. The ramp-function generator input is set internally to 0, i.e. the ramp-function generator begins to ramp down.
2. If the actual speed falls below the value $n_{\min}$ (P370), the "Release brake" signal is cancelled.
3. The firing pulse and the controller are disabled using the delay time P088 (e.g. until the brake has definitely been closed)

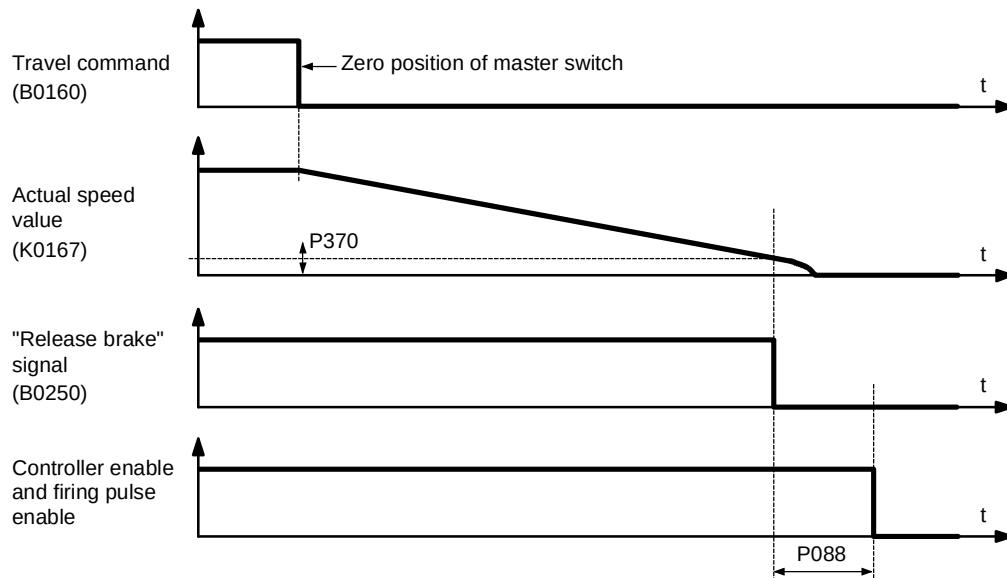


Fig. 7.6.12.2 Time characteristic following cancellation of travel command

Setting information:

- Use parameter P370 to set the minimum speed at which the brake should be closed (factory setting 5%).
- Use parameter P088 to set the delay time so that the firing pulses are only disabled after the brake has actually been closed (delayed controller shut-off).

Caution: If the value of P088 is too low, there may be a load slump because the load can no longer be held electrically and the mechanical brake has not yet closed completely. This results in a brief slump in the load in the case of suspended loads!

7.6.13 Setting the start pulse for the speed controller

Lifting gear:

In the case of lifting gear, the I component of the speed controller command cannot start from a value of zero when "Release brake" is entered, but from a fixed setting value that is selected to prevent the slumping of a suspended load when the brake is released. The basis for this can be either a constant load or the result of an existing load measurement can be fed into the SIMOTRAS HD converter using an analog input. In addition, the start pulse for the lowering operation can be reduced using U652.

Constant start pulse	Load measurement /variable start pulse
<u>Lifting:</u> U651: Setting value for I component of speed controller	<u>Lifting:</u> U655: Selection of connector via which an existing load measurement is to be fed into the SIMOTRAS HD converter
<u>Lowering:</u> U652: Reduction factor for the setting value used in lifting for the I component of the speed controller	

Overhead travel gear:

For overhead travel gear in the open air which is subjected to strong winds, it may on occasion be prudent not to let the I component of the speed controller start at zero when "Release brake" is entered, but at a setting value. Setting the I component also acts as the breakaway torque.

<u>Clockwise:</u> U651: Setting value for I component of speed controller for clockwise rotation (factory setting 0%)	<u>Anti-clockwise:</u> U656 = 453: Use setting value in U653 U653: Setting value for I component of speed controller for anti-clockwise rotation (U653=value in U651)

7.6.14 Setting of limit value for closed-loop/open-loop operation

- Determine switchover threshold for closed-loop and open-loop operation according to control characteristics (Section 3.3.6 and 3.3.7) and enter as values in parameters U628 (value) and U629 (hysteresis)
 for lifting gear: U628 = 60%
 for travel gear: U628 = up to 95%
- With the master switch fully open and speed U628 is reached, the SIMOTRAS HD receives the "Zero delay angle" command.
 The SIMOTRAS HD then outputs the full output voltage if outside the setpoint reduction range.
- Setpoint and actual value monitoring (FD31) is not active in open-loop operation.
 Overspeed monitoring (FD38) is always active.

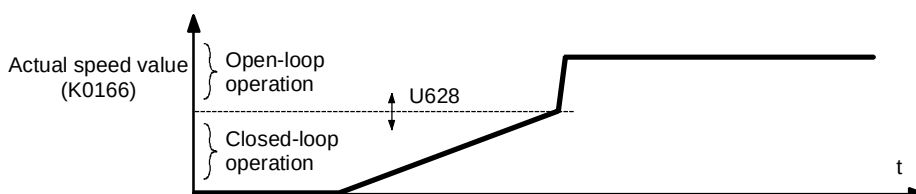


Fig. 7.6.14.1 Time characteristic when switching over to open-loop operation

7.6.15 Setting the rotor contactor stepping

Specifying limit values for switching over the rotor contactors (see Section 3.3.6 and 3.3.7):

On every control characteristic curve (in other words at a particular rotor resistance), the maximum possible torque reduces as the speed increases. As a result, the converter switches to the next rotor stage at the speed where the maximum possible torque is just 100% in order to receive an appropriate acceleration torque (switchover points S2, S3 and S4 in Fig. Fehler! Verweisquelle konnte nicht gefunden werden..1)

see also Section 6.1 Block diagram

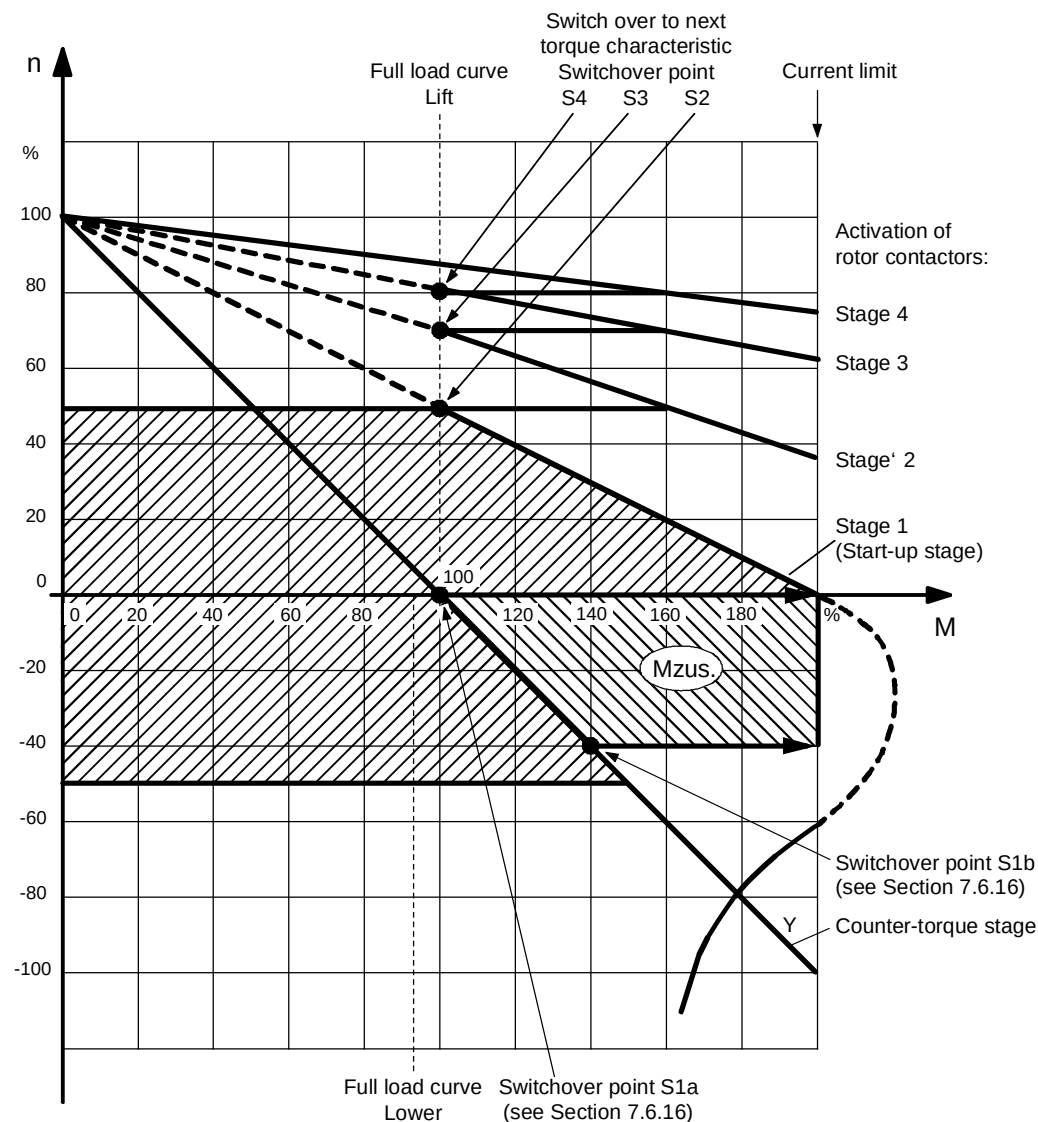


Fig. 7.6.15.1 Rotor contactor switching cycle

- with increasing speed:
 - U634 Value at which the rotor contactor for stage 2 is to be connected
 - U636 Value at which the rotor contactor for stage 3 is to be connected
 - U638 Value at which the rotor contactor for stage 4 is to be connected
- with decreasing speed:
 - U638 (– U639 hysteresis)
 - Value at which the rotor contactor for stage 4 is to be disconnected
 - U636 (– U637 hysteresis)
 - Value at which the rotor contactor for stage 3 is to be disconnected
 - U634 (– U635 hysteresis)
 - Value at which the rotor contactor for stage 2 is to be disconnected

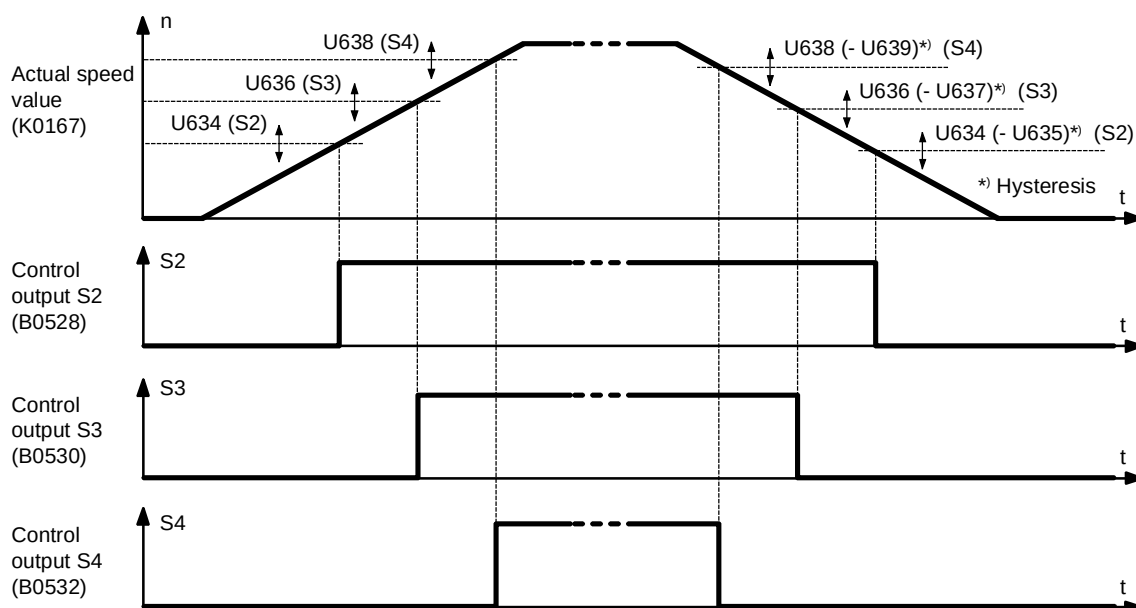


Fig. 7.6.15.2 Time characteristic of rotor contactor stepping

Preventing current peaks during rotor stage stepping:

- To prevent excessive stator current values occurring when switching in the next rotor contactor, it is desirable, at the same time as the contactor is switched in, to reduce the I component of the speed controller by roughly the same proportion by which the rotor resistance is also reduced. This enables the rotor current to be held at about the same value as before the switchover, despite the fact that the rotor resistance will now be lower.

Setting instructions:

U641 Reduction when connecting stage 1: R (stage 1) / R (counter-torque stage)

U642 Reduction when connecting stage 2: R (stage 2) / R (stage 1)

U643 Reduction when connecting stage 3: R (stage 3) / R (stage 2)

U644 Reduction when connecting stage 4: R (stage 4) / R (stage 3)

Example: Quotient = $0.8 \triangleq U641 = 80.0\%$

Increasing rotor contactor service life:

Off-load switching is recommended to increase the service life of the rotor contactors.

- U640.001: Pick-up time of rotor contactors (zero current interval)
- U640.002: Drop-out time of rotor contactors (zero current interval)

A disadvantage of off-load switching of rotor contactors:

there is a torque-free interval, and this may lead to a deviation in the speed.

7.6.16 Counter-torque operation and premature switching over from counter-torque stage to start-up stage

Counter-torque operation means that an electrical phase in opposition to the mechanical speed is applied to the running motor in order to brake the drive.

The rotor resistance stage is connected to the greatest resistance during this process.

The counter-torque stage is left once the drive has been braked to zero speed

(switchover point S1a in Fig. **Fehler! Verweisquelle konnte nicht gefunden werden..1**).

If rotor stage S1 is connected before the speed reaches zero (switchover point S1b in Fig. **Fehler! Verweisquelle konnte nicht gefunden werden..1**), the control range indicated by Rcon in Fig. **Fehler! Verweisquelle konnte nicht gefunden werden..1** is gained.

The most common operating condition, where the response outlined above occurs, is the following:
Lifting gear with a large load:

The load is lowered at the maximum speed (power lowering).

In order to generate the required braking torque, the unit must be switched over from the counter-torque stage to the start-up stage at a particular negative speed. This introduces the additional torque Mcon. Fig. **Fehler! Verweisquelle konnte nicht gefunden werden..1**.

The master switch is set to “zero position” or “Lift”.

A delay torque must now be applied in addition to the torque required to hold the load (e.g. 95% at rated load). When the drive is in counter-torque mode (i.e. the load is still being lowered), the delay torque becomes smaller as the speed reduces, which means that the torque range indicated by Mcon in the diagram above is gained.

- The value at which the early switchover from the counter-torque stage to the start-up stage in the “Delay lowering” operating condition occurs is set using parameter U630.

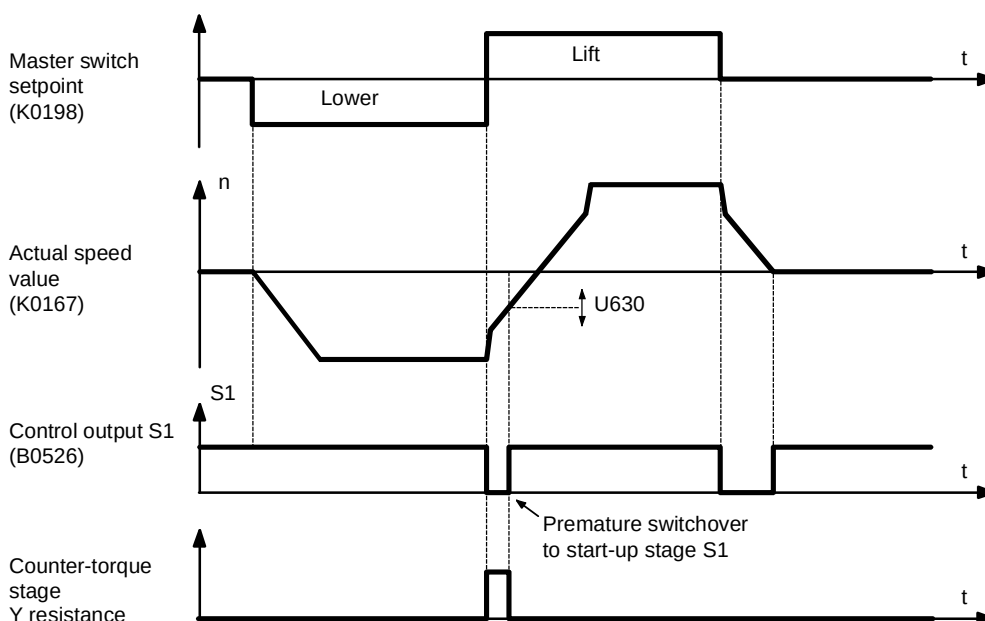


Fig. 7.6.16.1 Time characteristic for premature connection of start-up stage S1

7.6.17 Setting the ramp-down monitoring function

When the travel command is cancelled, SIMOTRAS HD will brake the drive electrically. The SIMOTRAS HD cancels the "Release brake" signal when the speed drops to below a minimum value (P370). A time stage is started at the beginning of the braking operation. If the time stage elapses before the minimum speed has been reached, a fault message is activated (and the firing pulses are disabled immediately and the "Release brake" signal cancelled)

- The time stage (U444) should be set to the value "parameterized ramp-down time + short safety time (e.g. 10% of the ramp-down time)".

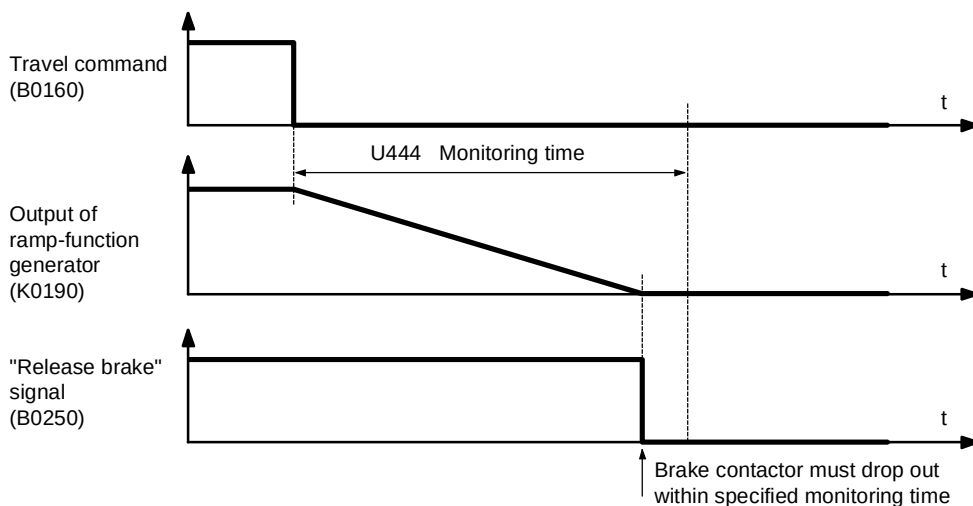


Fig. 7.6.17.1 Time characteristic of ramp-down monitoring

7.6.18 Setting up setpoint/actual value monitoring

The setpoint/actual value monitoring system constantly checks whether or not the actual speed is deviating from the setpoint speed (according to the ramp-function generator).

A time stage (P390) is started if the response threshold (P388) for the setpoint/actual value monitoring system is exceeded. The time stage is reset if the speed value does not drop below the response threshold again before the time stage elapses. Fault message F031 is activated when the time stage elapses.

In the controlled range, the setpoint/actual value monitoring system is not active. When switching back to the controlled range, a delay time (P387) will be running. The monitoring system will be active again after the delay time has elapsed.

- The following settings affect the setpoint/actual value monitoring system:

P388 Response threshold

P390 Time taken for time stage to activate the fault message F031

P387 Delay time when changing back from open-loop to closed-loop range

7.6.19 Setting the setpoint reduction when pre-limit switches are activated

- Specify a full setpoint with the master switch.
- Remove control input VE1 or VE2 = "Pre-limit switch".
- When the pre-limit switches are activated, the speed setpoint is reduced proportionally.
- The reduction factor is set using parameter U608.
- The reduction of the setpoint when the pre-limit switches are activated applies to both directions of rotation.

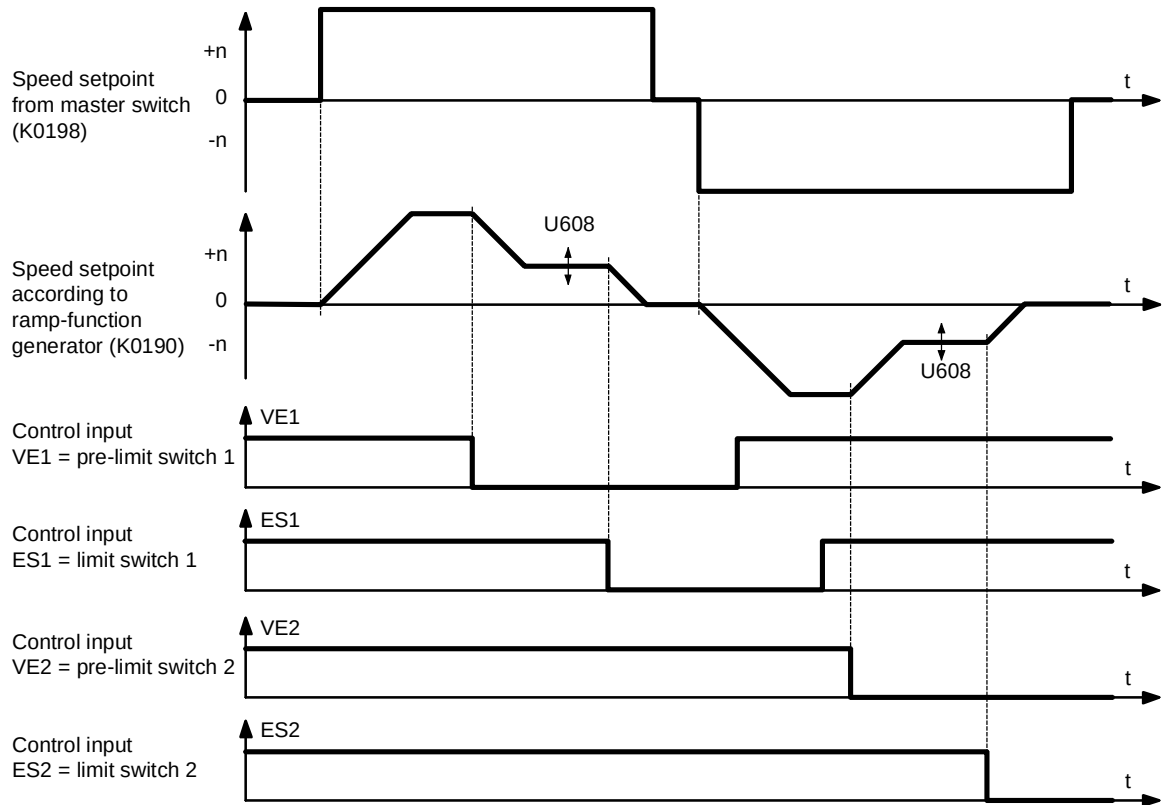


Fig. 7.6.19.1 Time characteristic of speed setpoint when pre-limit switches are activated

7.6.20 Documentation of setting values

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

7.7 SIMOTRAS HD troubleshooting table

Fault	Possible cause	Remedy
A fault or alarm message is pending	See Section 10	See Section 10
No current, although controller enabled	Not all enable conditions have been met	Evaluate operating state display on parameter r000 (see Section 11)
Drive accelerates uncontrollably	Tachometer voltage has incorrect polarity	Reconnect tachometer (swap terminals 103 and 104)
Drive does not achieve rated speed	Actual speed value calibrated incorrectly	Check P741 and P140 to P143
Drive does not achieve rated speed when the machine is warm	Rotor resistance levels have changed due to the increase in temperature	• Check rotor resistance taps • Check rotor contactor stepping values (U634, U636, U638)
Tried everything, fault not found		Contact the relevant sales partner or your "authorized control centre" (see Section 14)

7.8 Data for existing drive

Customer/system

Type of drive

☐ Lifting gear ☐ Trolley travel gear ☐ Crane travel gear ☐ Slewing gear ☐ Other

Movement of the lifting machine

☐ Slewing ☐ Horizontal ☐ Vertical ☐ Other

Speed		ms ⁻¹	Rated speed		rpm
min. speed		rpm	max. speed		rpm

Acceleration ramp Clockwise/lifting		s
Deceleration ramp Clockwise/lifting		s
Acceleration ramp Anti-clockwise/lowering		s
Deceleration ramp Anti-clockwise/lowering		s

Switching frequency		Switching ops./hour
Operating mode		% (to DIN VDE 0530) e.g. S3 = 40%

Change in rotational direction: ☐ under load ☐ from standstill

Weight of drive

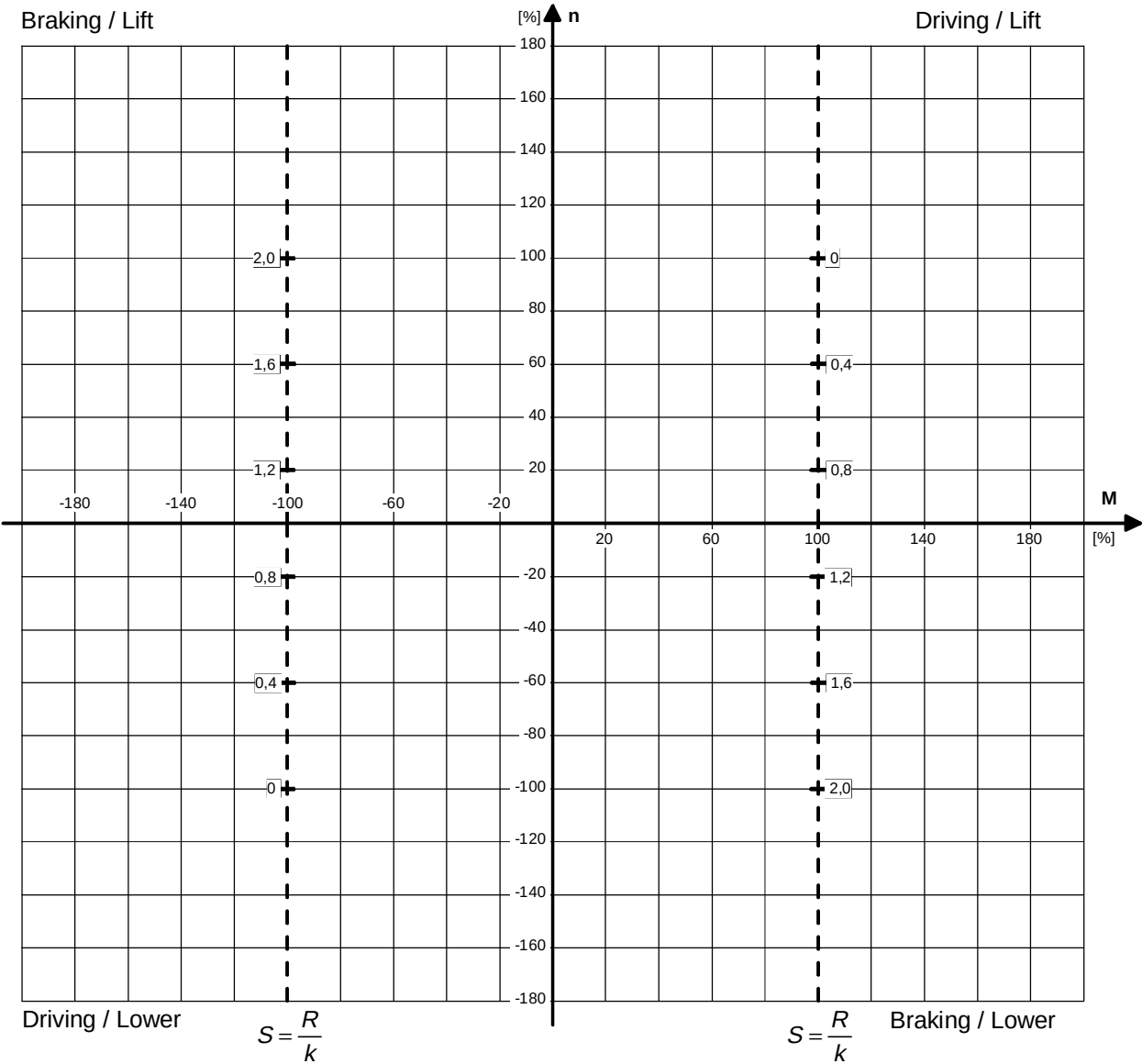
Empty:		kg	Under load:		kg

Motor data

Manufac.		Speed		rpm
Motor type		Frequency		Hz
Rated power		Power factor		cos phi
Connection Y / Δ		Torque		Nm
Stator voltage		Rotor voltage		V
Stator current		Rotor current		A

Characteristic sheet:

Customer/system



Control range: %

Char. rotor res.: $k = \frac{U_L}{I_L \cdot \sqrt{3}}$

$U_{ST} =$ V

$U_L =$ V

$k =$ Ω/Phase

$I_{ST} =$ A

$I_L =$ A

selected: $k' =$ Ω/Phase

	Slip [s] at 100% M	Resistance [R] $R = s \cdot k$	Threshold speed
Stage 4		Ω/phase	+ % to S4
Stage 3		Ω/ phase	+ % to S3
Stage 2		Ω/ phase	+ % to S2
Stage 1		Ω/ phase	- % to S1
Counter-torque stage		Ω/phase	

7.9 SIMOTRAS HD – QUICK START INSTRUCTIONS

Requirements: Factory settings in place, connected according to suggested connection in Section 6.1

Access authorization

P051 = 40 all parameters can be modified

Motor data

P100 Rated motor current (in amps)
 P114 Thermal time constant of motor (in minutes) (Factory setting: 10 min)
 (0 ... monitoring switched off)
 P490.001 Type of temperature sensor on terminal 22/23 (factory setting: 1)
 0 .. no temperature sensor present
 1 .. KTY84 P491 Alarm temperature (factory setting = 20°C)
 4 .. PTC with $R_n = 1330 \text{ Ohm}$: when $R < R_n$: B0184 = 0, when $R > R_n$: B0184 = 1

Speed sensing with analog tachometer (displayed on r002)

P083 = 1 Tachometer connected to terminals 103 and 104
 P741 Tachometer voltage at maximum speed (approx. 8 V to +270.00) (factory setting: 60.00 V)

Speed sensing with pulse encoder (displayed on r024)

P083 = 2 Pulse encoder connected to terminals 28/29 and 30/31
 P140 = 1 Pulse encoder has two pulse traces that are displaced by 90° (factory setting: 1)
 P141 Number of pulses of pulse encoder (factory setting: 250 pulses per revolution)
 P142 = 1 Pulse encoder outputs 15V signals (factory setting: 1)
 P143 Maximum speed (rpm) (factory setting: 1450 rpm)

Speed setpoint normalization

P401 Speed setpoint that must be attained under control by master switch (factory setting: 60 %)
 for lifting gear: approx. 60%, for travel gear: approx. 100%
 U628 Threshold for zero delay angle setting

Current limits (actual current value displayed on r019)

P171 For torque direction I (as % of P100) (factory setting: +200 %)
 P172 For torque direction II (as % of P100) (factory setting: -200 %)

Current controller

P155 Controller gain K_p (factory setting: 0.2)
 P156 Reset time T_n (factory setting: 0.02 s)

Speed controller

P225 Controller gain K_p (factory setting: 3.0)
 P226 Reset time T_n (factory setting: 0.2 s)
 P200 Smoothing of actual speed value (factory setting: 10 ms)

Ramp-function generator

Pos. setpoint (FK1/lift/forwards/right)	Neg. setpoint (FK2/lower/backwards/left)
P303 Ramp-up time (factory setting = 10 s)	P307 Ramp-up time (factory setting = 10 s)
P304 Ramp-down time (factory setting = 10 s)	P308 Ramp-down time (factory setting = 10 s)
P305 Lower transition rounding (factory setting = 0 s)	P309 Lower transition rounding (factory setting = 0 s)
P306 Upper transition rounding (factory setting: 0 s)	P310 Upper transition rounding (factory setting: 0 s)

Start pulse for speed controller

U651 Start pulse for clockwise movement (= lifting) (as % of P100) (factory setting: 0 %)
 U652 Start pulse reduction factor for anti-clockwise movement (= lowering) (factory setting: 50 %)

Rotor contactor stepping

U634 Speed at which the rotor contactor for stage 2 is switched in (factory setting: 50%)
 U636 Speed at which the rotor contactor for stage 3 is switched in (factory setting: 75%)
 U638 Speed at which the rotor contactor for stage 4 is switched in (factory setting: 90%)
 U630 Speed at which the rotor contactor for stage 1 is prematurely switched in when in "Delay lowering" mode (counter-torque operation) (factory setting: -1%)

Ramp-down monitoring

U441 When the travel command is cancelled, the motor must have reached its minimum speed (P370) within the time specified here, otherwise the fault message F023 is activated (factory setting: 10.5 s)
 (Recommended value: highest of P304 + 10% and P308 + 10%)

Setpoint reduction with pre-limit switch

U608 When approaching a pre-limit switch, the speed setpoint is multiplied by the value specified here (factory setting: 15%)

7.10 Starting up optional supplementary boards

For information about installing boards, please see Section 5.2.2, Optional supplementary boards.

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 1st board (e.g. the 1st EB1) of this particular type and the board with the higher letter the 2nd board (e.g. 2nd EB1).

The 1st board is parameterized via index 1 and the 2nd board via index 2 of the corresponding parameter.

7.10.1 Sequence of operations for starting up the T300 technology board

NOTE

Freely configurable technology boards T300 are guaranteed to operate correctly (board runup and data exchange with the SIMOTRAS 6SG70). 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, in some cases also c and L parameters).

The process data are interconnected at the basic converter end by means of the appropriate connectors and binectors (see function diagrams showing "Process data exchange with the technology or communication board with lower slot letter" in Section 8).

For meaning of bits of control and status words, please see function diagrams G37 to G40 in Section 8, "Control word 1", "Control word 2", "Status word 1" and "Status word 2".

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.

If a technology board is mounted in location 2, then only one communication board (CBP, CBC, ...) may be installed in slot G. Other boards are not supported.

7.10.2 Sequence of operations for starting up PROFIBUS boards (CB1, CBP)



Switch off the power supply and insert the board or adapter with board into a module location. Please remember to insert a board in location 2 before you use location 3. In new systems, the new CBP board should be used in preference to the earlier CB1 board.



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 (CB1, CBP) 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 SIMOTRAS HD 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 are interconnected at the basic converter end by means of the appropriate connectors and binectors (see function diagrams G34 and G35 "Process data exchange with the technology board or 1st or 2nd communication board" in Section 8). For meaning of bits of control and status words, please see function diagrams G37 to G40 in Section 8, "Control word 1", "Control word 2", "Status word 1" and "Status word 2".



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.

Note: The initialization process may interrupt the communication link to a supplementary board which is already operational.

The CB1 (Communication Board 1) or CBP (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.

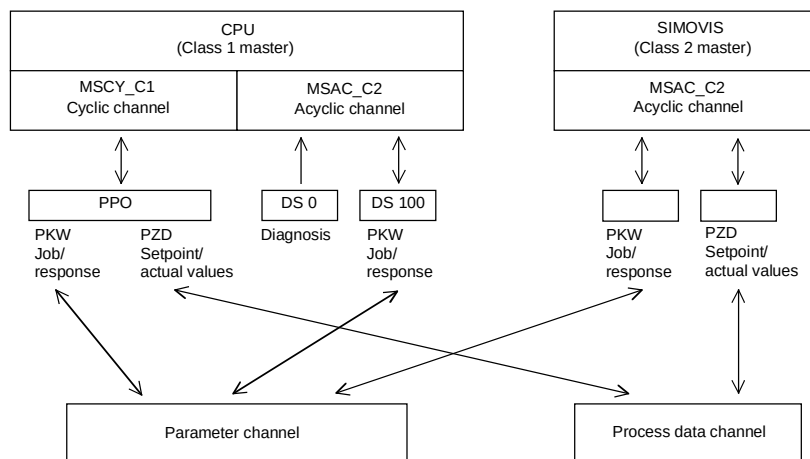
DPM1s support both a **cyclic channel** (transmission of process data and parameter data) and an **acyclic channel** (transmission of parameter data and diagnostic data).

DP masters of class 2 (DPM2) are programming, configuring or operator control/visualization devices (e.g. SIMOVIS) 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 CBP:



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

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

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

The user data structure for the **cyclic channel MSCY_C1** (see picture above) is referred to as a Parameter Process(data) Object (**PPO**) in the PROFIBUS profile for variable-speed drives. This channel is also frequently referred to as the **STANDARD** channel.

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

PZD section

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

PKW section

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

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

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

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

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

A total of five PPO types are defined:

PKW section					PZD section									
	PKE	IND	PWE		PZD1 STW 1 ZSW 1	PZD2 HSW HIW	PZD3	PZD4	PZD5	PZD6	PZD7	PZD8	PZD9	PZD 10
	1 st word	2 nd word	3 rd word	4 th word	1 st word	2 nd word	3 rd word	4 th word	5 th word	6 th word	7 th word	8 th word	9 th word	10 th 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 SIMOVIS.

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)	Parameter value 2 PWE2 (L word)	

The parameter value is entered as PWE2 (also as PWE1 with double words) in write jobs.

Index IND contains the value zero for non-indexed parameters and the appropriate index value for indexed parameters. An index value of 255 means that the job refers to all indices of the corresponding parameter. The parameter values for all indices of the parameter must therefore be transferred with a write job. In contrast, the drive returns all index values in the response telegram for a read job.

The parameter identifier defines what task should be performed by which parameter. It is a 16-bit value consisting of the following areas:

Job/response identifier	Parameter number (PNU)

Bits 0 to 10 contain the number of the relevant parameter. Bits 12 to 15 contain the job identifier or the response identifier as defined in the following list:

Job identifier	Meaning	Response identifier	
		positive	negative
0	No job	0	7 or 8
1	Request parameter value (word or double word)	1 or 2	
2	Change (write) parameter value (word)	1	
3	Change (write) 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	Change parameter value (array word)	4	
8	Change parameter value (array double word)	5	
9	Request number of array elements	6	
10	Reserved	-	
11	Change parameter value (array double word) and store in EEPROM	5	
12	Change parameter value (array word) and store in EEPROM	4	
13	Change parameter value (double word) and store in EEPROM	2	
14	Change parameter value (word) and store in EEPROM	1	
15	Request text	15	

If the drive was unable to execute the job, then it responds with a fault identifier. It returns a fault code as a parameter value. This code describes the fault in greater detail as defined in the following list:

Fault code	Meaning	
0	Illegal parameter number (PNU)	PNU does not exist
1	Parameter value is read-only value	Visualization parameter
2	Lower or upper value limit violated	
3	Faulty subindex	
4	Parameter is not indexed (not an array)	
5	Incorrect data type	
6	Parameter value can only be reset	
7	Descriptive element is read-only element	
8	PPO write (acc. to "Information Report") is not available	
9	Parameter description is not available	
10	Incorrect access level	
11	No parameterization enable (P927)	
12	Code word missing	Key parameter P051 incorrect
13	Text cannot be read cyclically	
15	Text does not exist	
16	PPO write missing	
17	Incorrect operating state	
19	Value cannot be read cyclically	
101	Parameter number is currently deactivated	
102	Channel is not wide enough	
103	Incorrect number of PKW	Applies only to serial interfaces
104	Parameter value is not legal	With BiCo selection parameters
105	Indexed parameter	
106	Job not implemented in drive	
107	Text cannot be written (changed)	
108	Incorrect number of parameter values	With job "Write all indices"

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 analysing 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).

File SIEM8022.GSD is needed for the CB1 and file SIEM8045.GSD for the CBP.

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://www.ad.siemens.de/support/html_76/index.shtml. Select "Customer Support Information System", "All Downloads", Selected Topic = PROFIBUS GSD files, "PROFIBUS GSD files: Drives" and "Master Drives CBP" to load the file.

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 SIMOTRAS HD 6SG70.

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 CB1	Meaning for CBP
001/033	Status_1 (CBP_Status) Meaning of bits as for CBP	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)

Index	Meaning for CB1	Meaning for CBP
002/034	Status_2 Bit0: "Timeout" signal (dp_status) (not set in normal operation) Bit1: "Clear Data" signal (dp_status) (not set in normal operation) Bit2: "Leave Master" signal (dp_status) (not set in normal operation) Bit3: "Freeze Mode" state (dp_status) (not set in normal operation) Bit4: "Baudrate Found" state (dp_status) (set in normal operation) Bit5: "Sync Mode" state (dp_status) (not set in normal operation) Bit8: Spontaneous message active (an unacknowledged spontaneous message is active) (not set in normal operation) Bit9: SPC error (not set in normal operation)	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	L byte: No. of received error-free messages H byte: Reserved	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: "Timeout" counter H byte: Reserved	L byte: No. of received error-free messages (DP Standard only) H byte: Reserved
005/037	L byte: "Leave Master" counter H byte: "Baud rate not found" counter	L byte: "Timeout" counter H byte: Reserved
006/038	L byte: Reserved H byte: "SPC-ASIC not initialized"	L byte: "Clear Data" counter H byte: Reserved
007/039	L byte: "Requested spontan. mess." counter H byte: "Acknow. spontan. mess." counter	L byte: "Heartbeat counter error" counter H byte: Reserved
008/040	L byte: "Heartbeat counter error" counter H byte: Reserved	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	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: No. ID bytes received from master	L byte: Mirroring of P918 (CB bus addr.) H byte: Reserved
011/043	L byte: Identifier byte 0 H byte: Identifier byte 1	L byte: "Re-config. by CUD" counter H byte: "Initialization runs" counter
012/044	L byte: Identifier byte 2 H byte: Identifier byte 3	L byte: Error ID DPS manager error H byte: Reserved
013/045	L byte: PPO type found (1 to 5) H byte: Reserved	L byte: PPO type found H byte: Reserved
014/046	Every bit marks a process data no. (1-10) in the receive message to which a 32-bit value is assigned	L byte: Mirroring of "DWord specifier ref"
015/047	Every bit marks a process data no. (1-10) in the receive message to which a 32-bit value is assigned	H byte: Mirroring of "DWord specifier act"
016/048	-	L byte: DPV1:DS_Write, pos. ack. counter H byte: Reserved

Index	Meaning for CB1	Meaning for CBP
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	Date of creation: Day, month
026/058	Date of creation: Year	Date of creation: Year
027/059	Software version	Software version (Vx.yz, display x)
028/060	Software version	Software version (Vx.yz, display yz)
029/061	Software version	Software version: Flash-EPROM checks.
030/062	-	Reserved
031/063	-	Reserved
032/064	-	Reserved

7.10.3 Sequence of operations for starting up CAN bus boards (CB2, CBC)



Switch off the power supply and insert the board or adapter with board into a module location. Please remember to insert a board in location 2 before you use location 3.



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):

- U711 Basic identifier for PKW Request/PKW Response
- U712 Basic identifier for PZD Receive
- U713 Basic identifier for PZD Send
- U714 No. of PZD for PZE Send
- U715 Updating rate for PZD Send
- U716 Basic identifier for PZD Receive Broadcast
- U717 Basic identifier for PZD Receive Multicast
- U718 Basic identifier for PZD Receive Internode
- U719 Basic identifier for PKW Request Broadcast
- U720 Baud rate
- U721 Reserved for CAN profile (not currently in use, leave setting at 0)
- U722 Telegram failure time (0 = deactivated)
- P918 Bus address
- P927 Parameterization enable (need be set only if parameter values are to be altered via the CAN bus)
- The process data are interconnected at the basic converter end by means of the appropriate connectors and binectors (see function diagrams G34 and G35 "Process data exchange with the technology board or 1st or 2nd communication board" in Section 8). For meaning of bits of control and status words, please see function diagrams G37 to G40 in Section 8, "Control word 1", "Control word 2", "Status word 1" and "Status word 2".



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.

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).

In contrast to other busses such as PROFIBUS, there are no node addresses on the CAN bus, but telegrams are individually identified for transmission purposes. Each data message, the so-called **COBs (Communication Objects)**, has its own individual **identifier** and contains a maximum of 8 bytes of user data. The CB2 and CBC boards use the Standard Message Format with **11-bit identifiers**. Simultaneous use by other nodes of Extended Message Format with 29-bit identifiers is tolerated, but messages with this format are not evaluated.

Nodes on the bus determine from the identifier which telegrams apply to them. The COBs to be sent and received by each node must be defined before data transmission commences. The identifiers also determine bus accessing priority. Low identifiers gain faster access to the bus, i.e. they have higher priority than high identifiers.

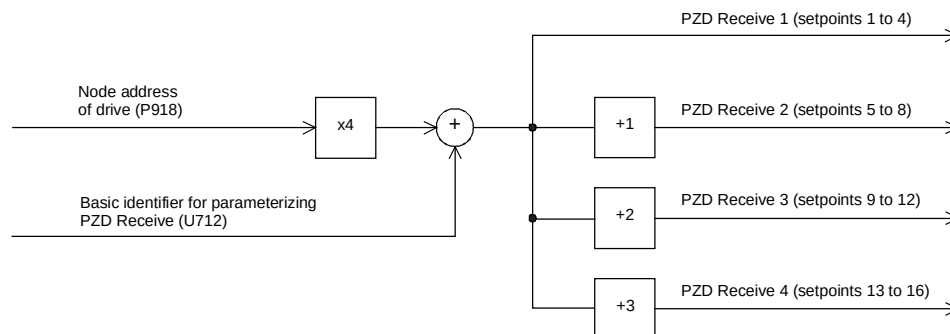
Errored telegrams can be reliably detected by means of a number of interactive error detection mechanisms. A transmission is automatically repeated when errors are detected.

User data are exchanged between the CAN master and the CAN boards on the drives, i.e. the slaves. User data are categorized as either process data (control and status information, setpoints and actual values) or data which relate to parameters.

Process data (**PZDs**) are time-critical and therefore processed faster by the drive (every 3.3 ms at system frequency of 50 Hz) than the non-time-critical **PKW data** (parameter identifier value), which is processed by the drive every 20 ms.

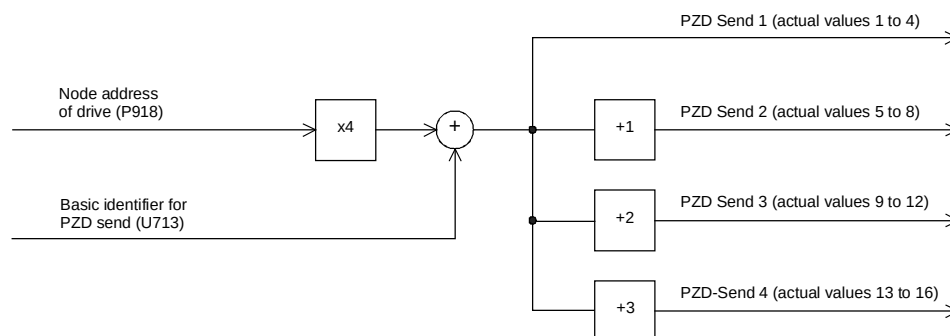
All settings required to operate the communication board are made in drive parameters (see Function Diagrams G34 and G35, Section 8 "Data exchange with a technology board or the 1st communication board" or "Data exchange with the 2nd communication board").

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 16 PZD words, with each COB requiring its own separate identifier. These assignments are made in CB parameters as shown in the following diagram:



Example of PZD Receive:

P918 = 1 This setting assigns identifier 100 to the first 4 receive PZDs,
 U712 = 96 identifier 101 to the second 4 receive PZDs, etc.



Example of PZD Send:

P918 = 1 This setting assigns identifier 200 to the first 4 send PZDs,
 U713 = 196 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 Function Diagrams G34 and G35, Section 8 "Data exchange with a technology board or the 1st communication board" or "Data exchange with the 2nd communication board").

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.

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.

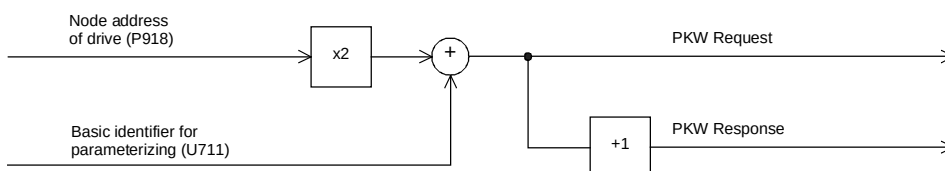
Bit 10 (control by PLC) must always be set in control word 1 or else the drives will not accept setpoints and control words.

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.

As the various PZD transmission functions can be used simultaneously, there will be a certain amount of overlapping data in the drive. For example, the first PZD from PZD-Receive and PZD-Receive-Broadcast will always be interpreted as control word 1. Make sure that the transmitted data produces a meaningful combination.

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.

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. SIMOTRAS HD 6SG70 does not use double word parameters itself, these jobs can only be executed where access is available to technology board parameters (e.g. T300).

The CBC or CB2 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.

Fault and alarm messages:

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.

7.10.4 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 centre 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 CB) and index 2 for the 2nd SIMOLINK board (2nd CB): (the use of a 2nd SLB is planned for future versions of the software)

- 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 SIMOTRAS HD 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 SIMOTRAS HD converter and the SLB, irrespective of the cycle time on the bus (U746). A shorter cycle time still means, however, that the data are transferred more quickly after they have been made available by the converter or more up-to-date information for the converter.

U745 and U746 together determine the number of addressable nodes (this can be checked with diagnostic parameter n748.4 in the converter with the dispatcher board).

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

The number of nodes serves only to check whether data can be exchanged with the values set in U745 and U746. These parameters must otherwise be corrected.

A maximum of 201 nodes (dispatcher and 200 transceivers) can be connected to the SIMOLINK bus. Node addresses 201 to 255 are reserved for special telegrams and others. Consequently, with 8 channels per node, a bus cycle can be a maximum of 6.4 ms in duration.



Process data are connected to the SIMOLINK board through assignment of the corresponding connectors and/or binectors to telegram addresses and channel numbers (see Section 8, Sheet Z11 "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 means that node 1 in channel 0 transmits status word 1 (K0032) as

U751.01 = 32 word1 and status word 2 (K0033) as word2

U751.02 = 33

Changes to the receive data parameters have no effect until the electronics supply voltage of the drive is switched on again.

SIMOLINK (**Siemens Motion Link**) is a digital, serial data transmission protocol which uses fiber optics as a transmission medium. The SIMOLINK drive link has been developed to allow a fast, cyclic exchange of process data (control information, setpoints, status information and actual values) via a closed ring bus.

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.

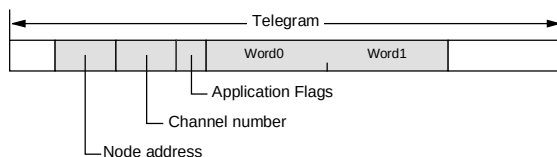
Active bus nodes receive and/or send telegrams (SIMOLINK master, dispatcher, transceivers).

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.

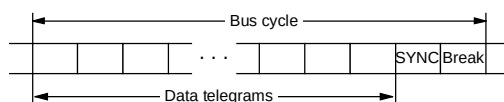


The assignment between connector values to be transferred and individual telegrams and channels is also parameterized (see Section 8, Sheet Z11 "SIMOLINK Board: Receiving, transmitting").

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.

7.10.5 Procedure for starting up expansion boards (EB1 and EB2)

- 1 Remove connector X480 from the EB1 board for safety reasons. A short circuit could otherwise occur should the signal direction of the bidirectional binary inputs/outputs be incorrectly parameterized (see also point 3).
This risk of short circuits does not exist on EB2 boards.
- 2 The analog inputs on the EB1 can be used either as current or voltage inputs, the mode being selected by setting **jumper**s (X486, X487, X488) appropriately (see Function Diagrams, Section 8). The same applies to EB2 (X498); on this board, the analog output can also be configured as a current or voltage source (X499).
- 3 Parameterize the desired functions for the inputs and outputs (see Function Diagrams, Section 8).
If you wish to operate a bidirectional binary input/output on an EB1 as an input, please note that the output circuit must be deactivated in the corresponding parameter (e.g. U769.01=0). A short circuit will otherwise occur if the signal levels of the external input and output signals are opposed.
Switch off the device.
- 4 With the power supply disconnected, insert the adapter board with expansion board in a location. Please remember to insert a board in location 2 before you use location 3.
- 5 EB1 boards only: Plug connector X480 back into board.

Expansion boards EB1 and EB2 expand the range of terminals on the basic converter. A total of 2 EB1 boards and 2 EB2 boards may be installed in one SIMOTRAS HD 6SG70. 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 Sheets Z1 to Z8 in Section 8, function diagrams for expansion boards EB1 and EB2.

7.10.6 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). When connecting unipolar signals, one earth connection for all signals on terminal 75 (CTRL-) is sufficient. However, with very long cables or where there are high levels of radiated noise, it is advisable to bridge terminals 69, 71 and 75 (A-, B- and CTRL-) and connect them to the encoder ground. The zero track of the pulse encoder is not evaluated by SIMOTRAS HD 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, Sheet Z9)



- 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 SIMOTRAS HD 6SG70 converters.

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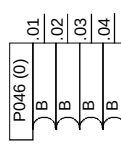
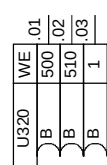
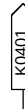
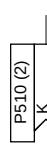
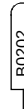
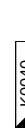
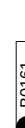
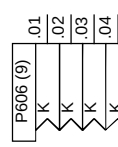
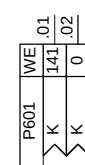
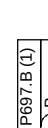
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Drive-specific (crane) control (see also Section 6.1)

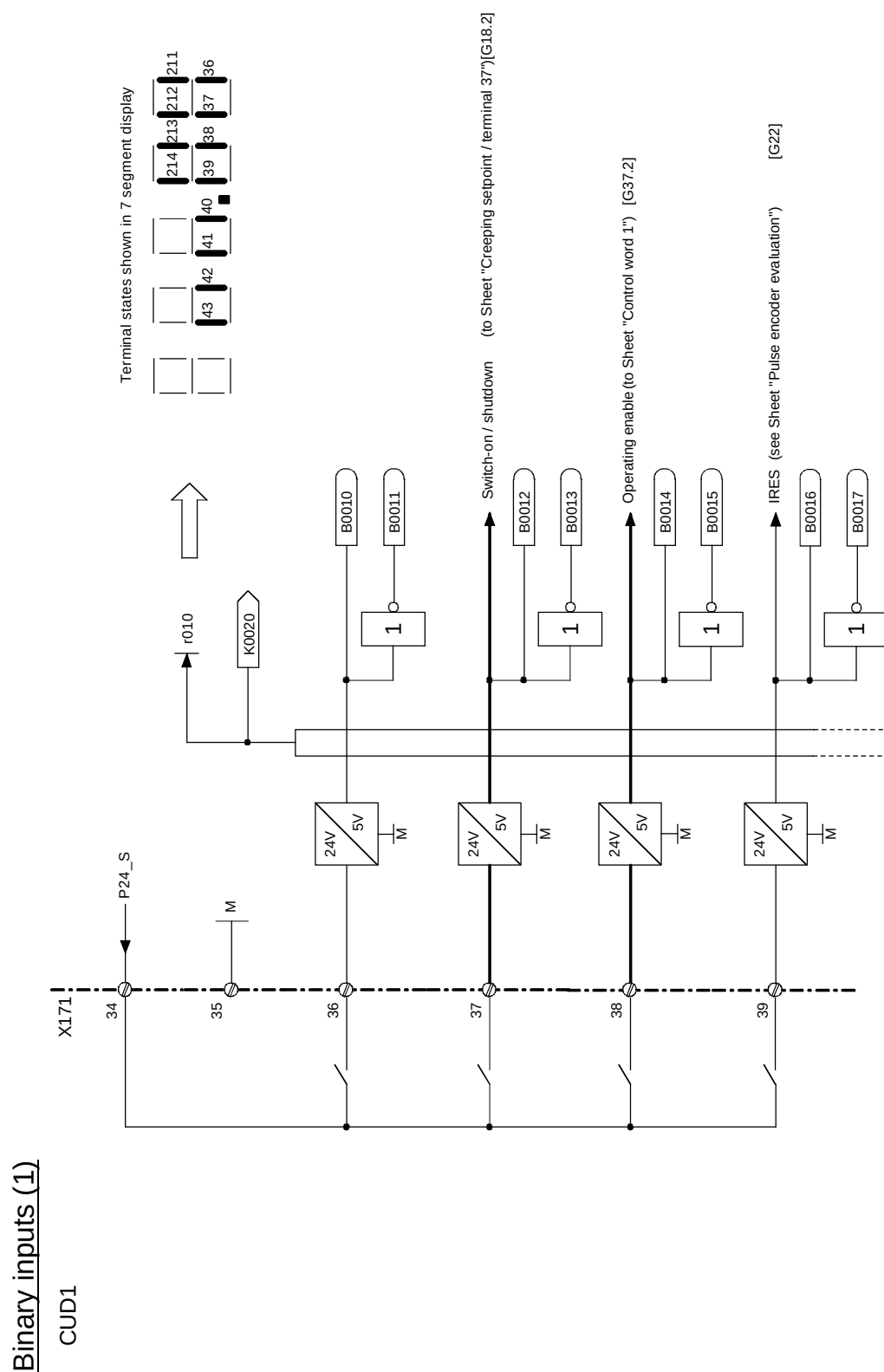
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Sheet G1 Symbols used

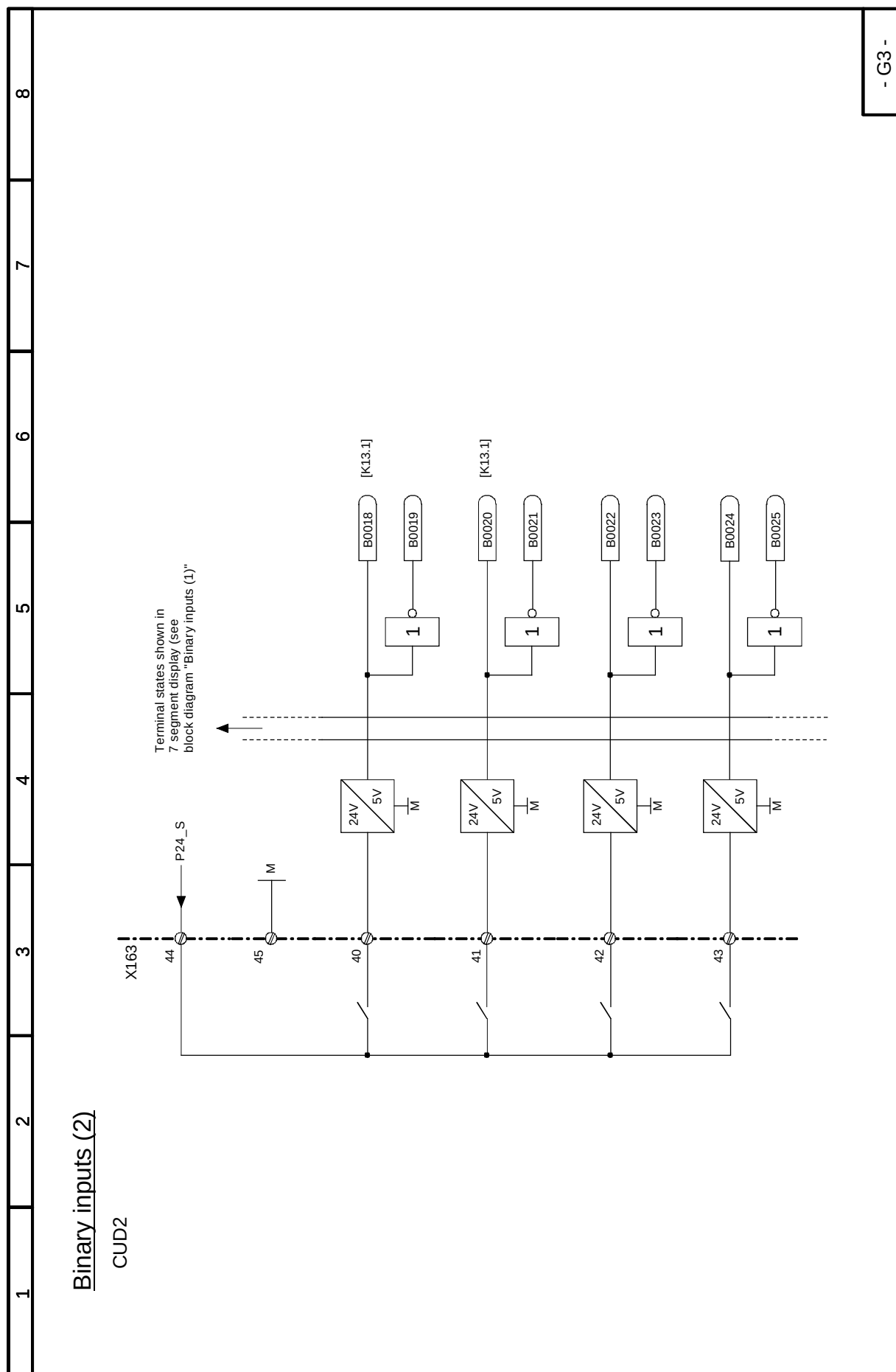
1	2	3	4	5	6	7	8
Symbols used							
P462.F(10.00s) 0.01...300.00s Ramp-up time 	Setting parameter Factory setting in brackets "F"= parameter in function parameter set 0.00...300.00s = setting range	Display parameter Parameter number = r045 .02 = Index 2 of the parameter			Selection of binectors using "indexed" parameters Factory setting in brackets Setting range = all binector numbers Ability to enter selected binectors for each index		
r045.02 					Selection of binectors using "indexed" parameters Different factory setting for each index Setting range = all binector numbers Ability to enter selected binectors for each index		
	Connector (freely connectable analog signal)				Selection of a connector Factory setting in brackets Setting range = all connector numbers Ability to enter selected connector		
	Binector (freely connectable binary signal)						
	Hard-wired connector (no selection possible)						
	Hard-wired binector (no selection possible)						
	Designation for free function block (number of the function block)				Selection of connectors using "indexed" parameters Factory setting in brackets Setting range = all connector numbers Ability to enter selected connectors for each index		
	Selection of a binector Factory setting in brackets Setting range = all binector numbers Ability to enter selected binector				Selection of connectors using "indexed" parameters Different factory settings for each index Setting range = all connector numbers Ability to enter selected connectors for each index		
	Selection of a binector Factory setting in brackets "B" = parameter in BICO data set Setting range = all binector numbers Ability to enter selected binector						

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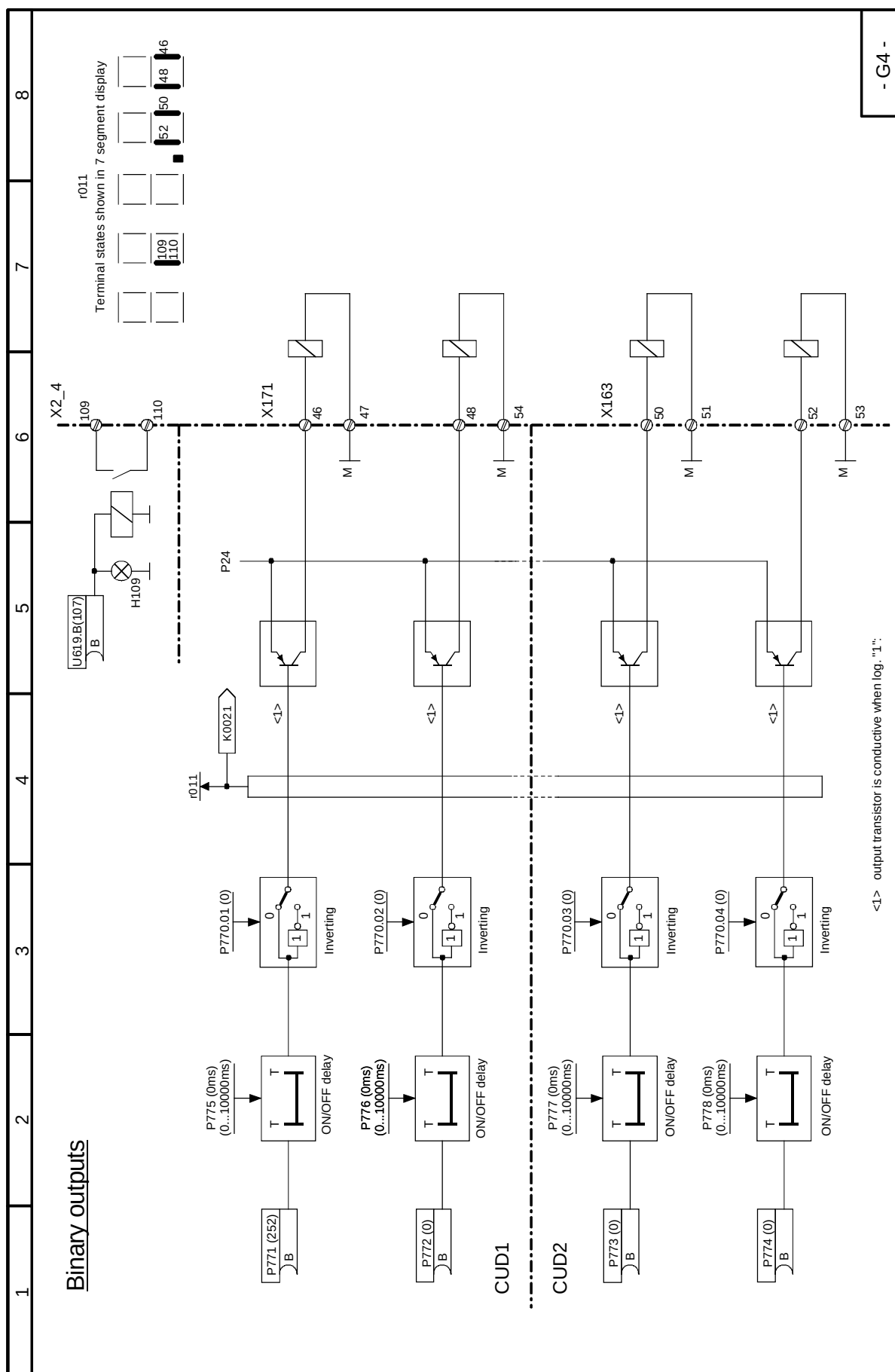
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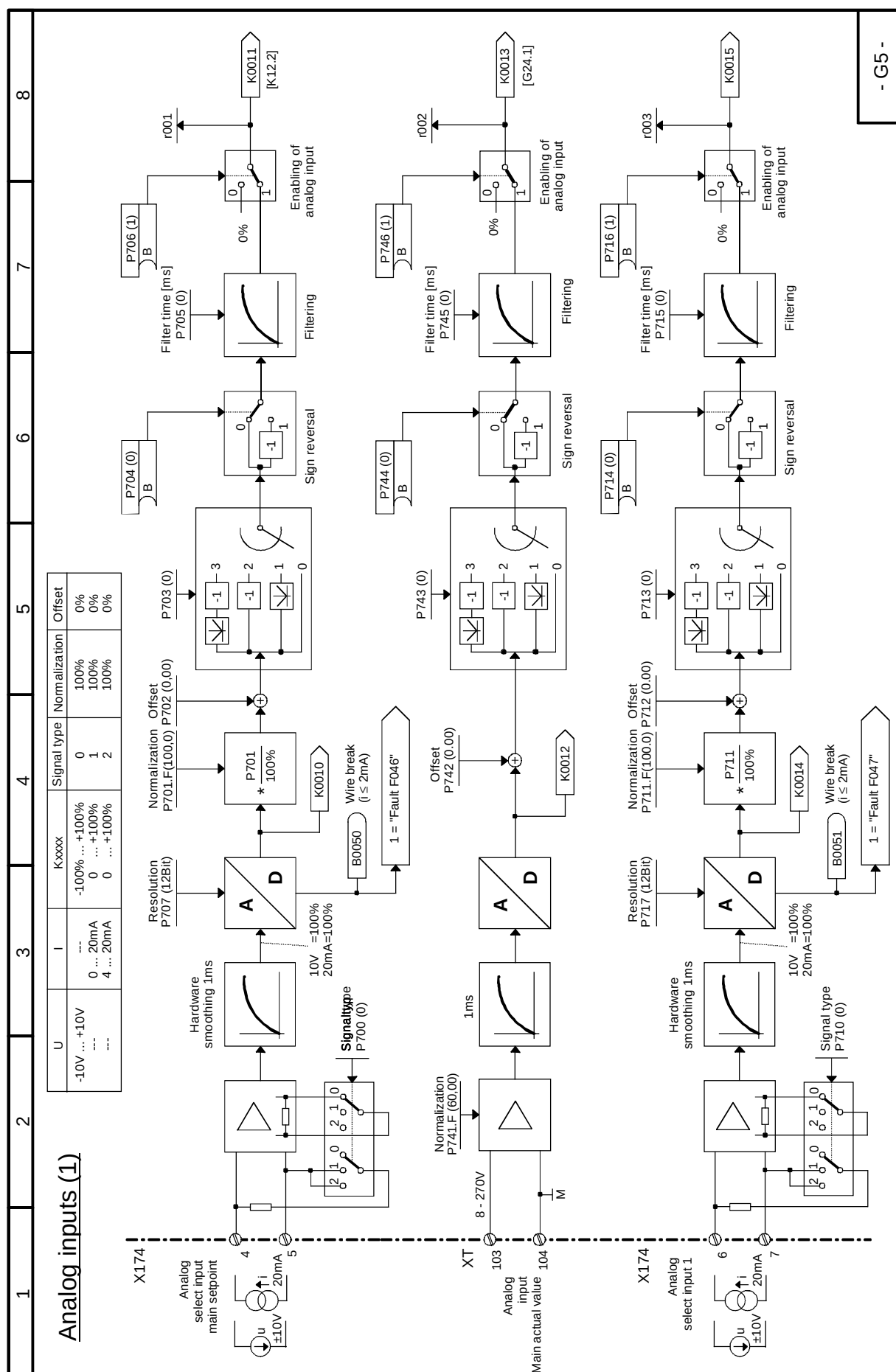
Sheet G3 Binary inputs, terminals 40 to 43



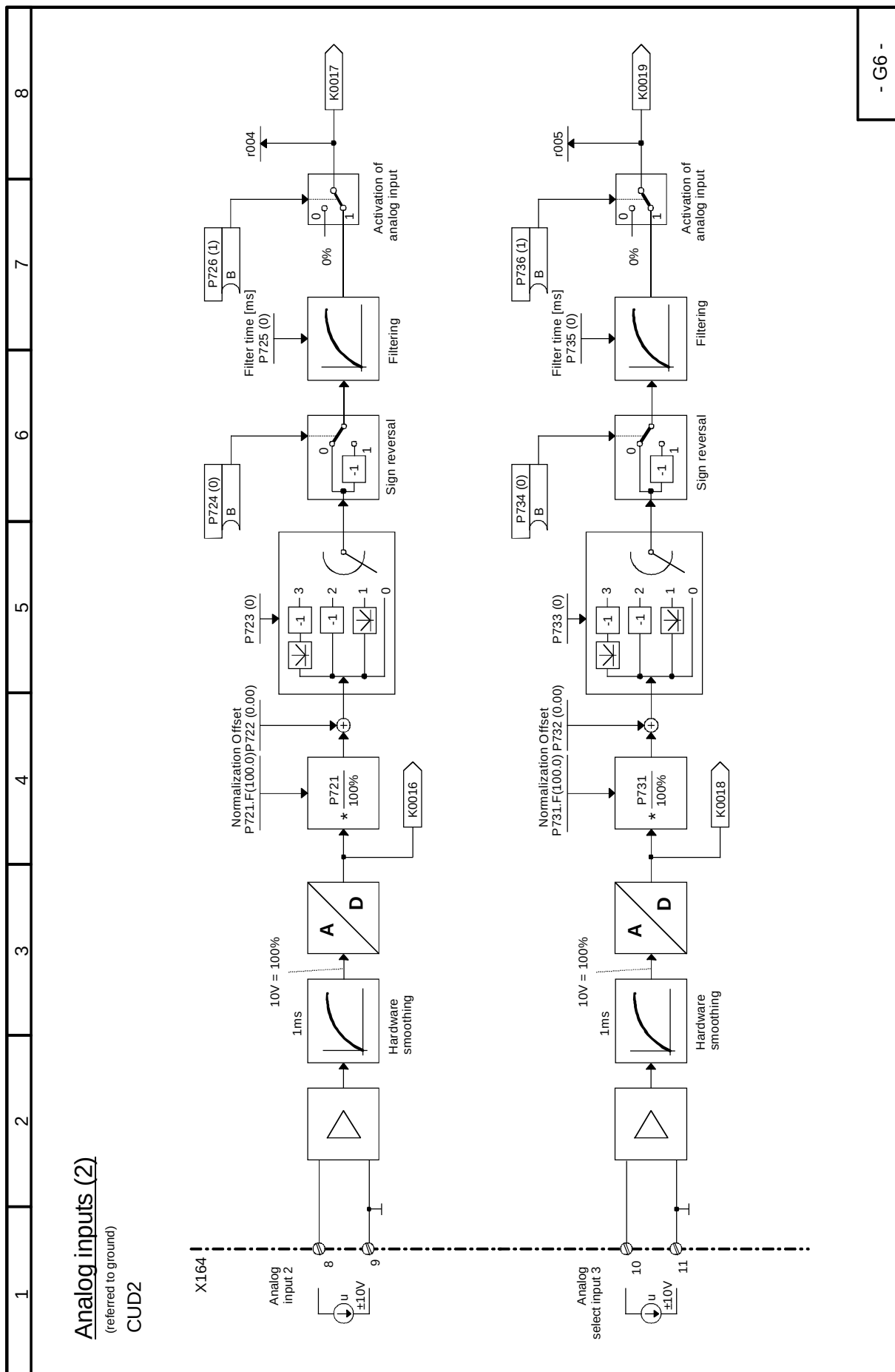
Sheet G4 **Binary outputs, terminals 46/47 and 48/54**
Binary outputs, terminals 50/51 and 52/53
Control outputs, terminal 109/110



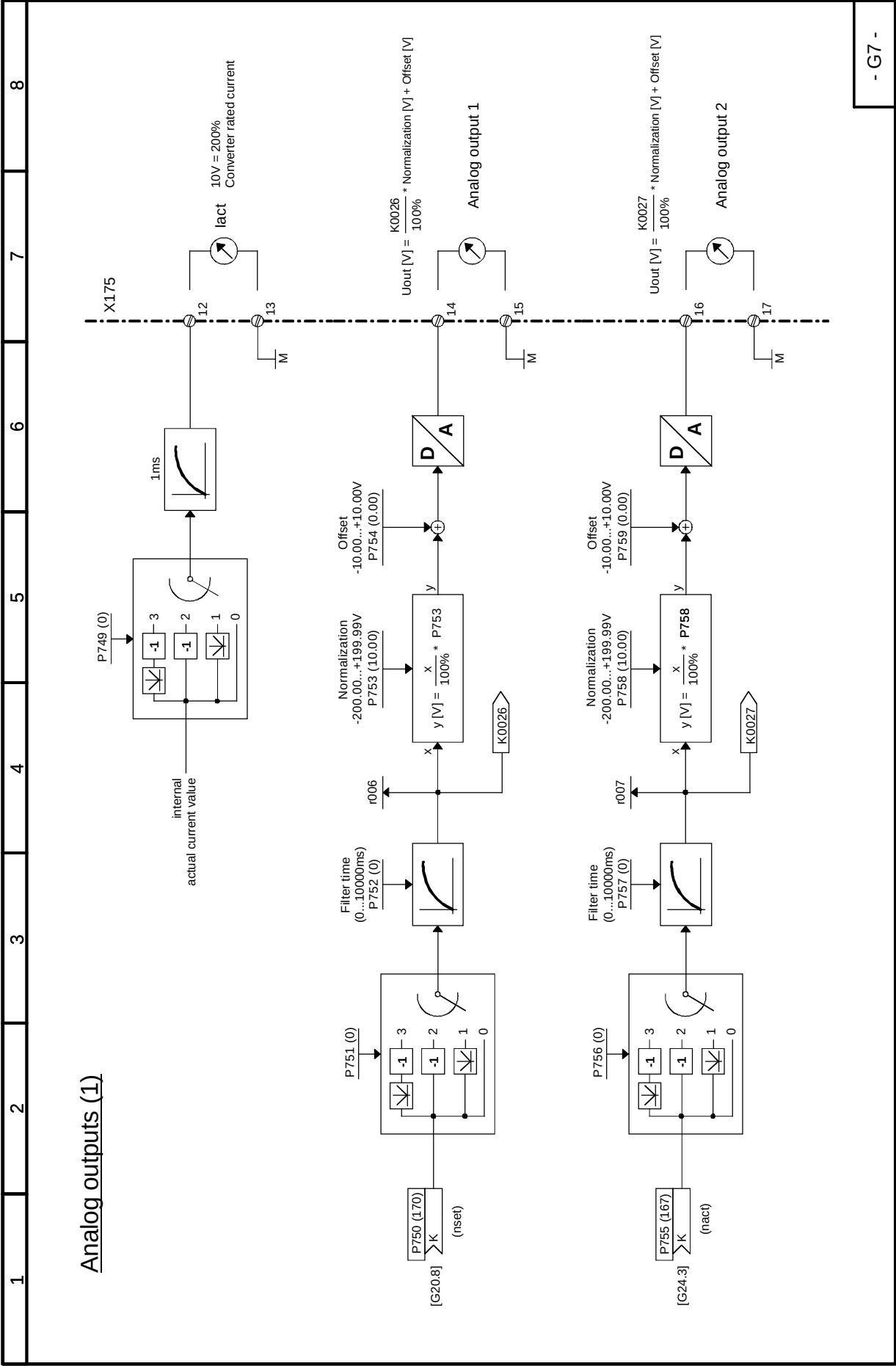
Sheet G5 Analog inputs, terminals 4/5, 6/7 and 103/104



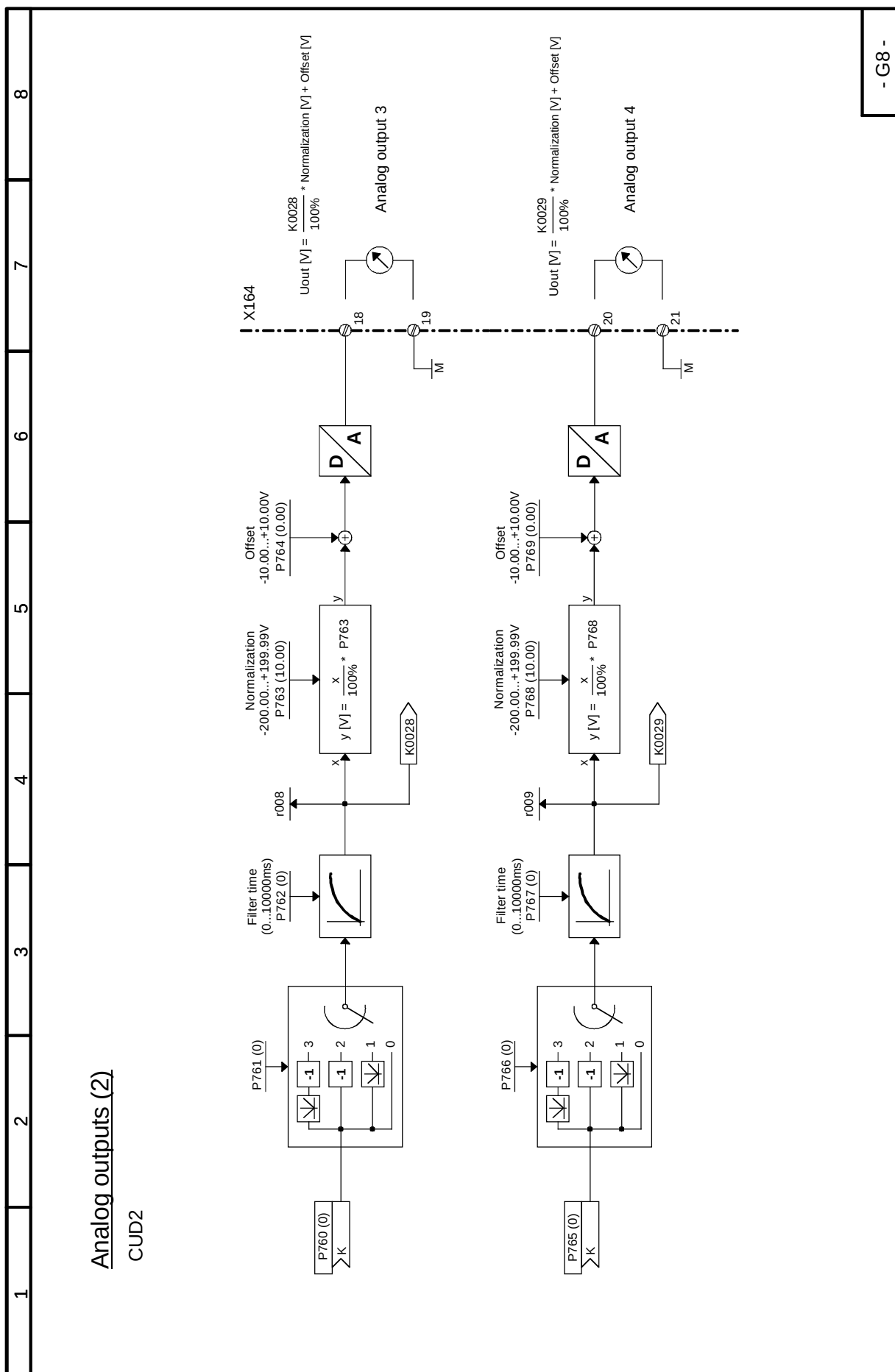
Sheet G6 Analog inputs, terminals 8/9 and 10/11



Sheet G7 Analog outputs, terminals 12/13, 14/15 and 16/17



Sheet G8 Analog outputs, terminals 18/19 and 20/21

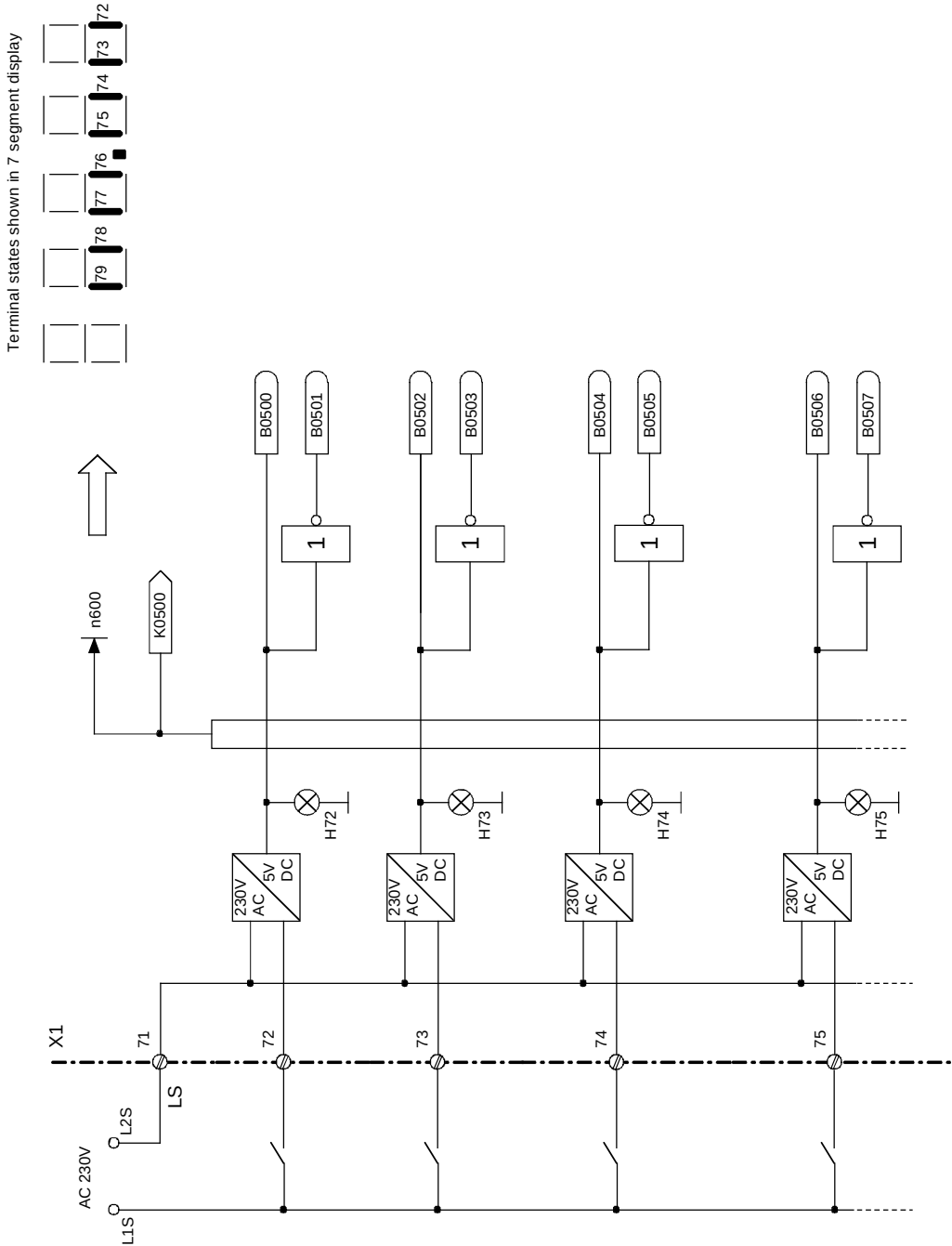


- G8 -

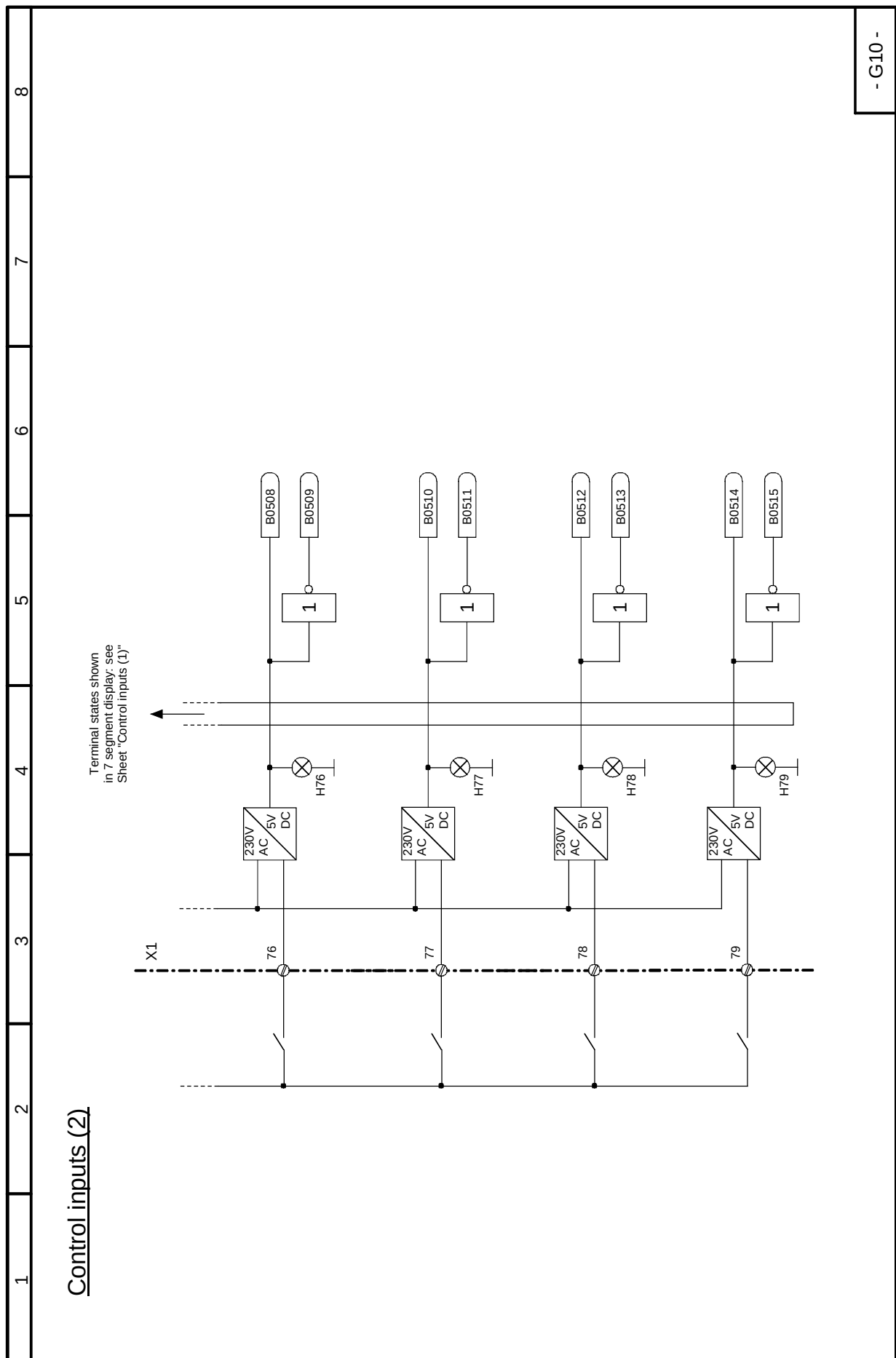
Sheet G9 Control inputs, terminals 71 to 75

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Control inputs (1)



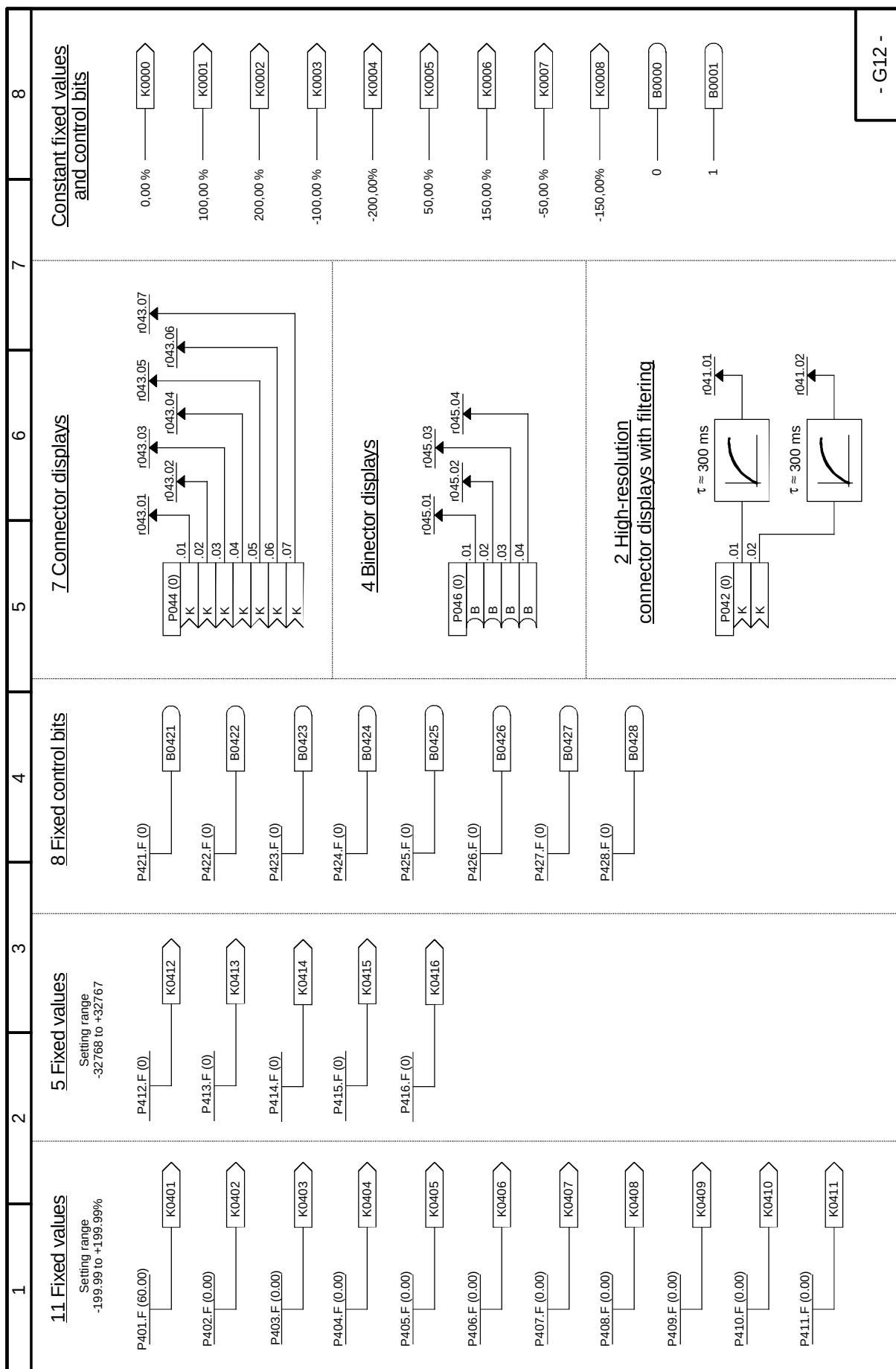
Sheet G10 Control inputs, terminals 76 to 79



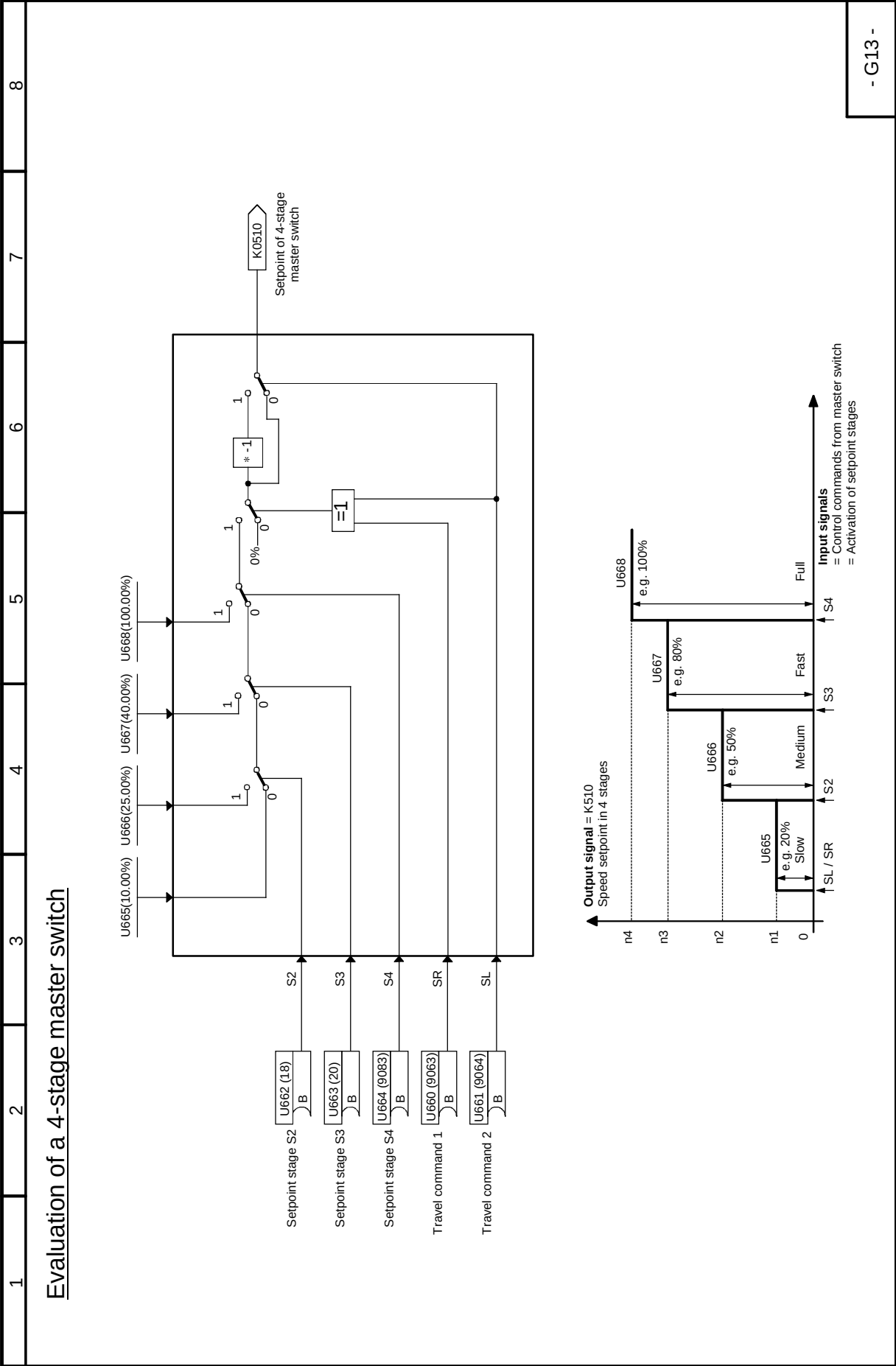
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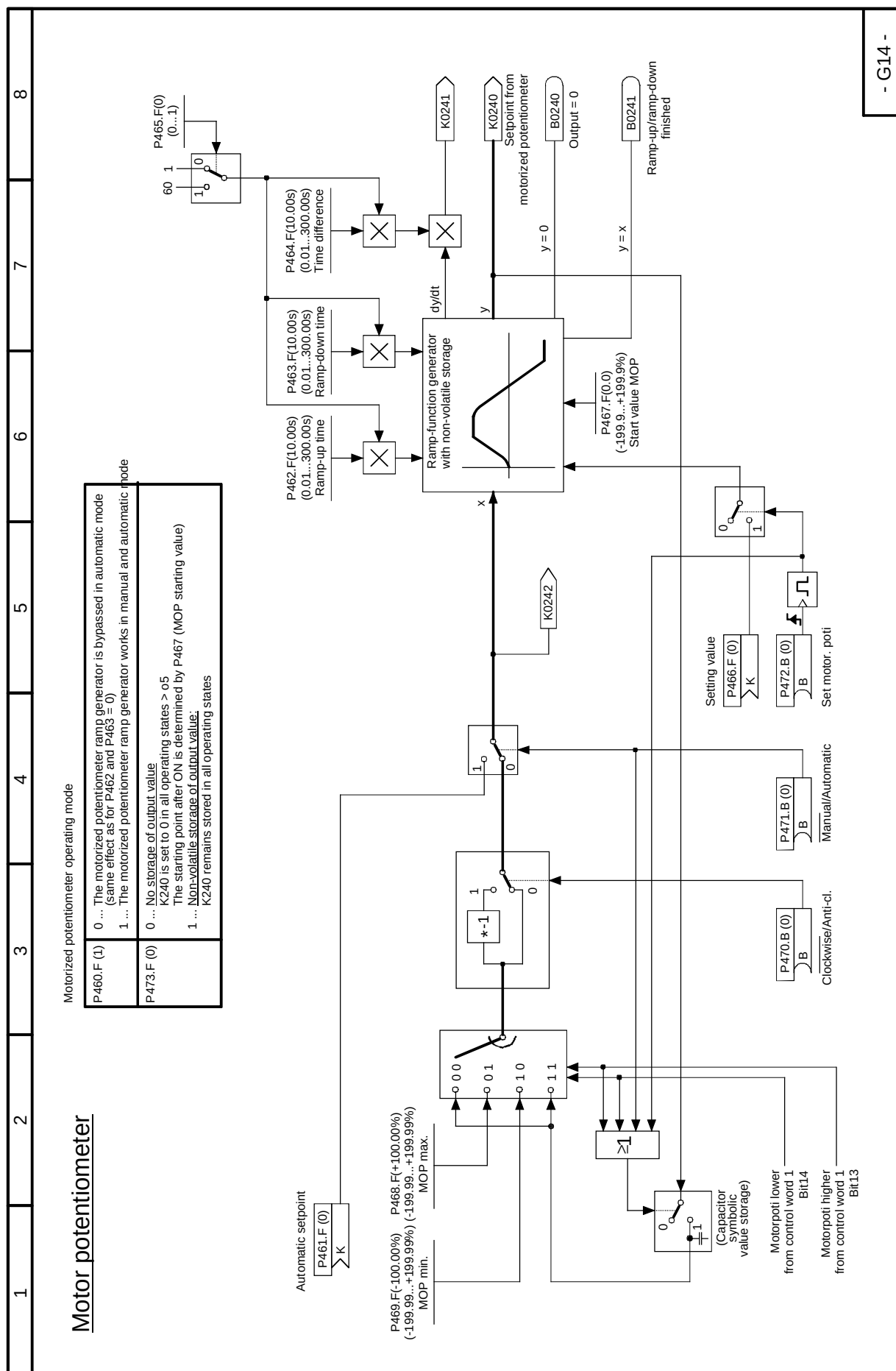


Sheet G12 Fixed values, fixed control bits, constant fixed values and control bits, connector and binector displays



Sheet G13 Evaluation of a four-stage master switch

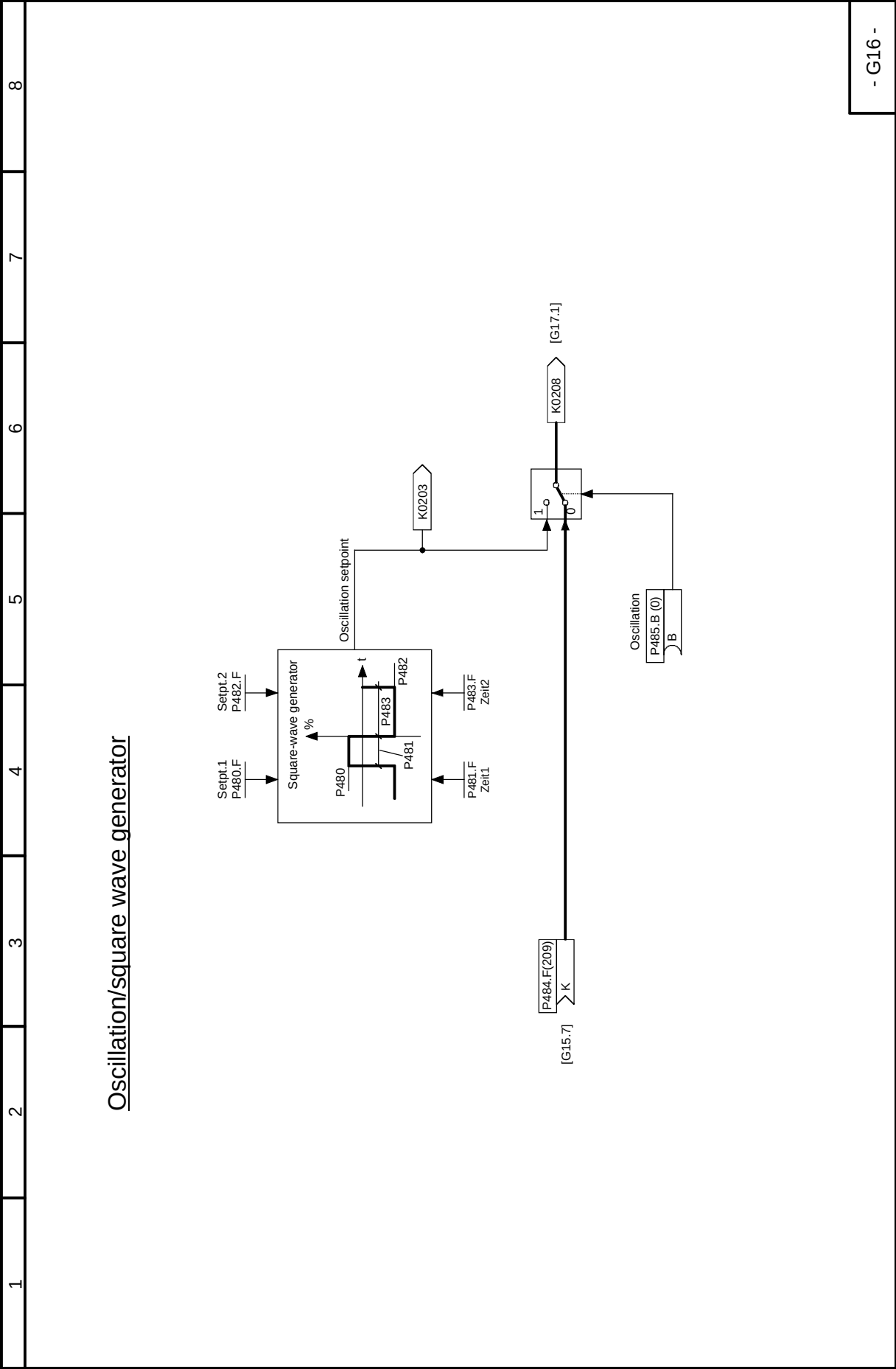


Sheet G14 Motorized potentiometer

8-18



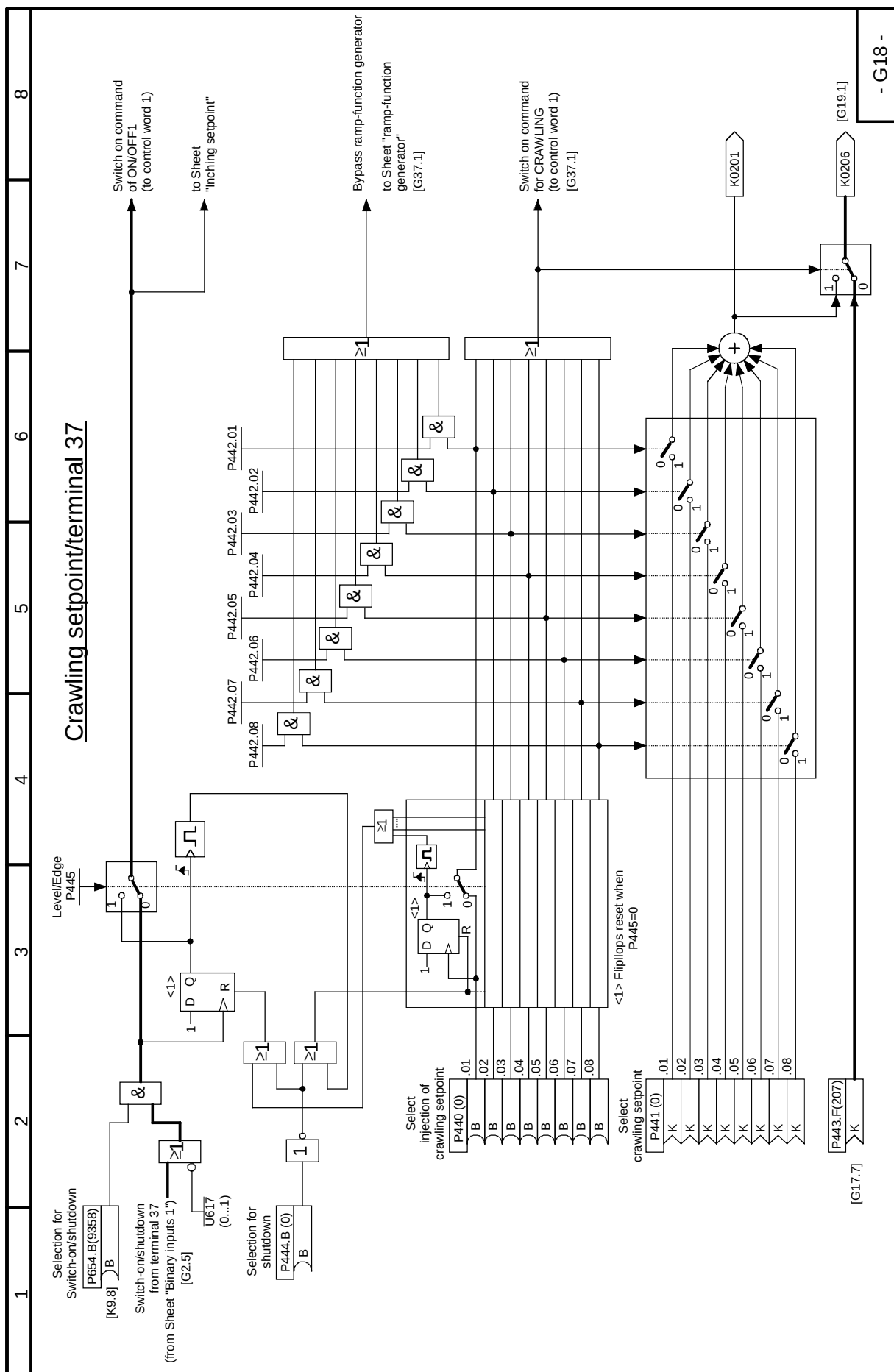
Sheet G16 Oscillation/square wave generator



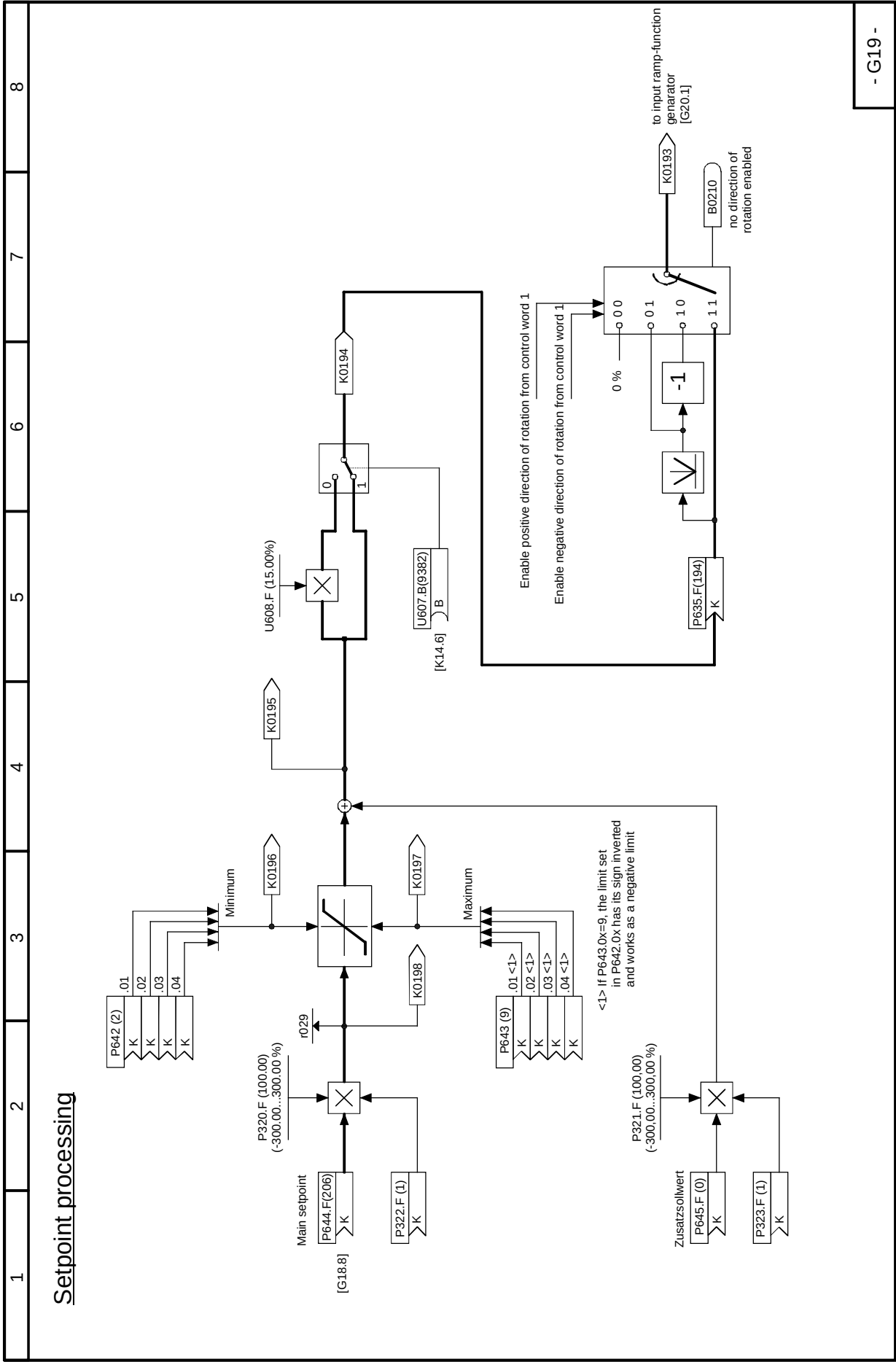
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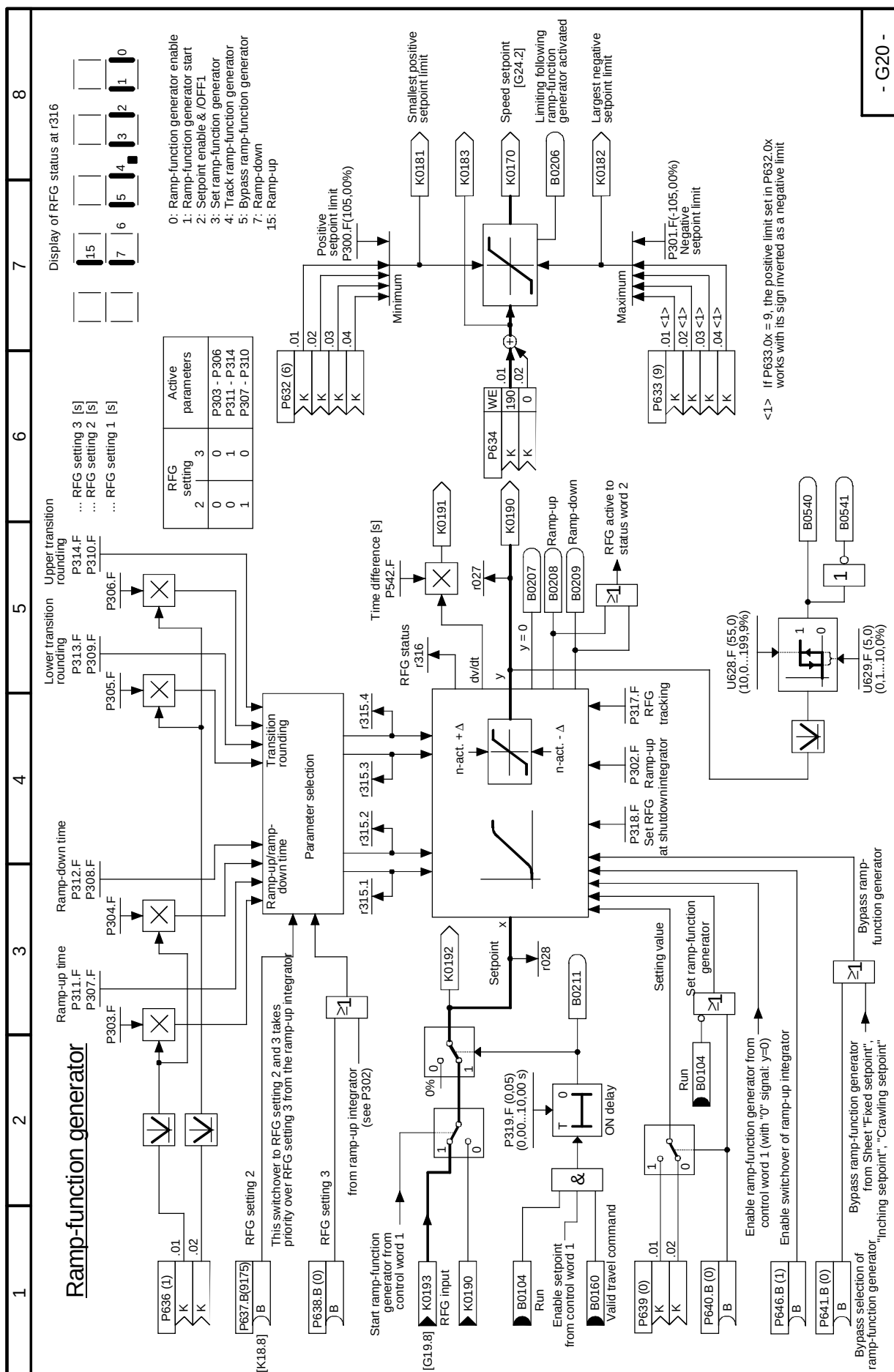
Sheet G18 Crawling setpoint



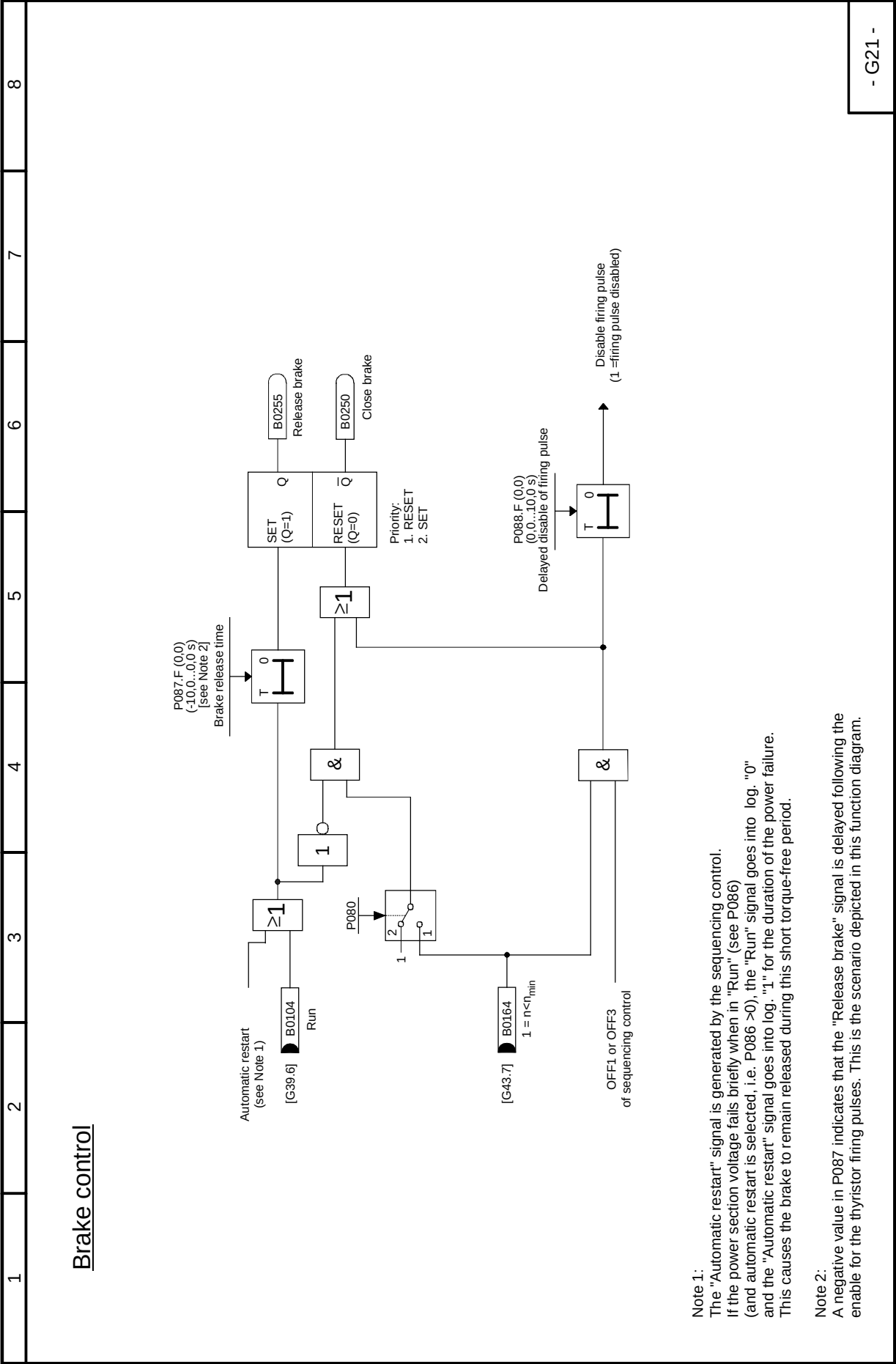
Sheet G19 Setpoint processing



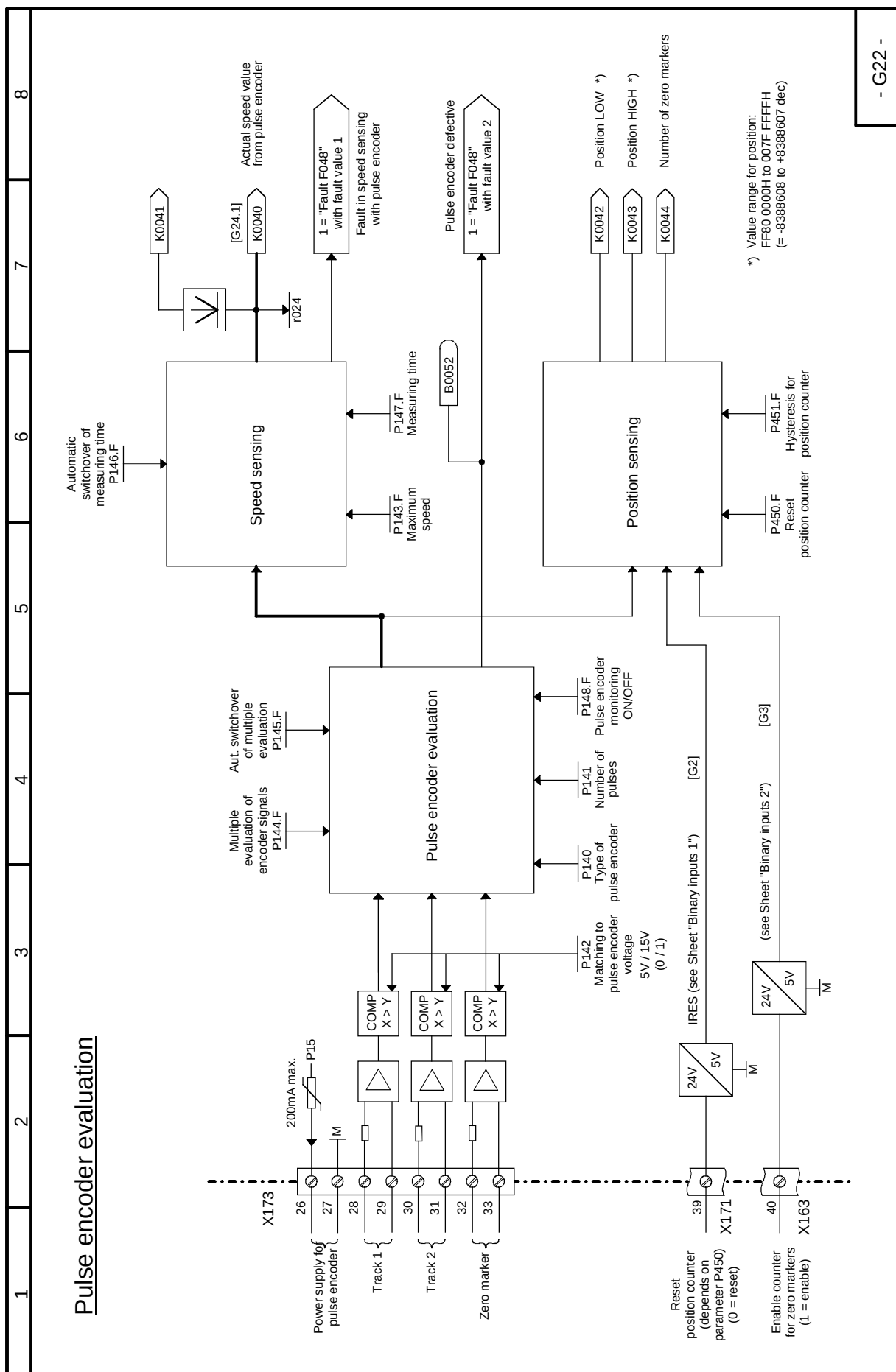
Sheet G20 Ramp-function generator



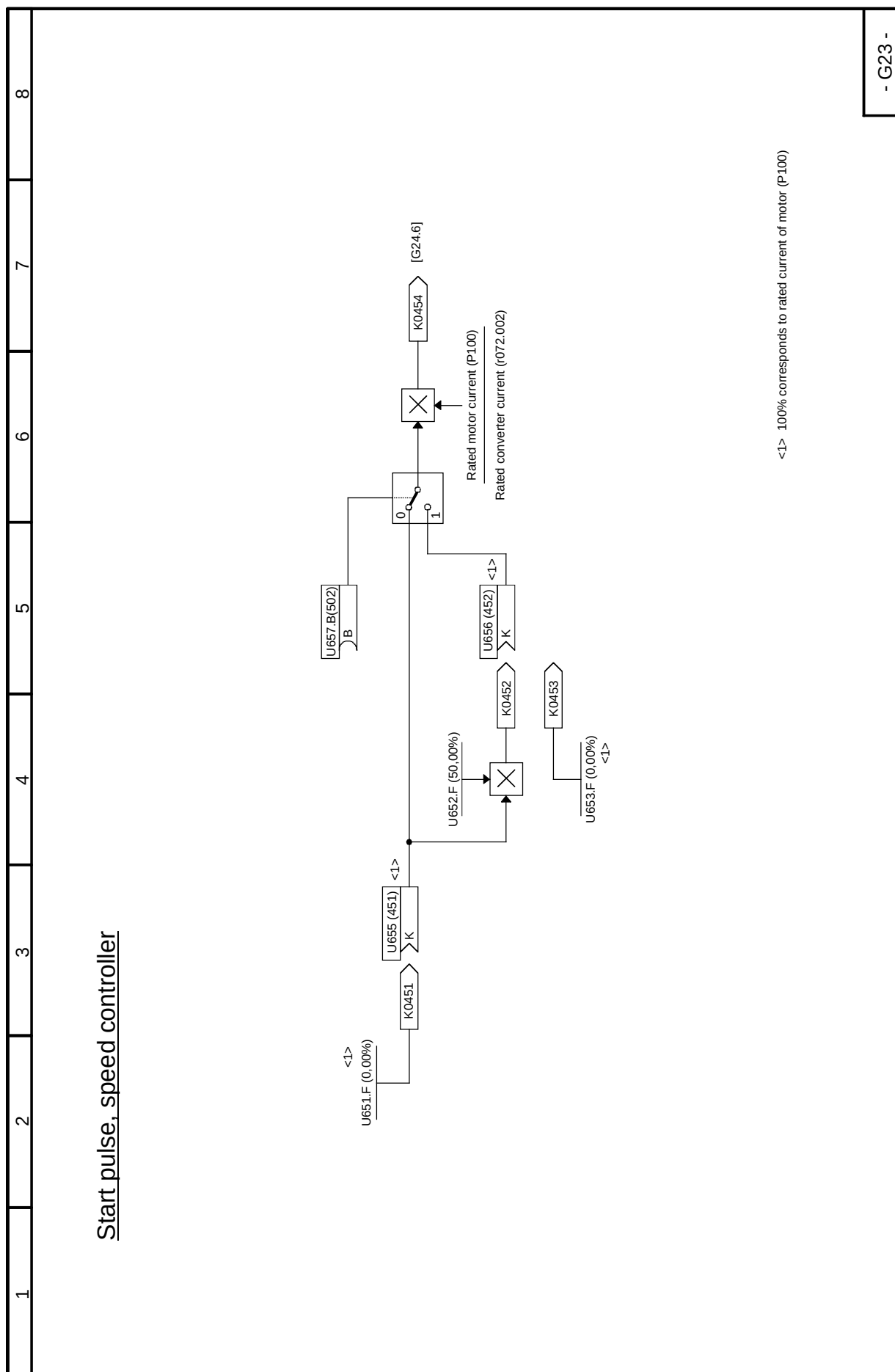
Sheet G21 Brake control



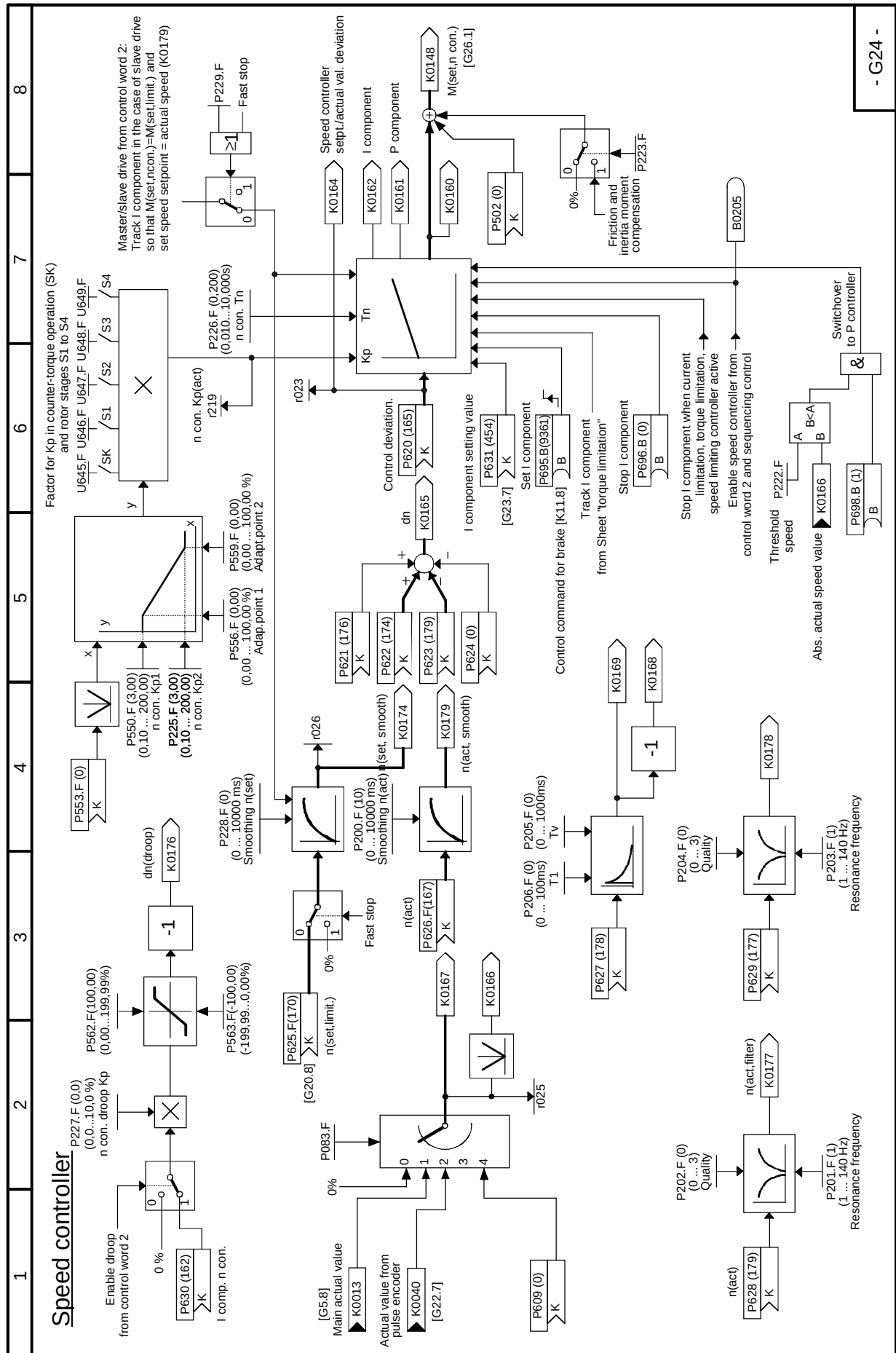
Sheet G22 Pulse encoder evaluation



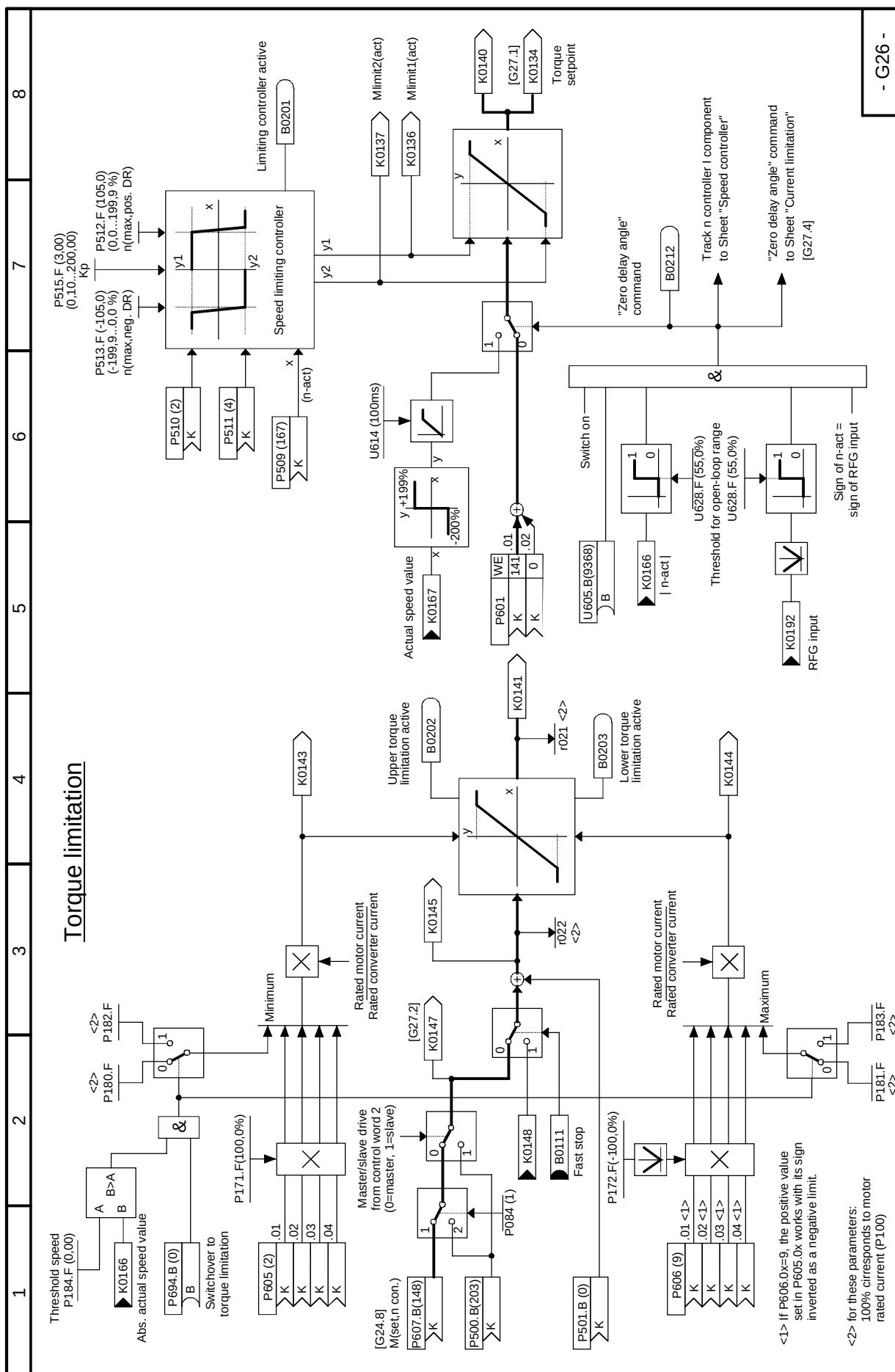
Sheet G23 Start pulse, speed controller



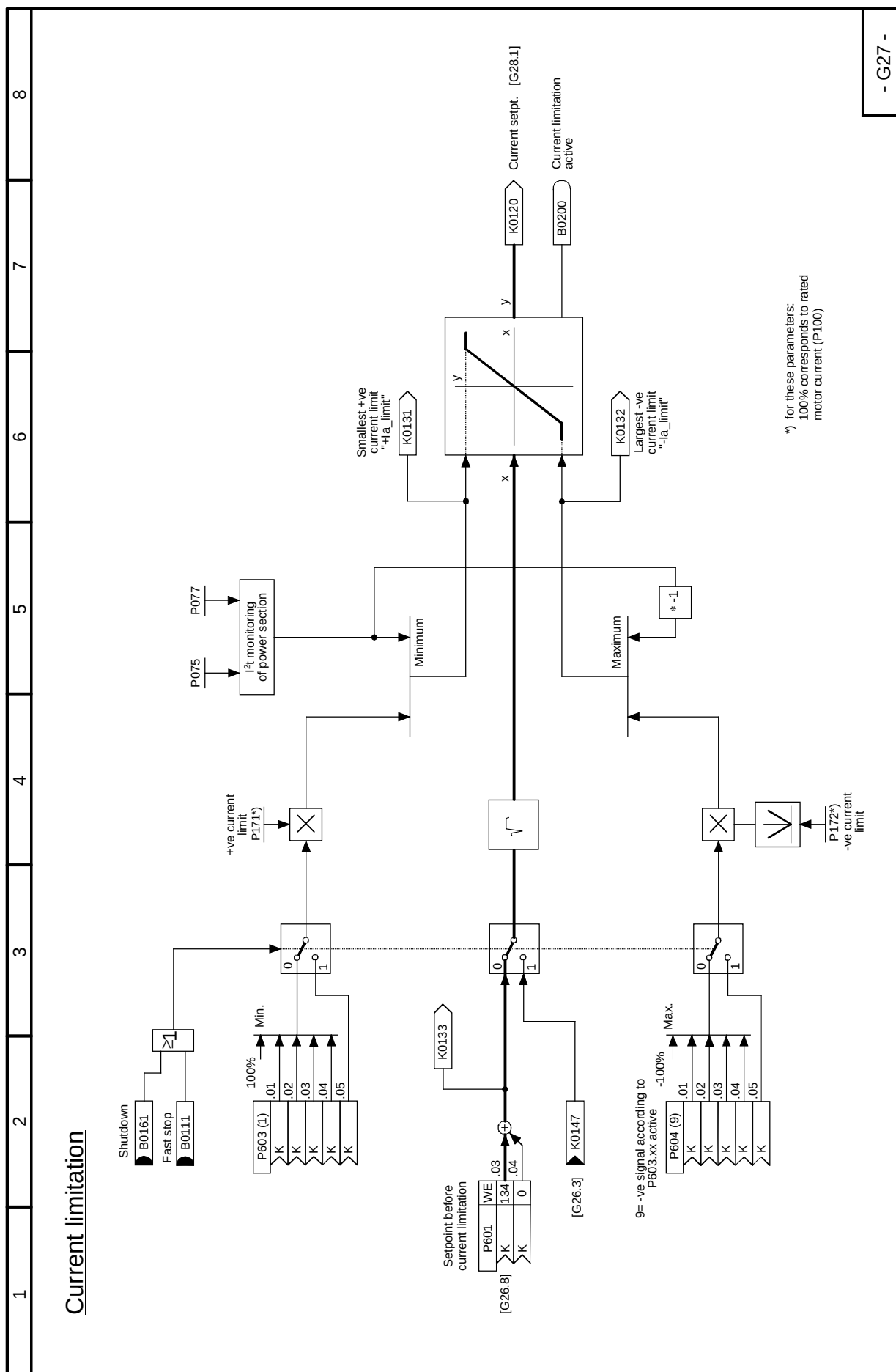
Sheet G24 Speed controller



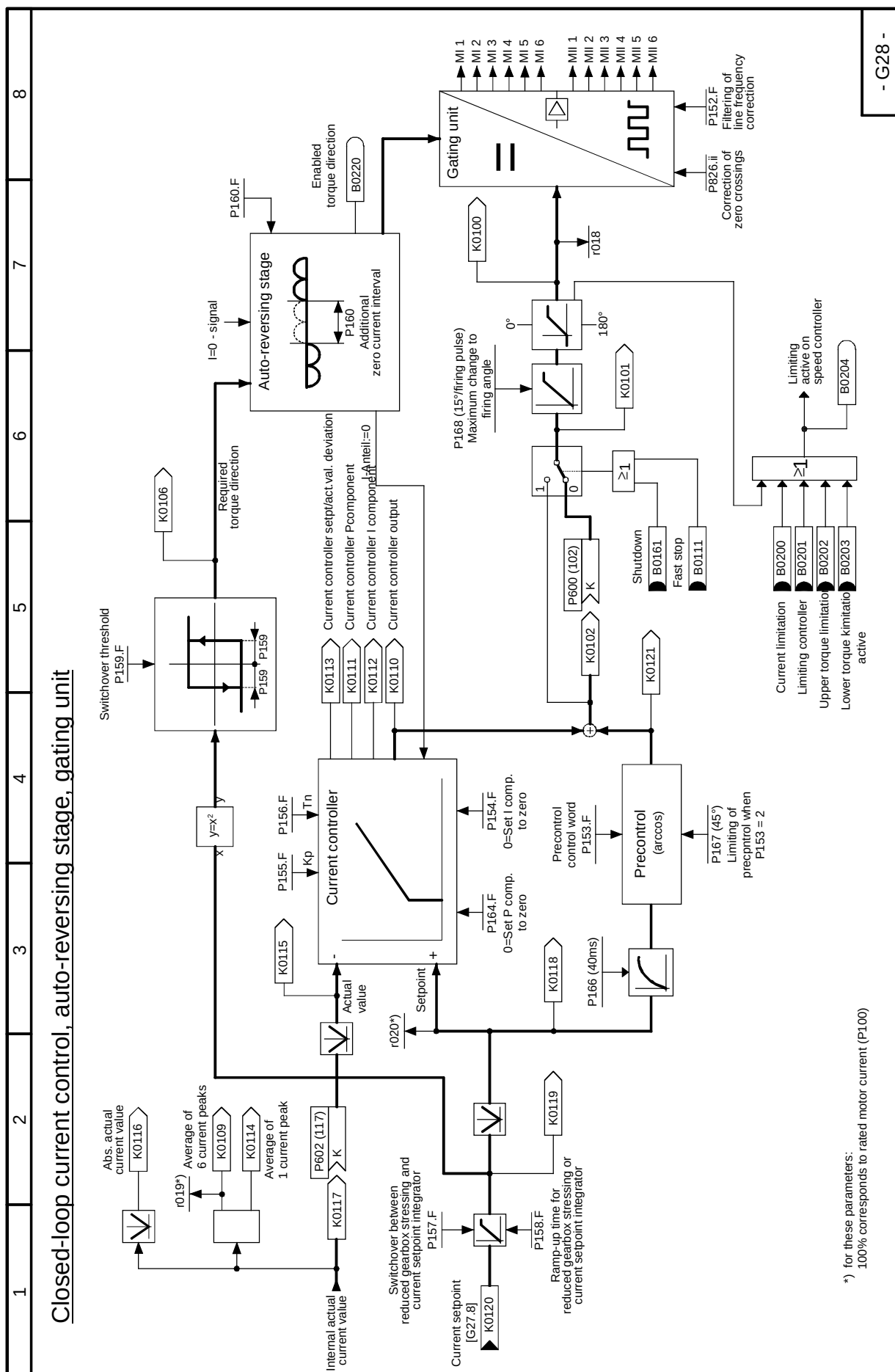
Sheet G26 Torque limitation



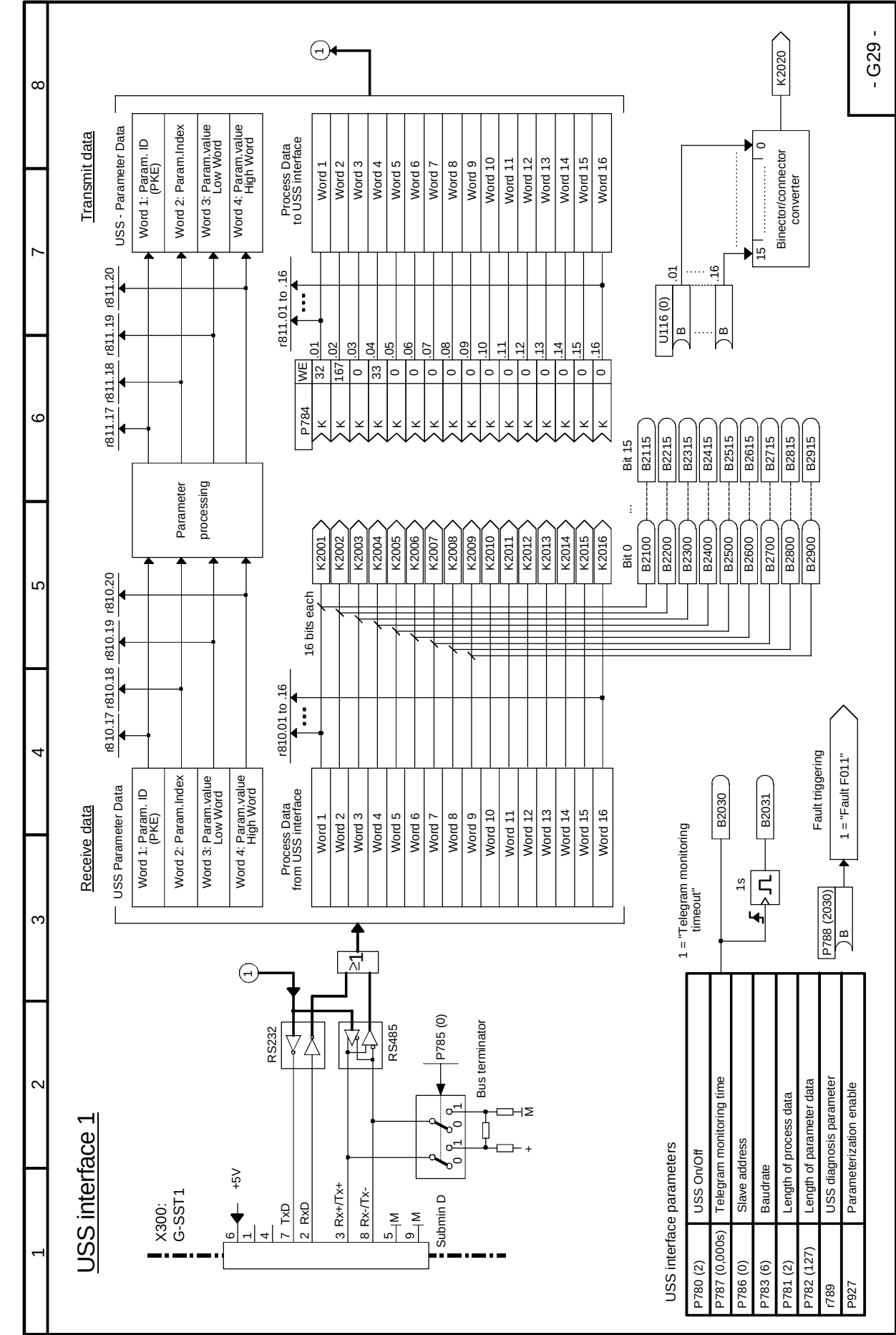
SIEMENS AG 6SG7000-0BA76
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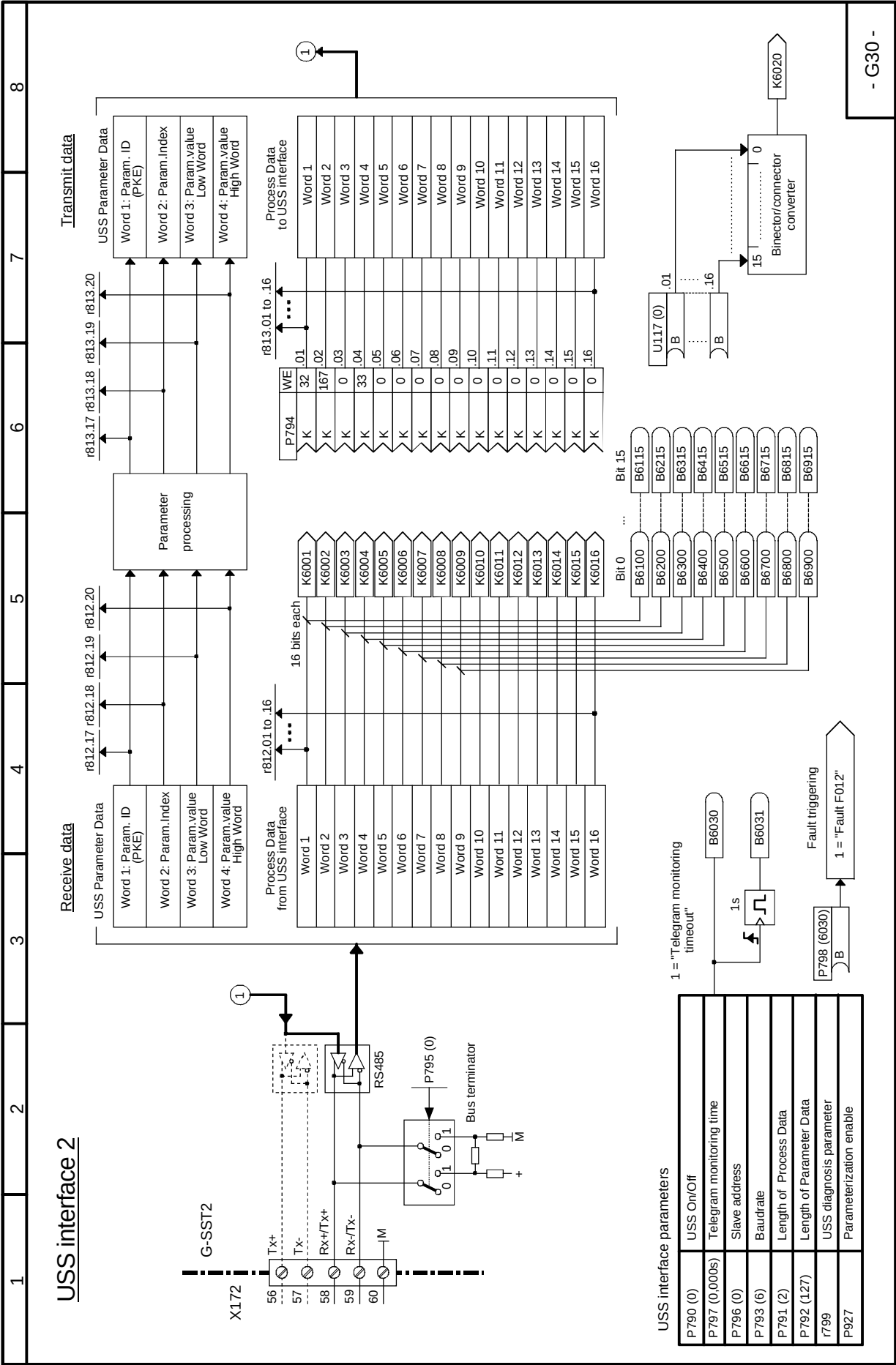
Sheet G28 Closed-loop current control, auto-reversing stage, gating unit



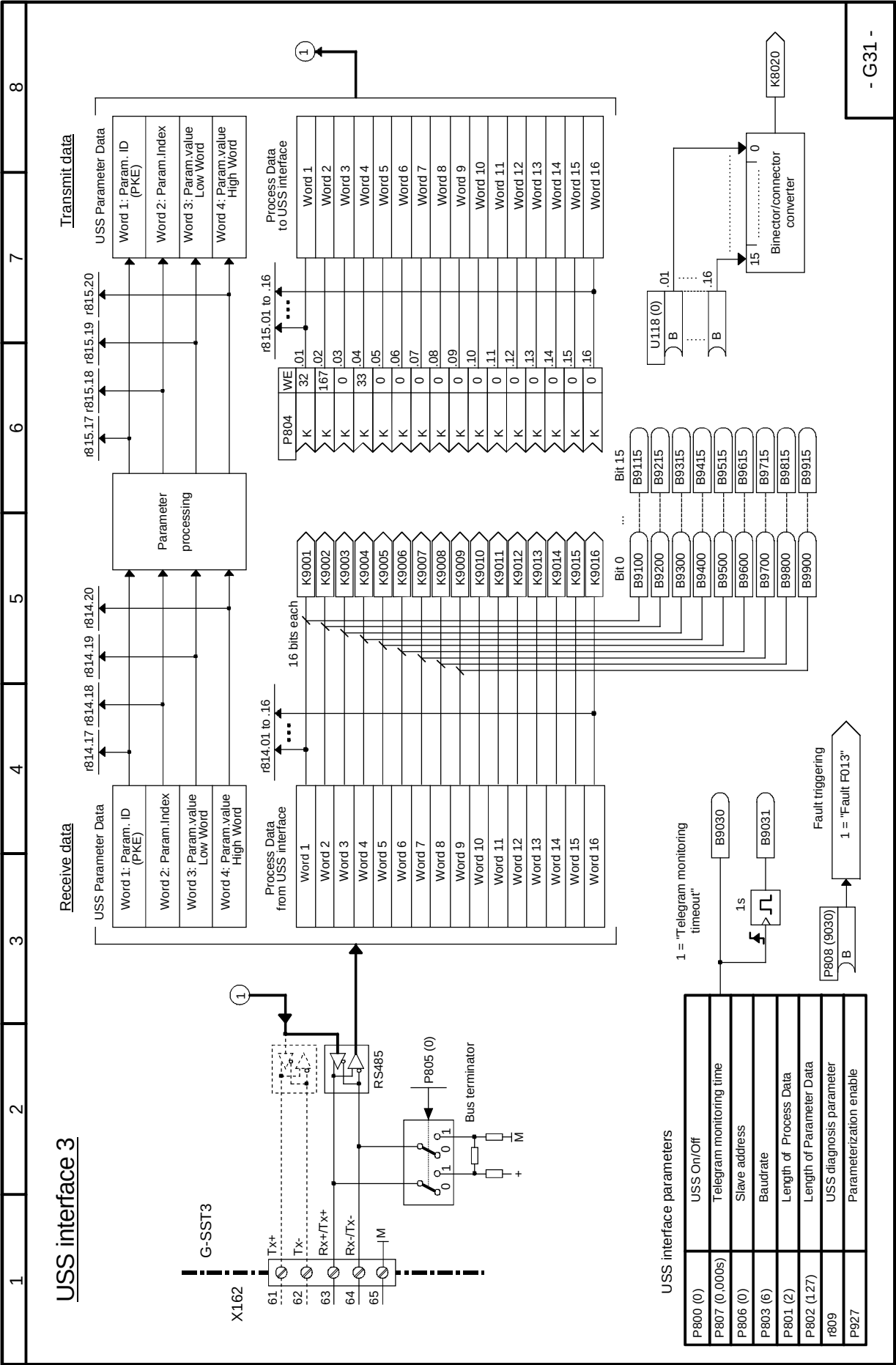
Sheet G29 USS interface 1



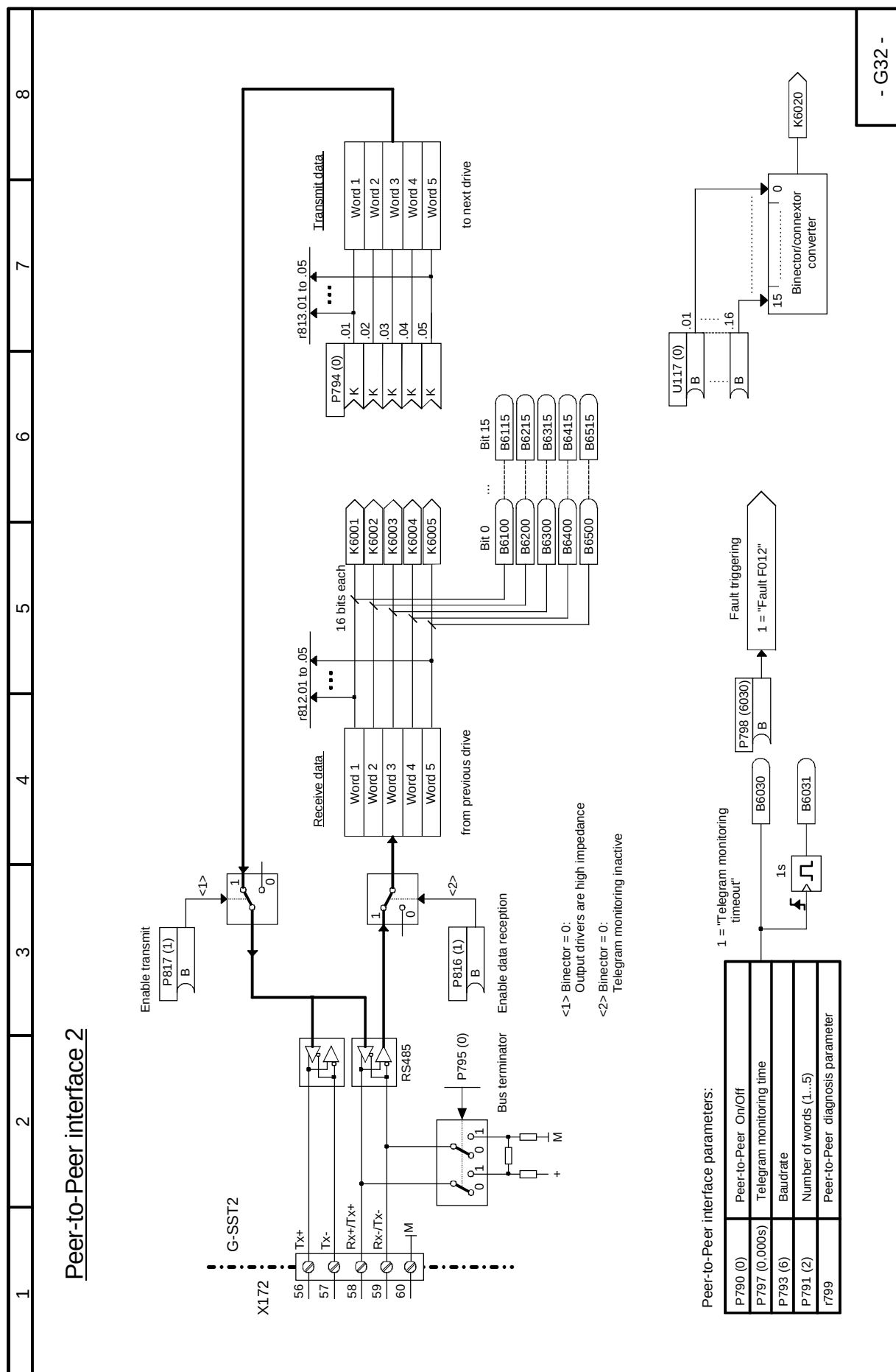
Sheet G30 USS interface 2



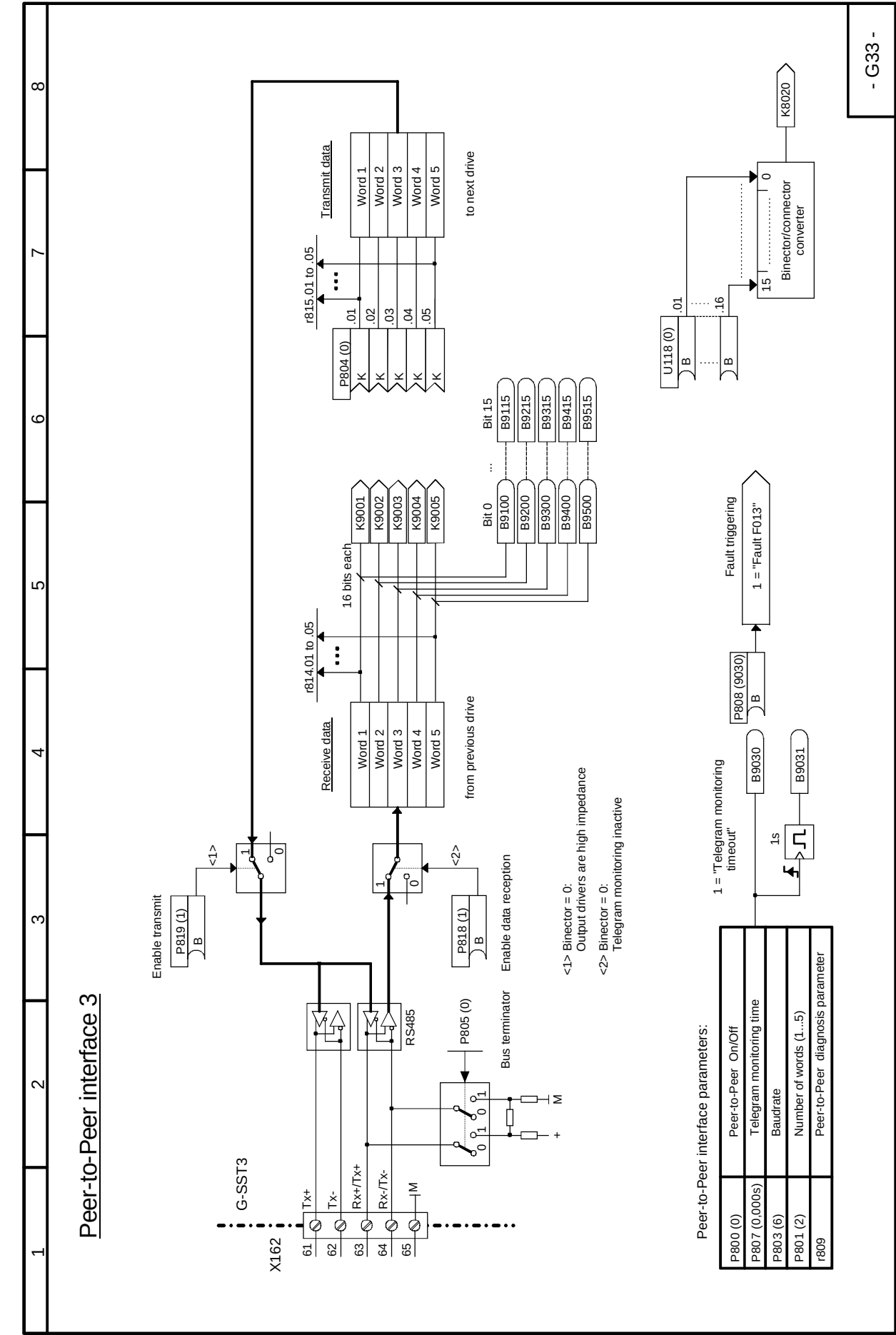
Sheet G31 USS interface 3

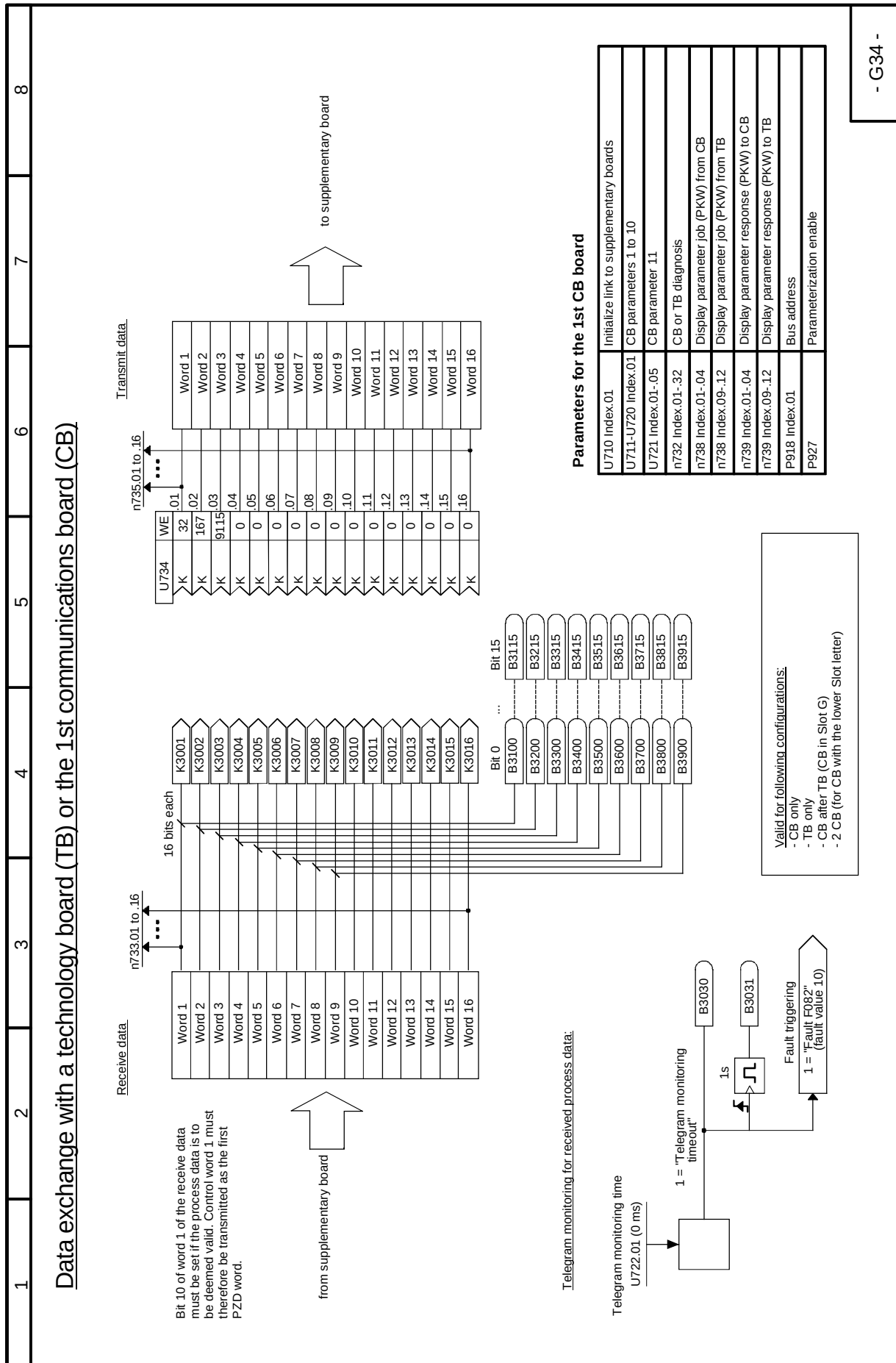


Sheet G32 Peer-to-Peer interface 2

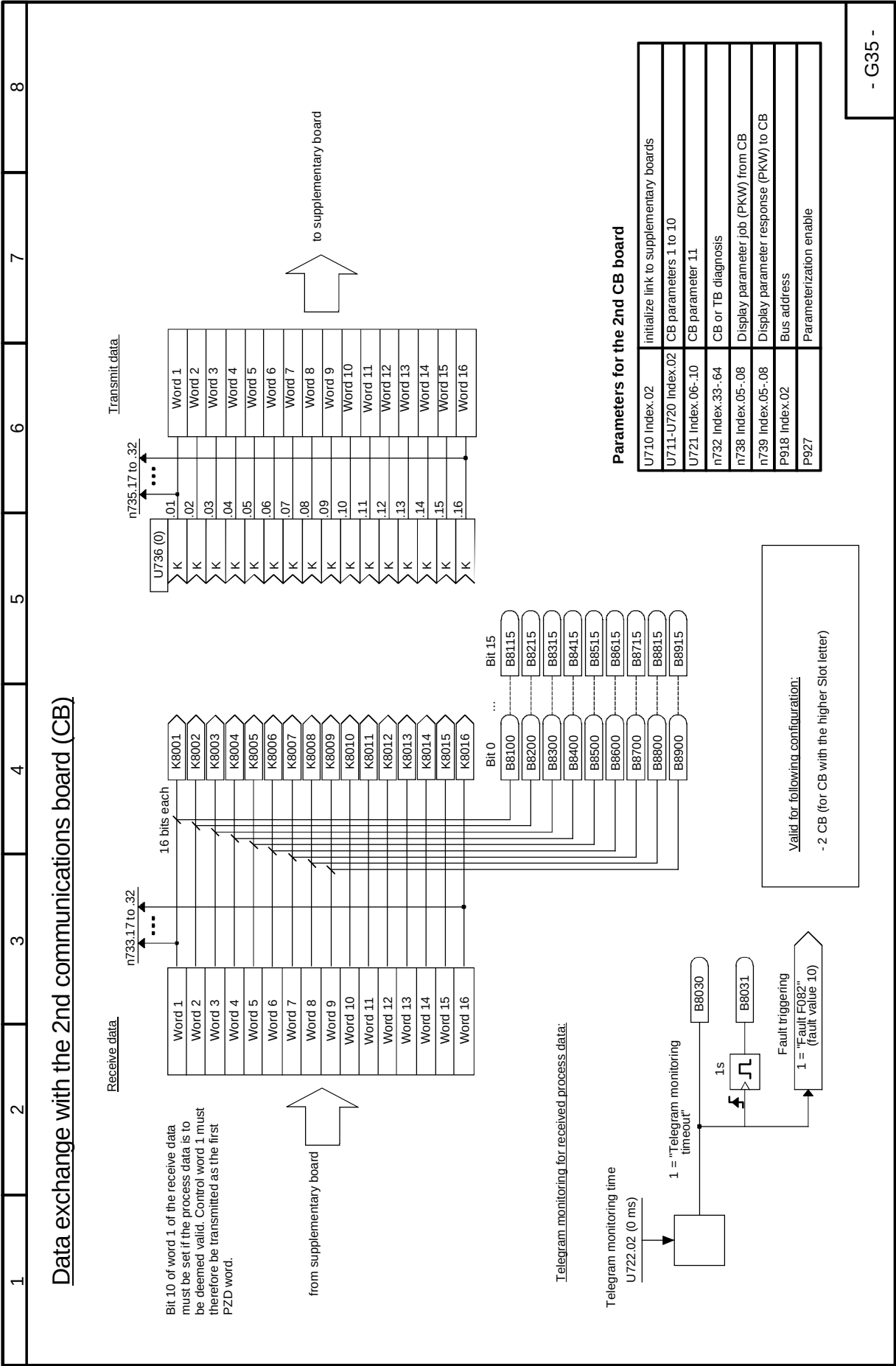


Sheet G33 Peer-to-Peer interface 3

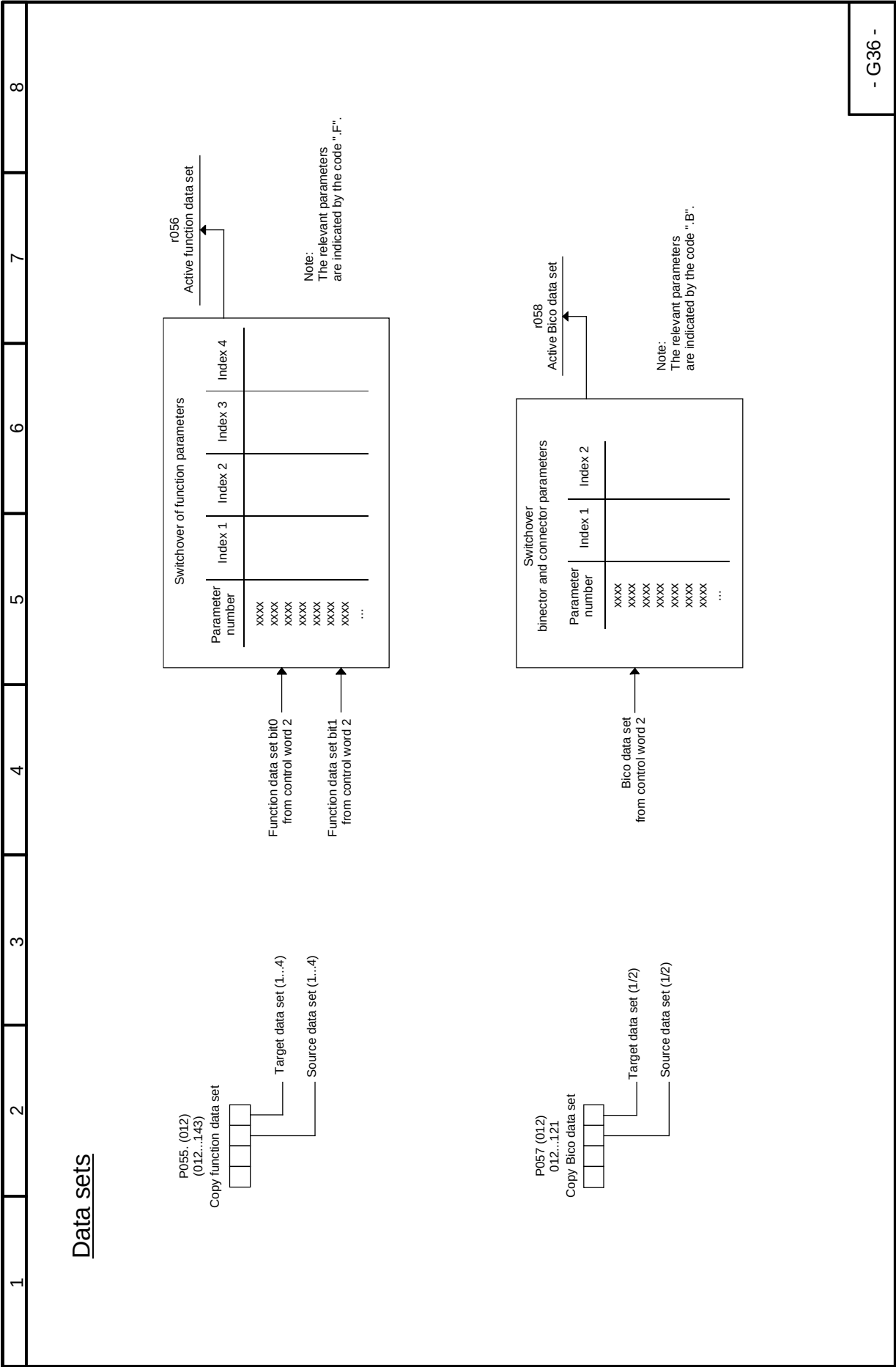


Sheet G34 Data exchange with a technology board or 1st communications board

Sheet G35 Data exchange with the 2nd communications board



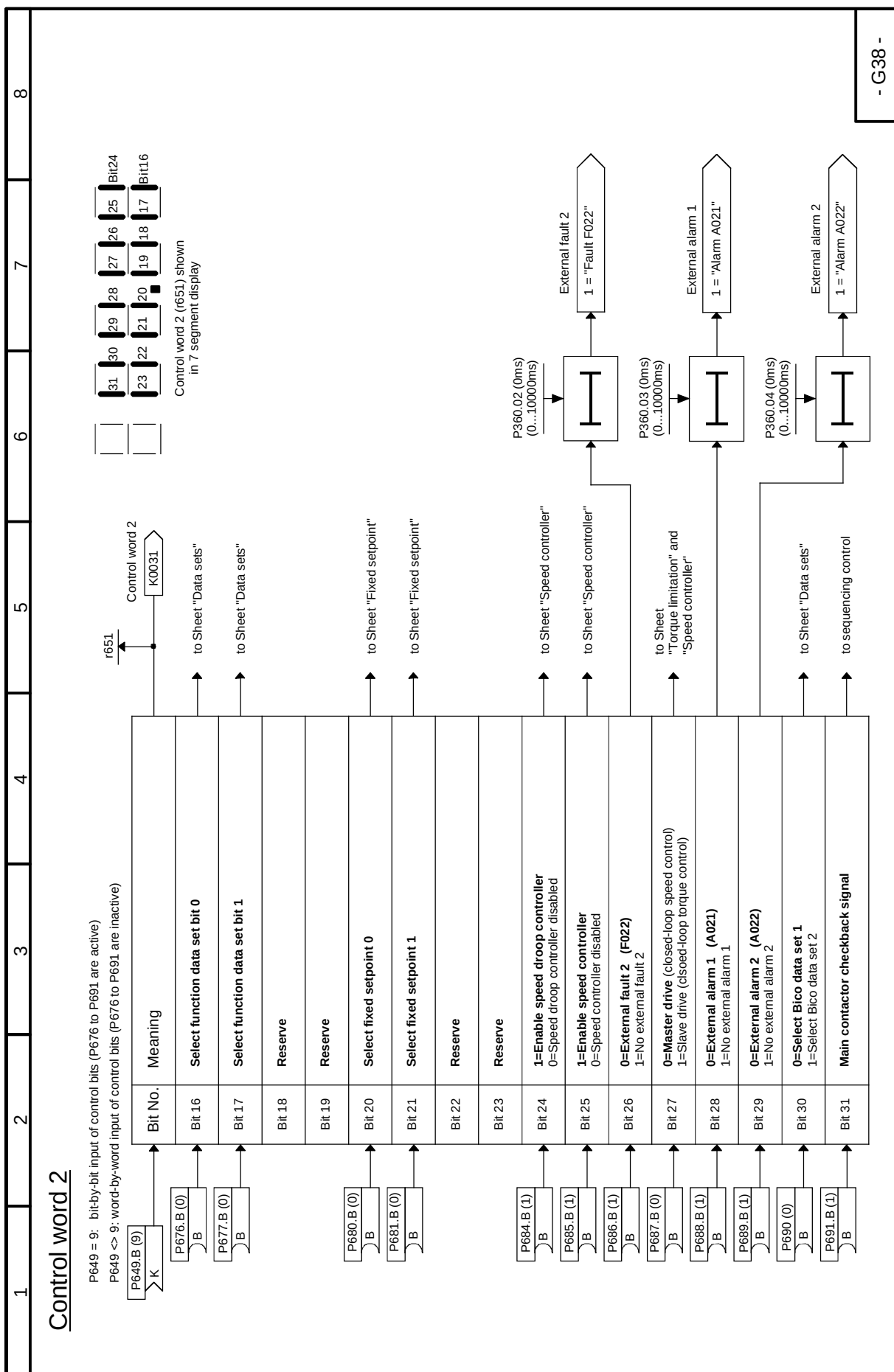
Sheet G36 Data sets



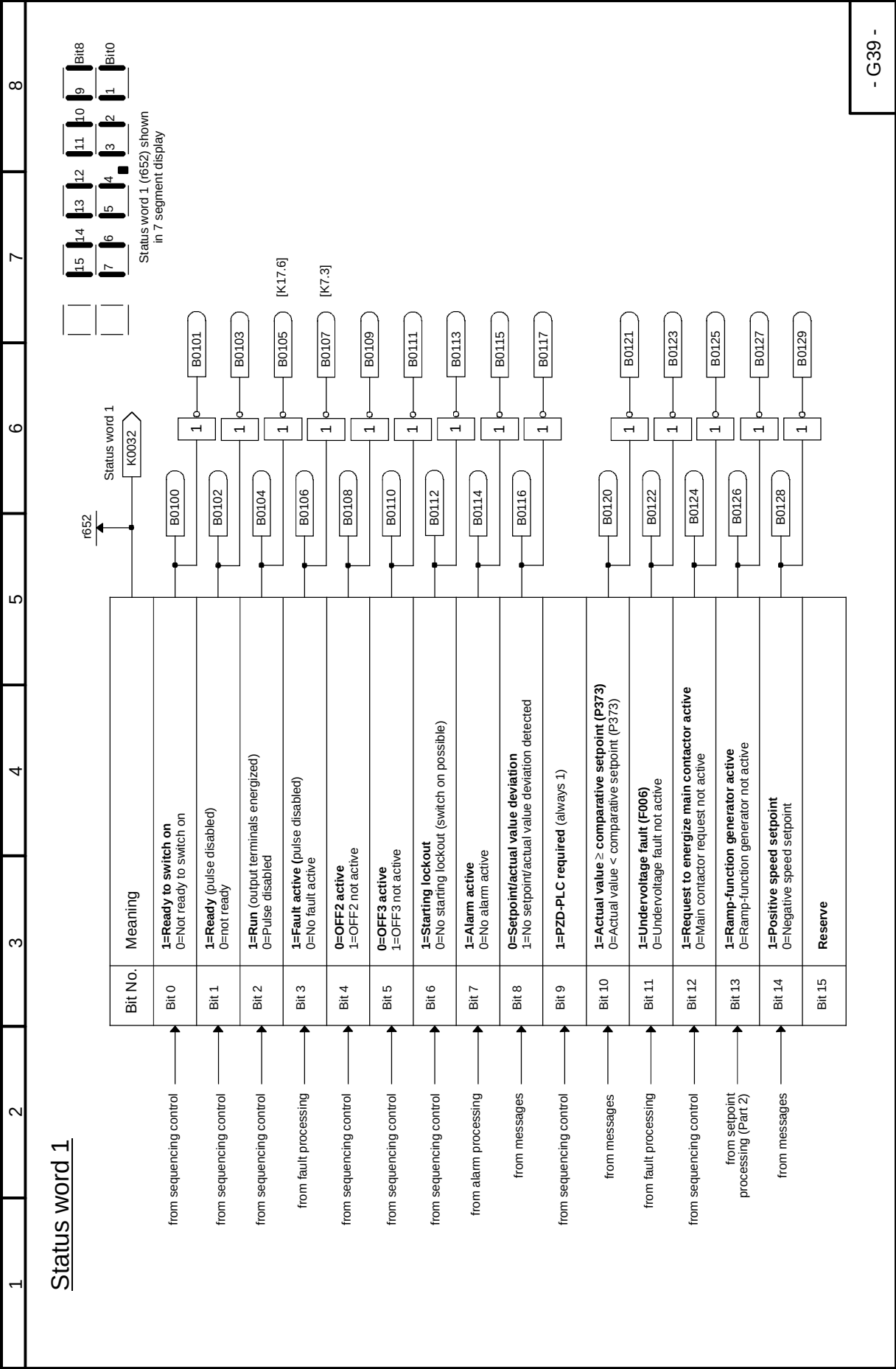
8-40



Sheet G38 Control word 2

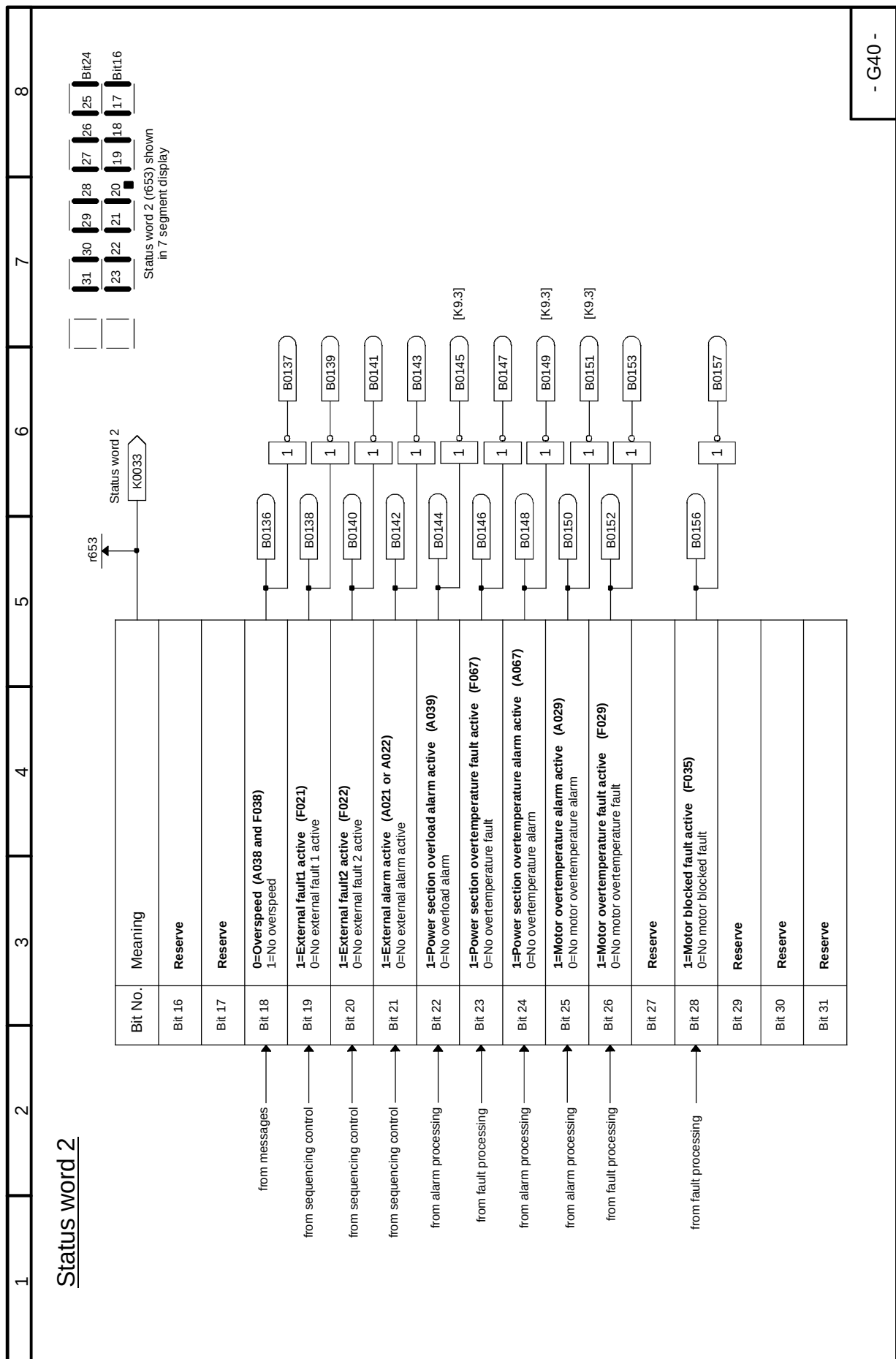


Sheet G39 Status word 1

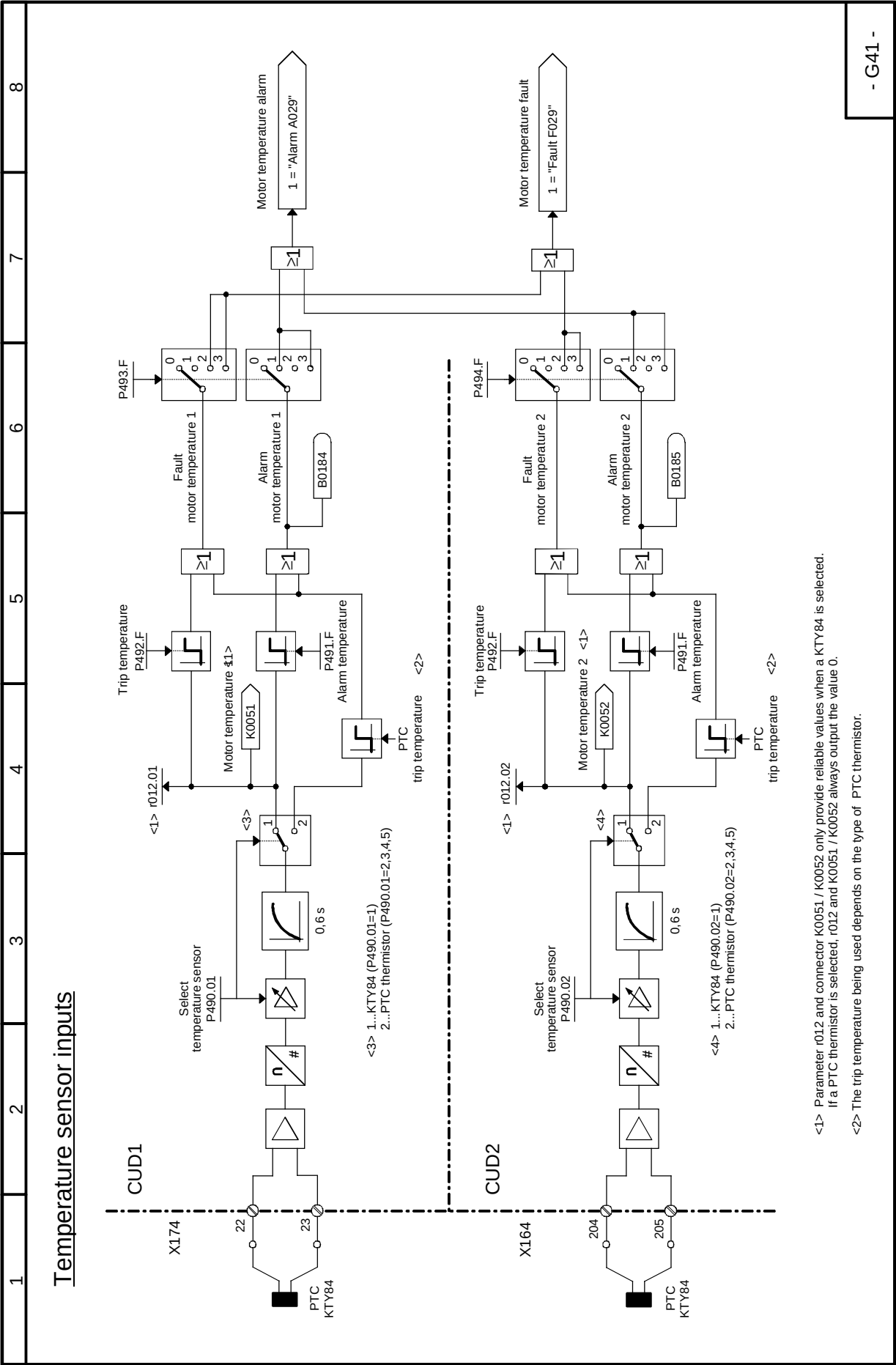


- G39 -

Sheet G40 Status word 2



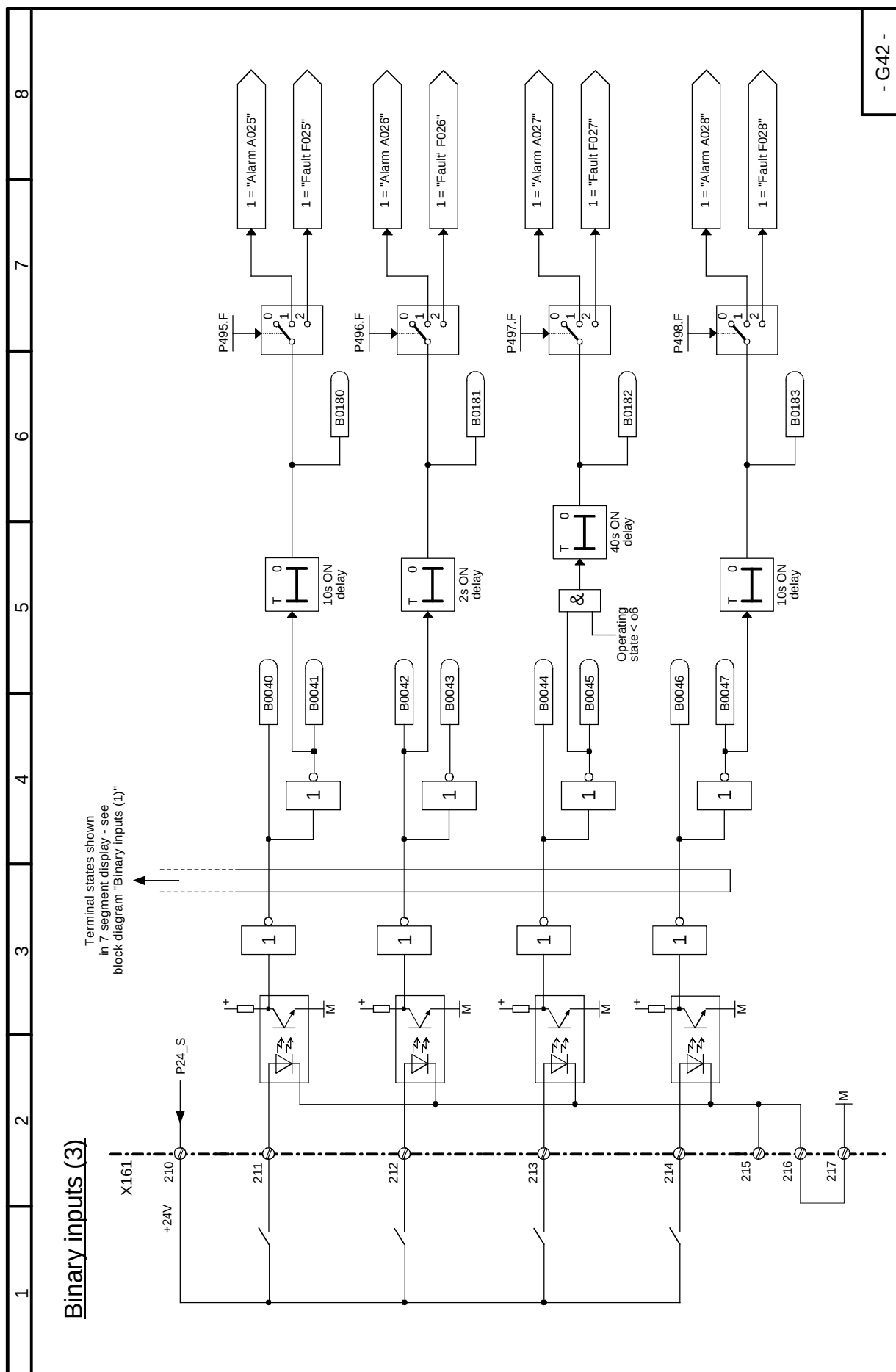
Sheet G41 Temperature sensor inputs



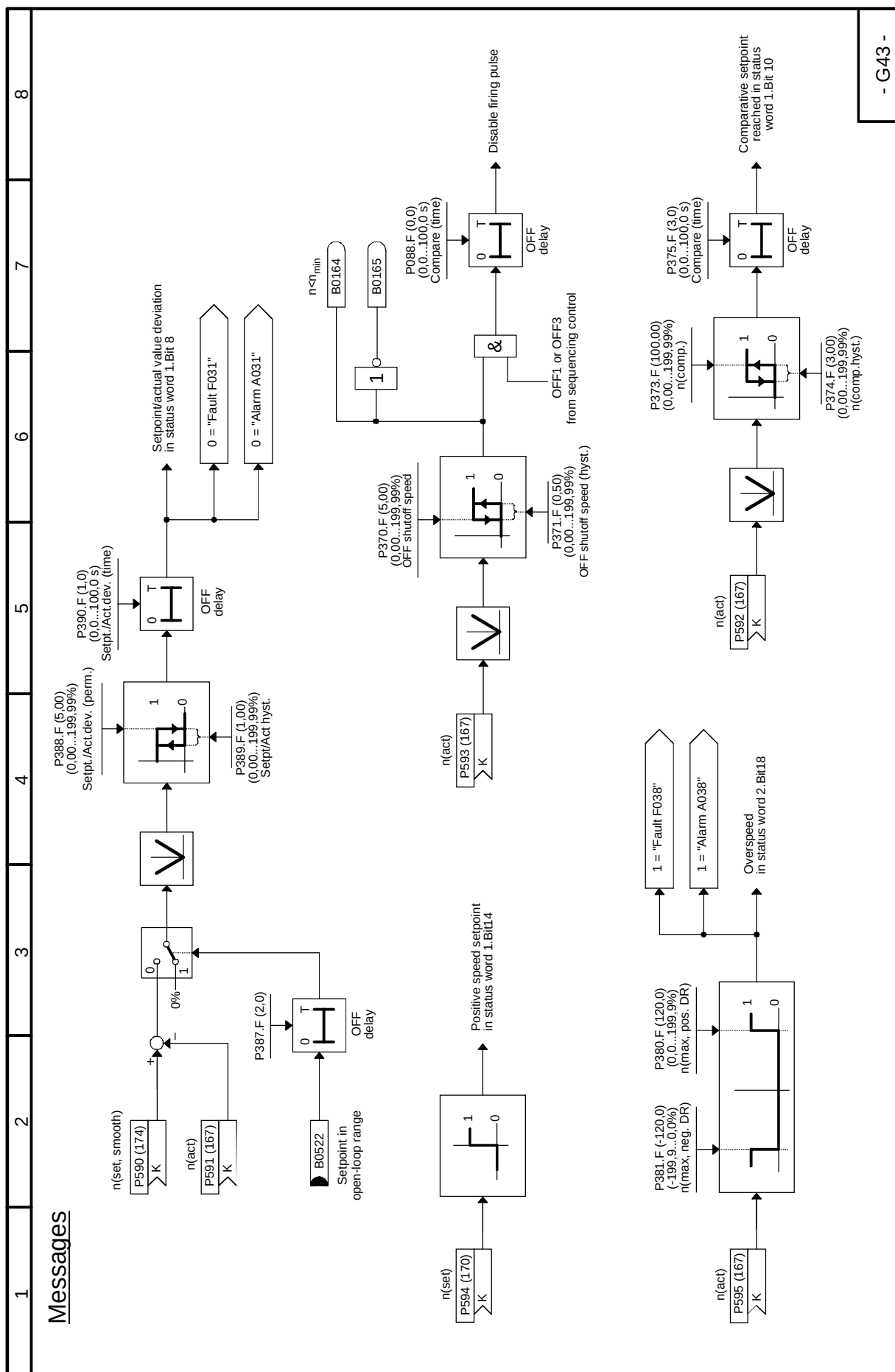
<1> Parameter r012 and connector K0051 / K0052 only provide reliable values when a KTY84 is selected.
If a PTC thermistor is selected, r012 and K0051 / K0052 always output the value 0.

<2> The trip temperature being used depends on the type of PTC thermistor.

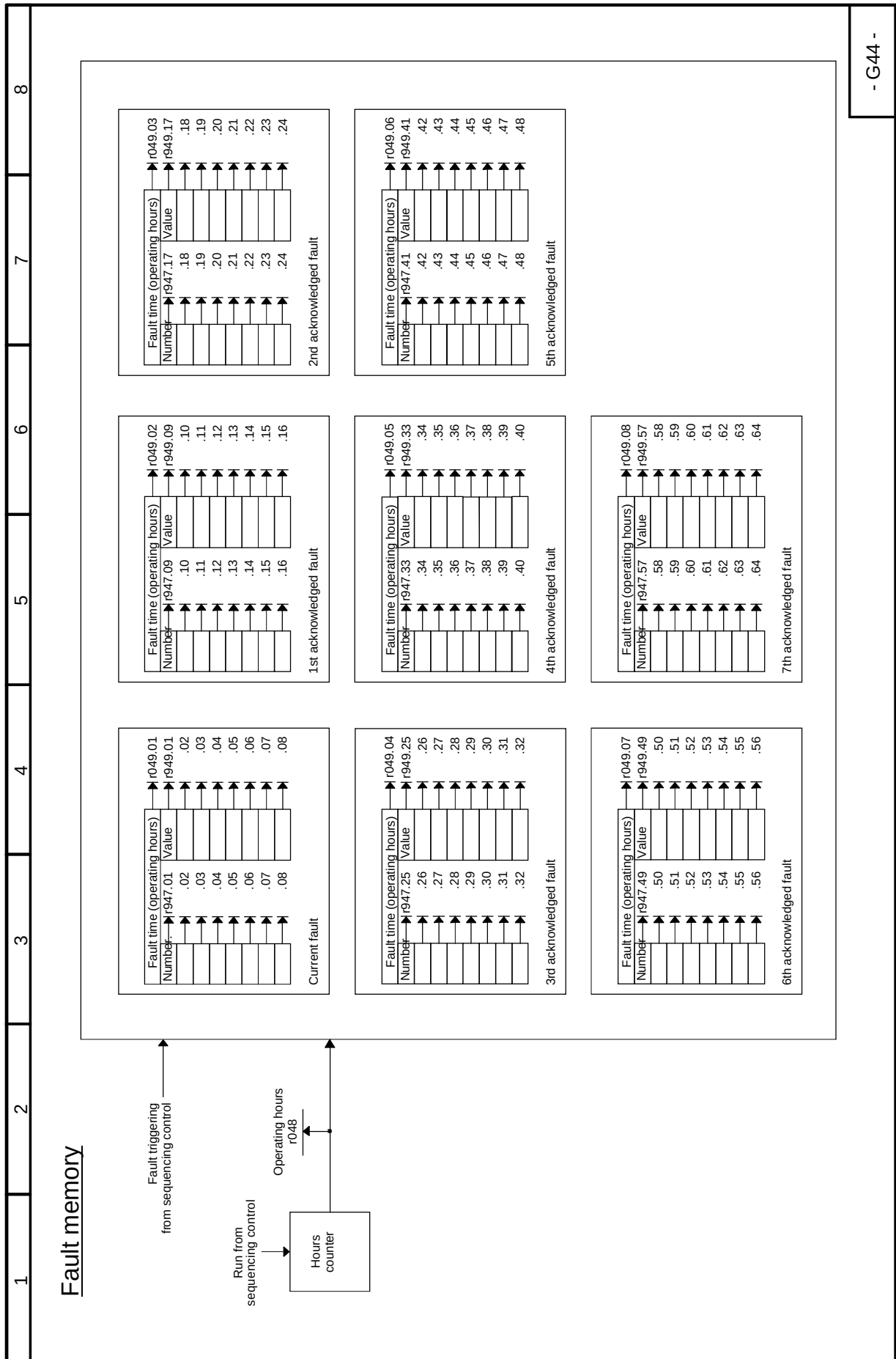
Sheet G42 Binary inputs, terminals 211 to 214



Sheet G43 Messages

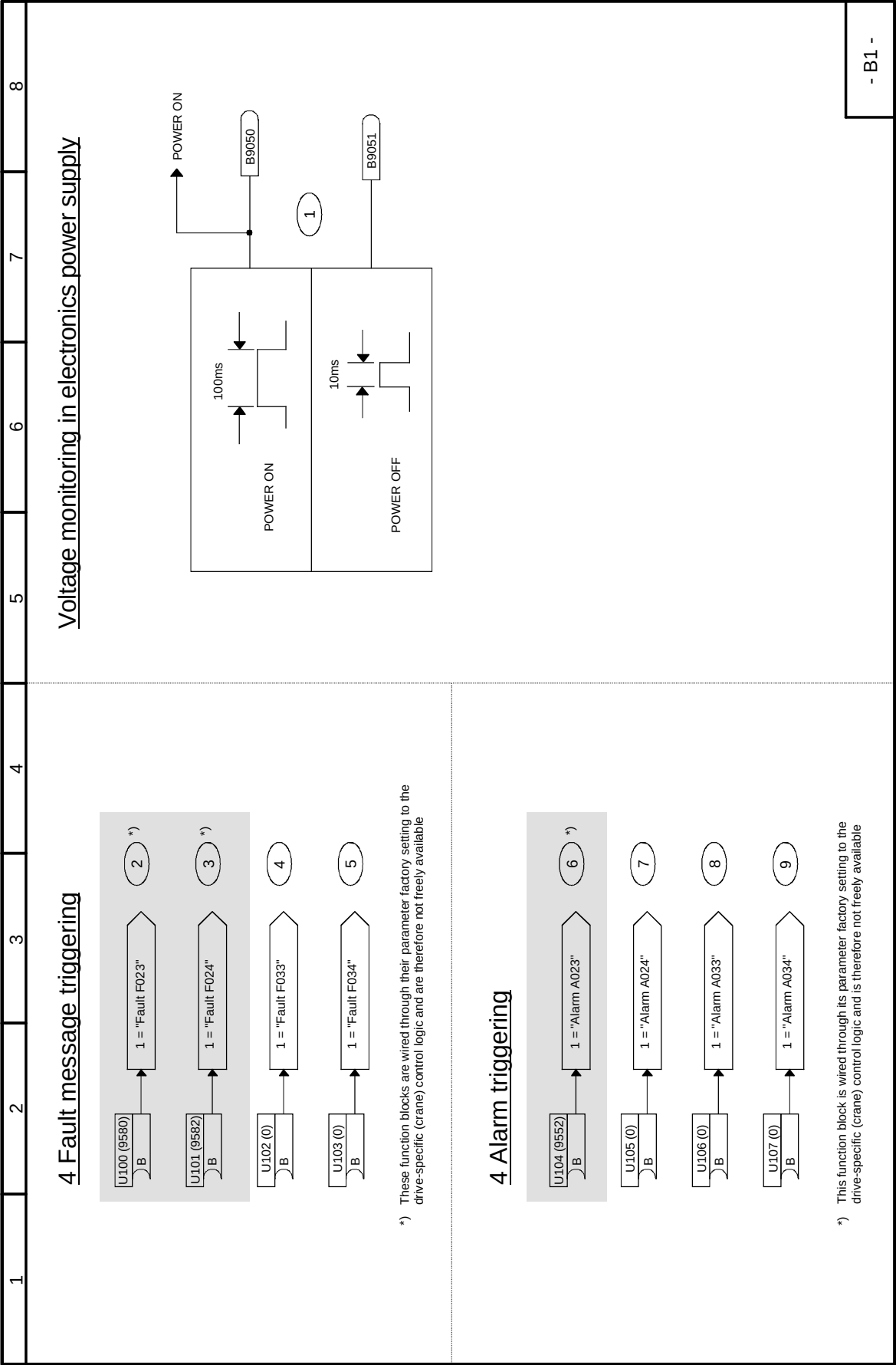


Sheet G44 Fault memory

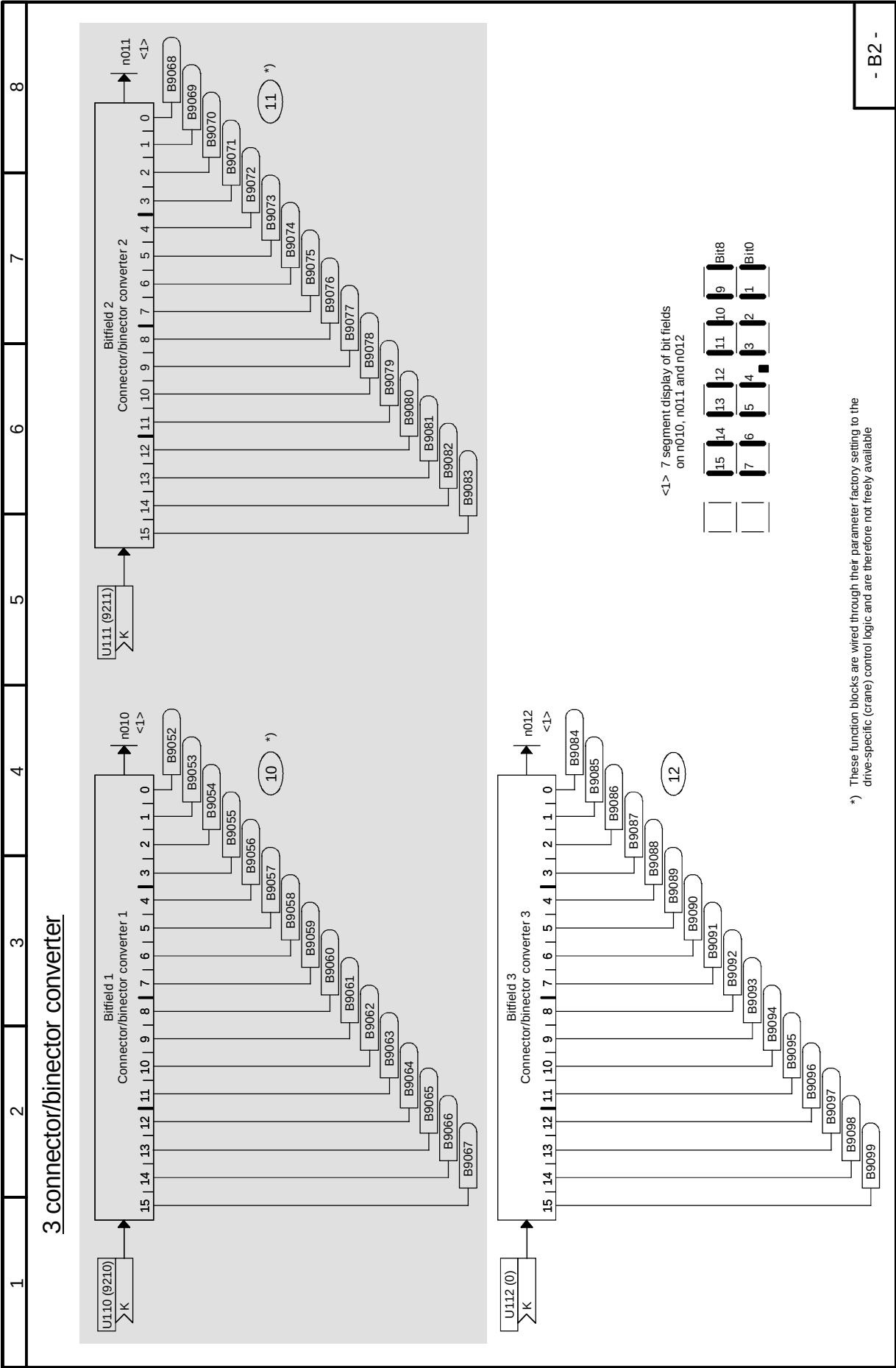


Freely assignable function blocks Sheets B1 to B24

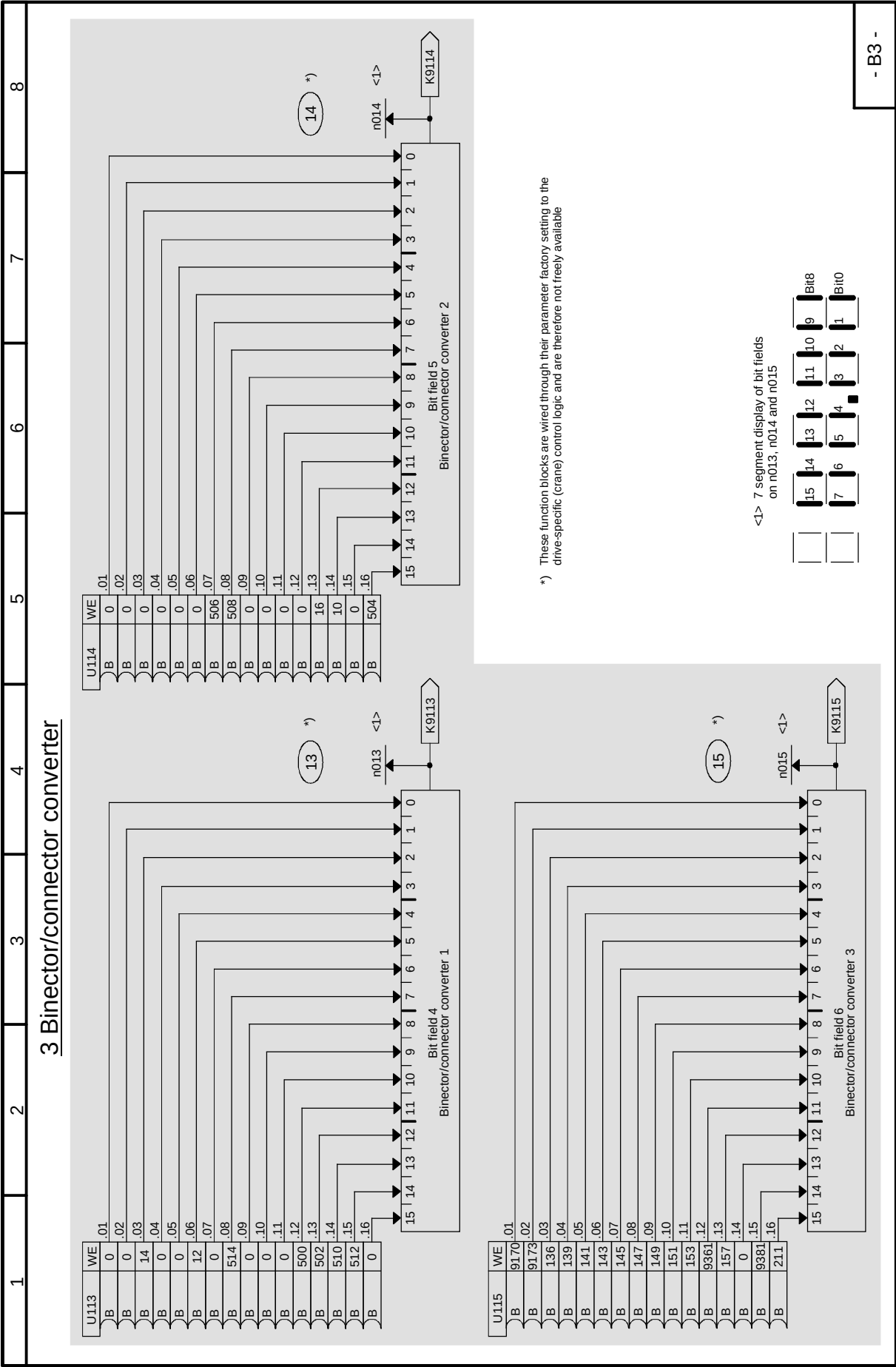
Sheet B1 Voltage monitor, electronics power supply, fault and alarm message triggers

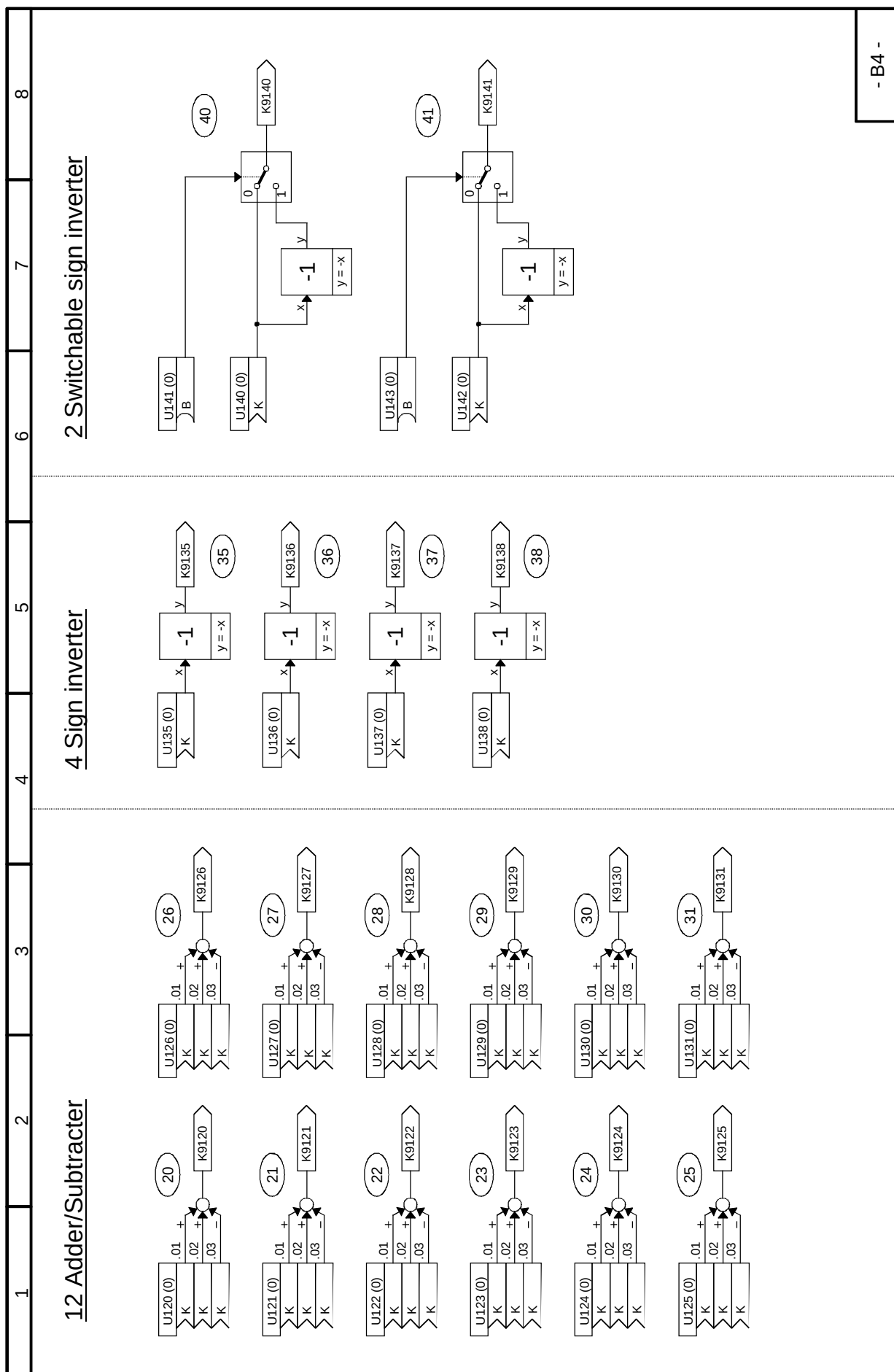


Sheet B2 Connector/binector converters



Sheet B3 Binector/connector converters



Sheet B4 Adders/subtractors, sign inverters, switchable sign inverters


- B4 -

Sheet B5

Dividers, multipliers, high-resolution multipliers/dividers

1

2

3

4

5

6

7

8

3 Divider

U145 (1)

.01 x1

.02 x2

>K

>K

÷

x1 ÷ 100% x2

y

K9145

45

U146 (1)

.01 x1

.02 x2

>K

>K

÷

x1 ÷ 100% x2

y

K9146

46

U147 (1)

.01 x1

.02 x2

>K

>K

÷

x1 ÷ 100% x2

y

K9147

47

Dividing by 0 (x2 = 0):
if x1 > 0: y = +199.99%
if x1 = 0: y = 0.00%
if x1 < 0: y = -199.99%

4 Multiplier

U150

WE

9229

401

>K

>K

.01 x1

.02 x2

>K

401

×

x1 × x2

100%

y

K9150

50

U151 (0)

>K

>K

×

x1 × x2

100%

y

K9151

51

U152 (0)

>K

>K

×

x1 × x2

100%

y

K9152

52

U153 (0)

>K

>K

×

x1 × x2

100%

y

K9153

53

*) This function block is wired through its parameter factory setting to the drive-specific (crane) control logic and is therefore not freely available

3 High resolution multiplier/divider

U155 (1)

.01 x1

.02 x2

.02 x3

>K

>K

>K

×

x4 = x1 × x2

x4 (32Bit)

<1>

÷

y = x4 ÷ x3

y

K9155

55

U156 (1)

.01 x1

.02 x2

.02 x3

>K

>K

>K

×

x4 = x1 × x2

x4 (32Bit)

<1>

÷

y = x4 ÷ x3

y

K9156

56

U157 (1)

.01 x1

.02 x2

.02 x3

>K

>K

>K

×

x4 = x1 × x2

x4 (32Bit)

<1>

÷

y = x4 ÷ x3

y

K9157

57

Examples:

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

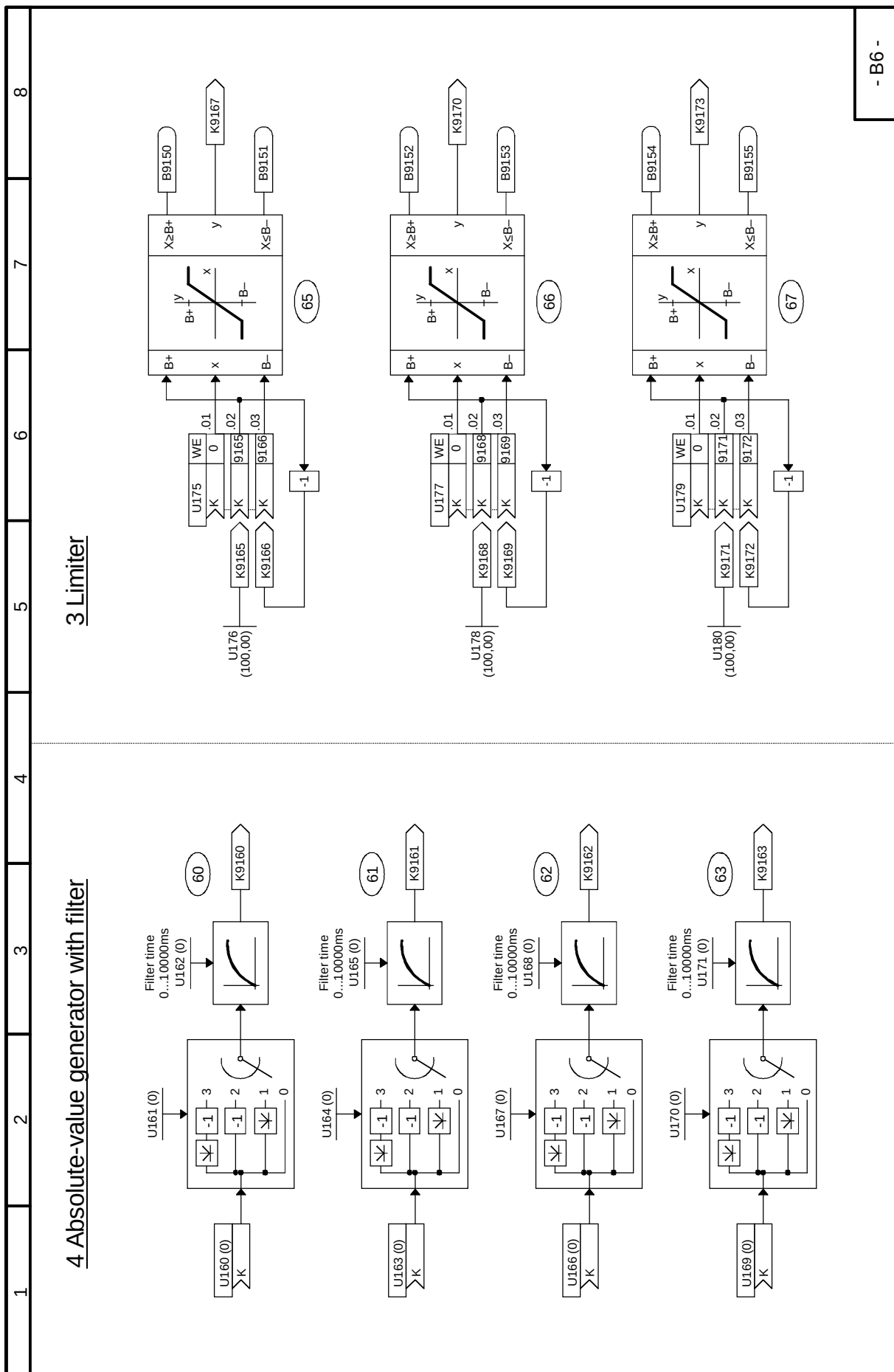
Dividing by 0 (x3 = 0):
if x4 > 0: y = +199.99%
if x4 = 0: y = 0.00%
if x4 < 0: y = -199.99%

<1> Range of values for x4 corresponds to -400%to. +400%

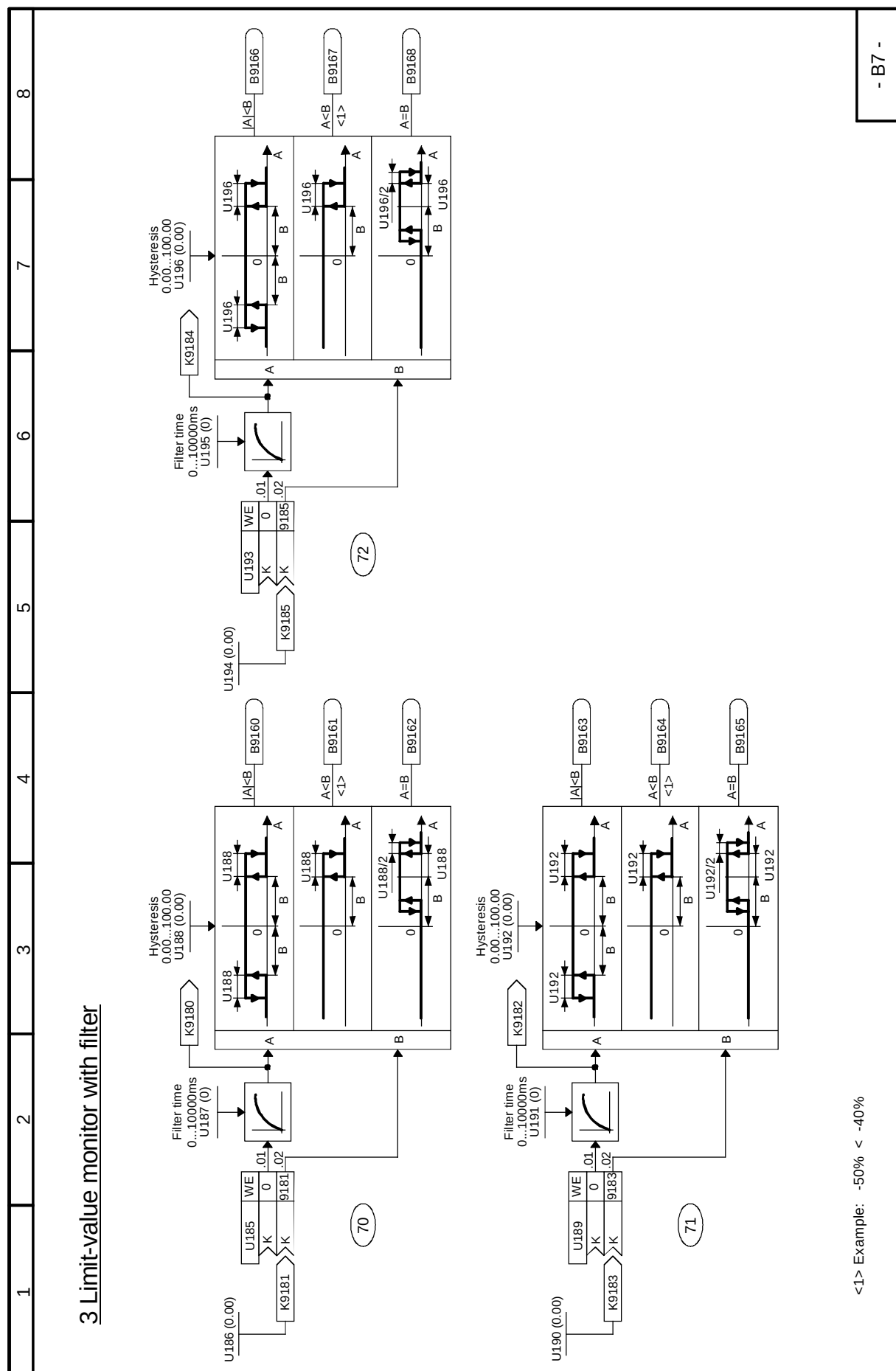
- B5 -

8-52

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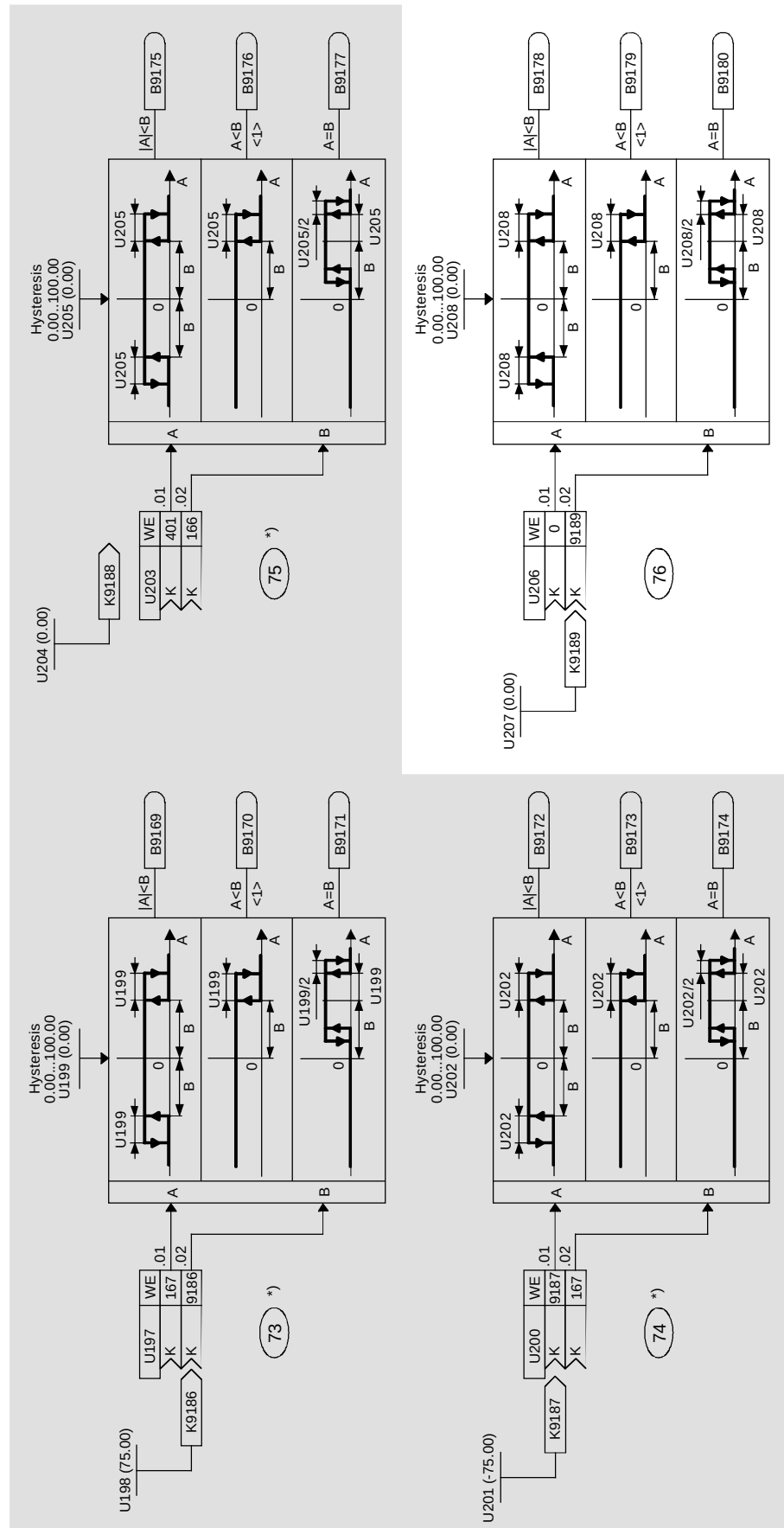
Sheet B6 Absolute-value generators with filter, limiters


SIEMENS AG 6SG7000-0BA76
SIMOTRAS HD Operating Instructions



Sheet B8 Limit-value monitor without filter

4 Limit-value monitor without filtering

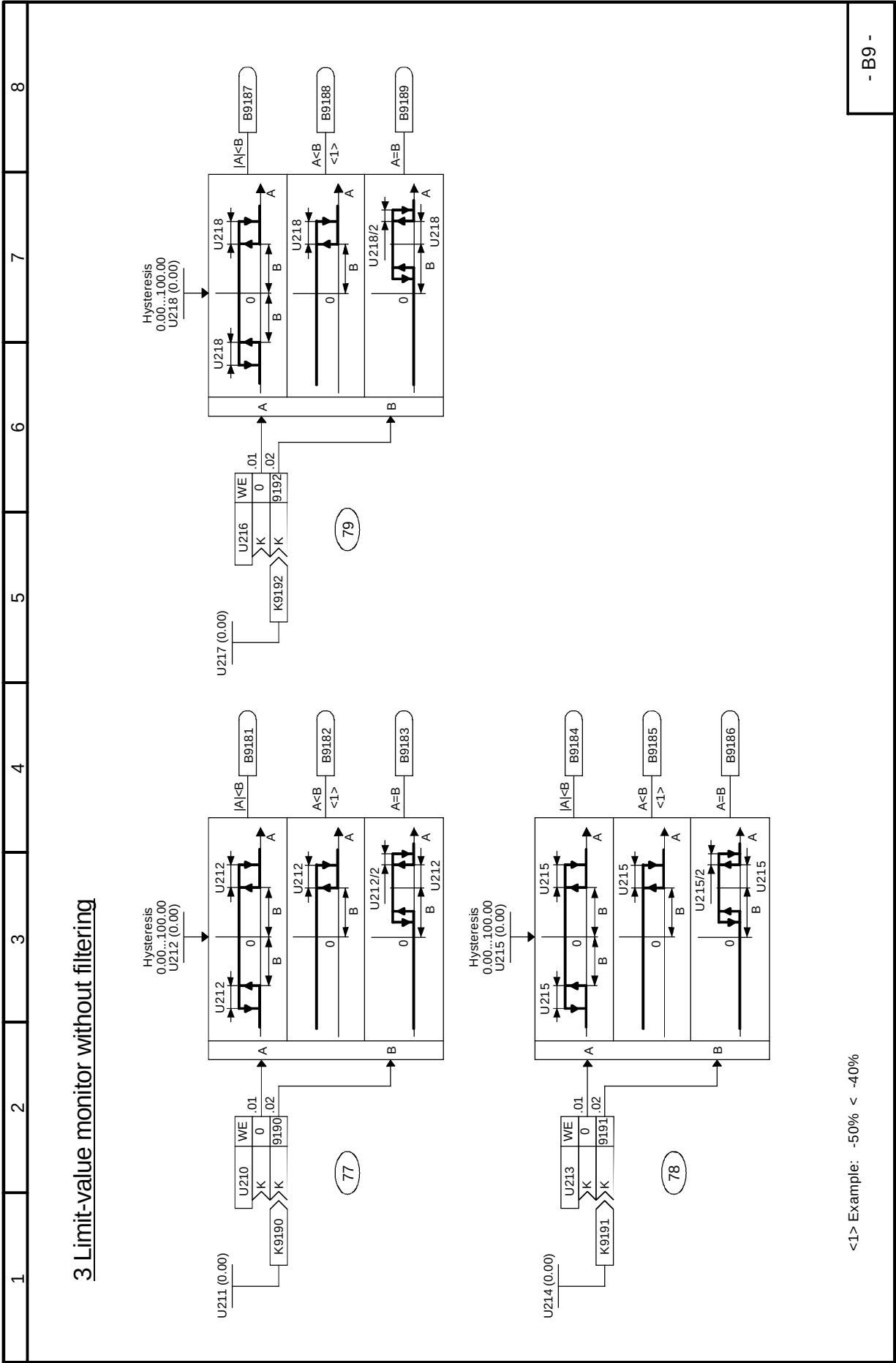


*) These function blocks are wired through their parameter factory setting to the drive-specific (crane) control logic and are therefore not freely available

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

- B8 -

Sheet B9 Limit-value monitor without filter



Sheet B10

Maximum selection, minimum selection, tracking/storage elements, analog signal memories

1	2	3	4	5	6	7	8		
Maximum selection U220 (0) .01 x1 .02 x2 .03 x3 MAX y K9193 80 y = Maximum of x1, x2, x3 (.g. -40% greater than -50%)			2 Tracking/storage elements U222 (0) .01 x .02 y .03 RESET (y=0) TRACK STORE Power On Mode U224 (0) 1 ⇒ y=x 1 ⇒ freeze y <1> U225 (0) K U226 (0) .01 B .02 B .03 B 82 U223 (0) .01 B .02 B .03 B 83 U224/U227=0: no "non-volatile" storage: zero appears at output when voltage recovers U224/U227=1: with "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.					2 Analog signal memory U229 (0) B U230 (0) K SET (y=x) RESET (y=0) POWER ON <2> U231 (0) B U230 (0) K 84 U228 (0) K U231 (0) B 85 U229 (0) B U230 (0) K 85 U228 (0) K U231 (0) B 84 U229 (0) B U230 (0) K 85	
Minimum selection U221 (0) .01 x1 .02 x2 .03 x3 MIN y K9194 81 y = Minimum of x1, x2, x3 (e.g. -50% less than -40%)			2 Analog signal memory U229 (0) B U230 (0) K SET (y=x) RESET (y=0) POWER ON <2> U231 (0) B U230 (0) K 84 U228 (0) K U231 (0) B 85 U229 (0) B U230 (0) K 85 U228 (0) K U231 (0) B 84 U229 (0) B U230 (0) K 85						

- B10 -

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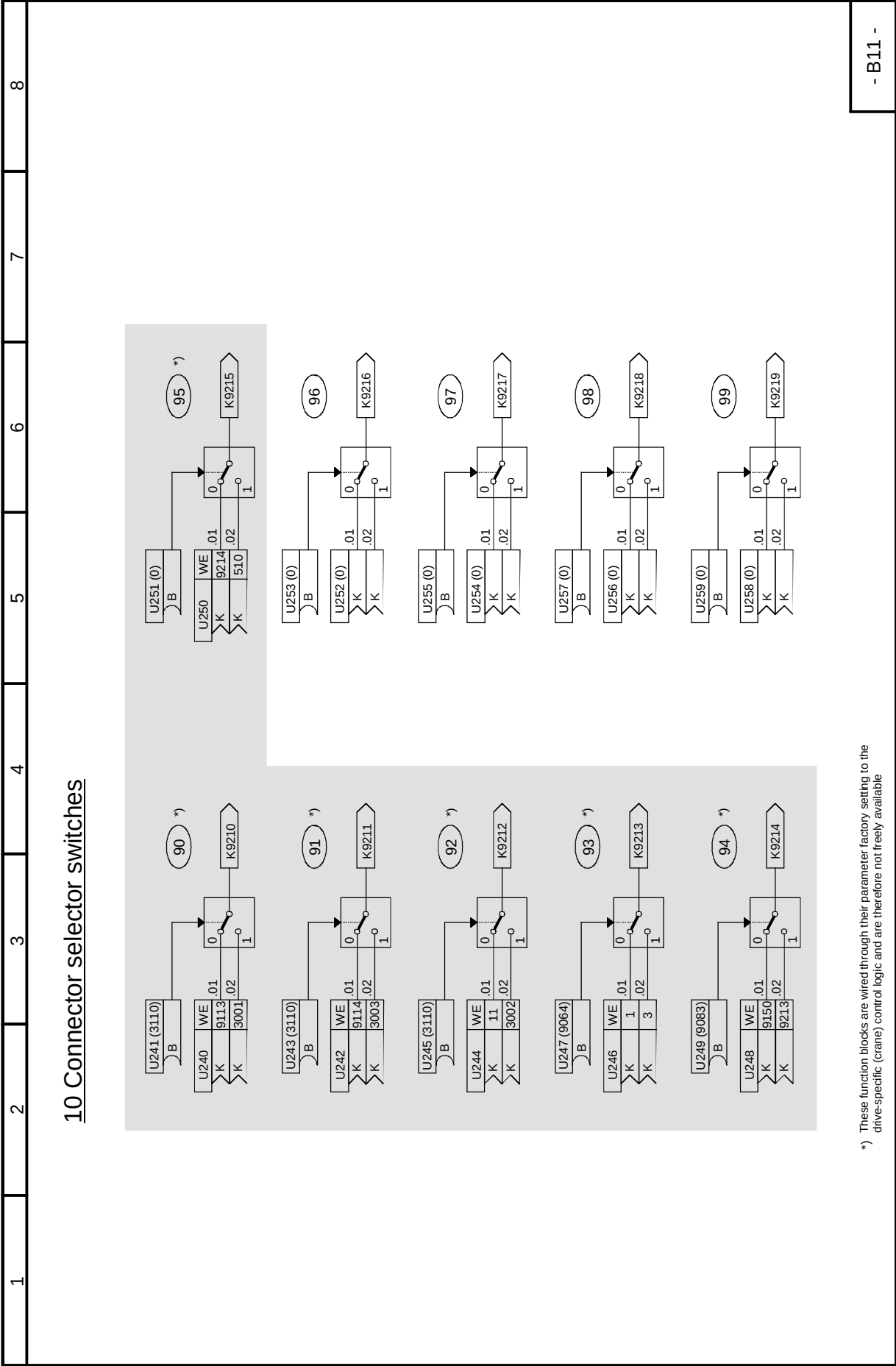
84

U229 (0)

B

U230 (0

Sheet B11 Analog signal selector switch



U251 (0)

B

U250

WE

9214

K

510

WE

.01

9214

K

510

0

1

95

*

K9215

U253 (0)

B

U252 (0)

K

K

WE

.01

9214

K

510

0

1

96

K9216

U255 (0)

B

U254 (0)

K

K

WE

.01

9214

K

510

0

1

97

K9217

U257 (0)

B

U256 (0)

K

K

WE

.01

9214

K

510

0

1

98

K9218

U259 (0)

B

U258 (0)

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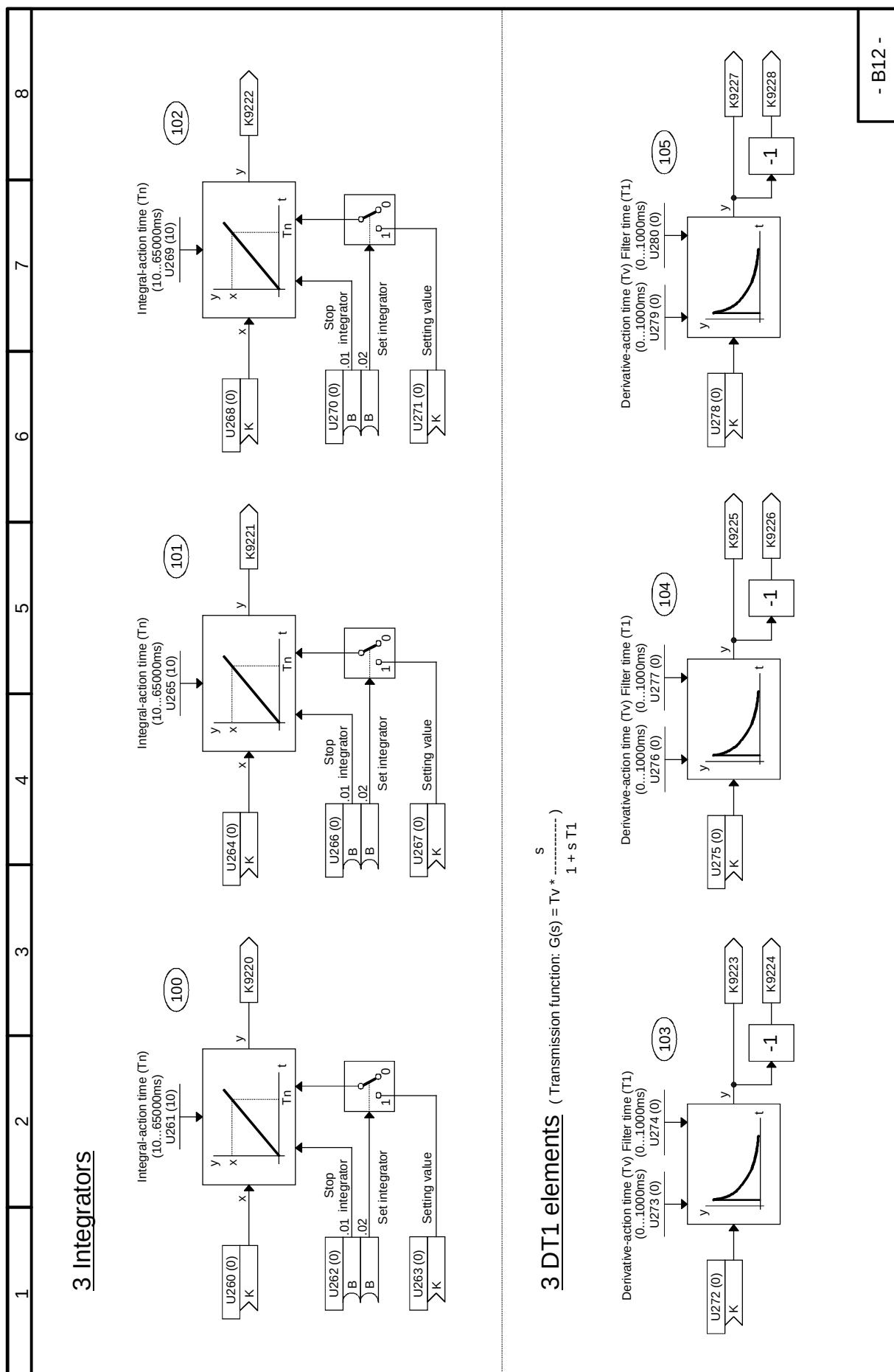
99

K9219

*) These function blocks are wired through their parameter factory setting to the drive-specific (crane) control logic and are therefore not freely available

- B11 -

Sheet B12 Integrators, DT1 elements

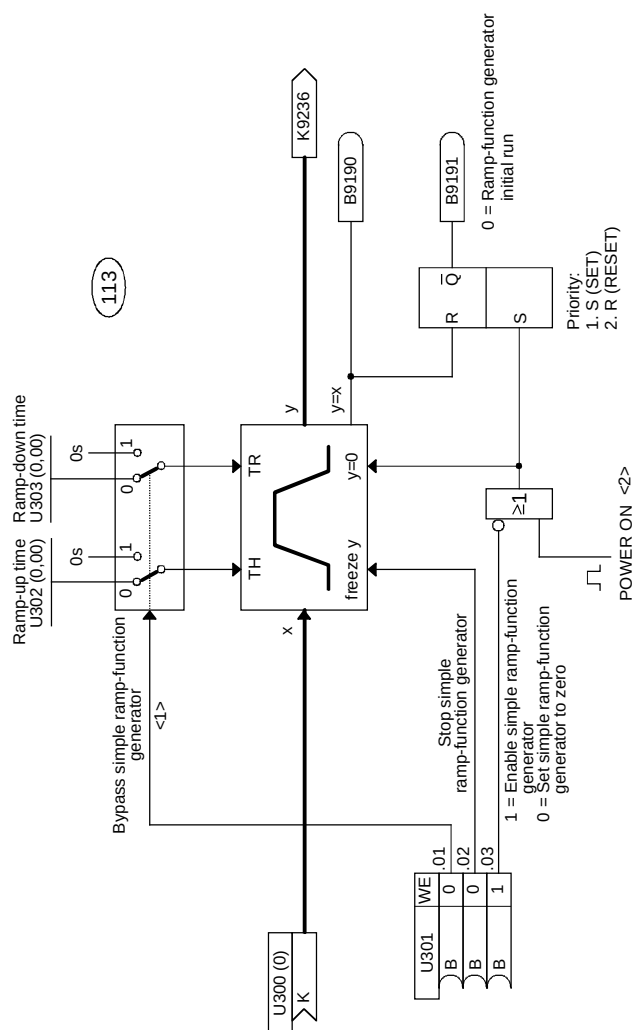


Sheet B13 Characteristic blocks, dead zones, setpoint branching

1	2	3	4	5	6	7	8
106 *) Y values U283.01 to .10 (0) U281 (9212) >K U282.01 to .10 (0) X values K9229 107 Y values U286.01 to .10 (0) U284 (0) >K U285.01 to .10 (0) X values K9230 108 Y values U289.01 to .10 (0) U287 (0) >K U288.01 to .10 (0) X values K9231 109 Dead zone z U291 (0.00) U290 (0) >K K9232 110 Dead zone z U293 (0.00) U292 (0) >K K9233 111 Dead zone z U295 (0.00) U294 (0) >K K9234 112 Minimum Speed U297(0.00) Maximum Speed U298(100.00) U296 (0) >K U298 U297 -100% 100% -U297 -U298 U299 U299 (0.00) Hysteresis K9235 3 Characteristic block 3 Dead zones Setpoint branching - B13 - 8-60 SIEMENS AG 6SG7000-0BA76 SIMOTRAS HD Operating Instructions							

Sheet B14 Simple ramp-function generator

Simple ramp-function generator



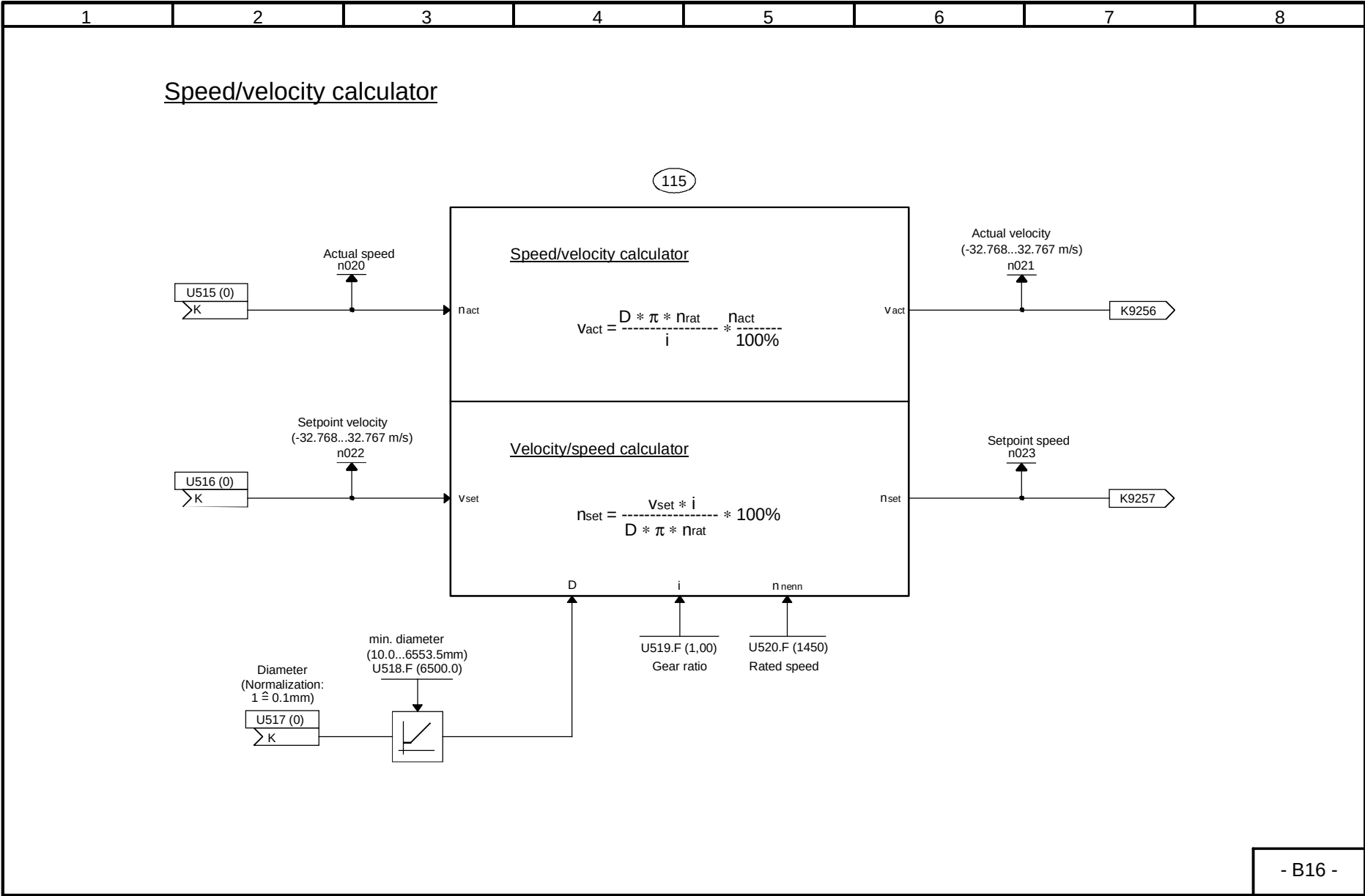
<1> if U301.01 = 9191, the ramp-function generator operates just once after being enabled (edge from log. "0" to "1")

<2> from voltage monitoring of electronics power supply

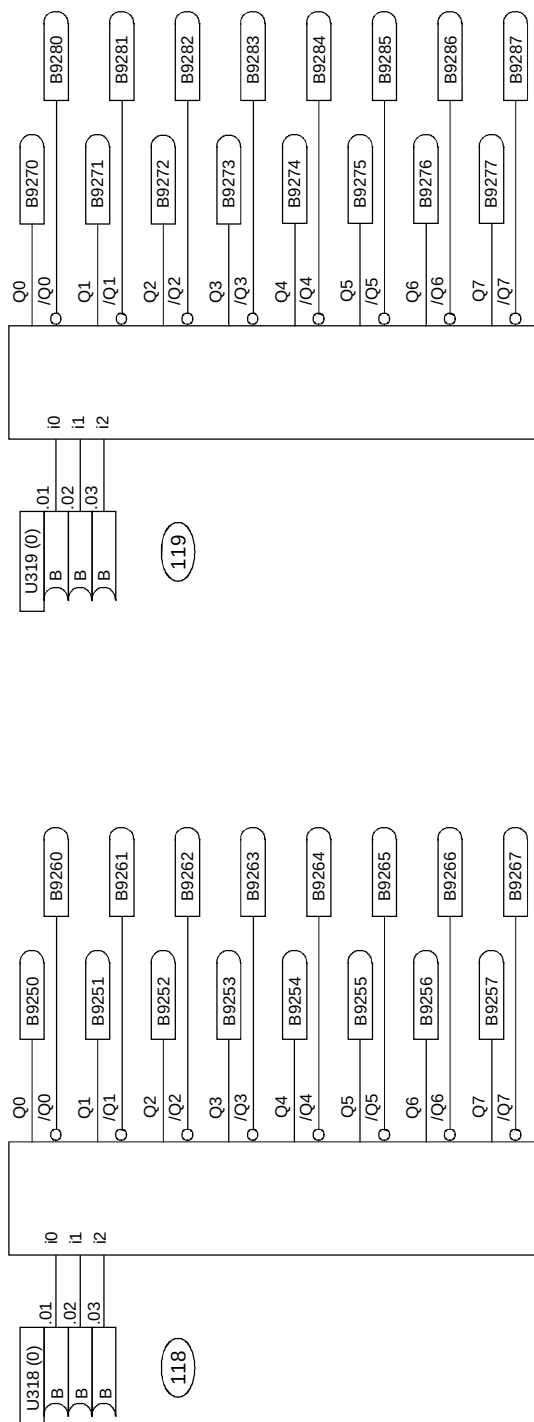
-B14-

8-62





8-64



	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q0/Q1	Q2/Q3	Q3/Q4	Q5/Q6	Q6/Q7
000	1	0	0	0	0	0	0	0	0	1	1	1	1
001	0	1	0	0	0	0	0	0	1	0	1	1	1
010	0	0	1	0	0	0	0	0	1	1	0	1	1
011	0	0	0	1	0	0	0	0	1	1	0	1	1
100	0	0	0	0	1	0	0	0	1	1	0	1	1
101	0	0	0	0	0	1	0	0	1	1	1	0	1
110	0	0	0	0	0	0	1	0	1	1	1	1	0
111	0	0	0	0	0	0	0	1	1	1	1	1	0

Sheet B18 AND elements

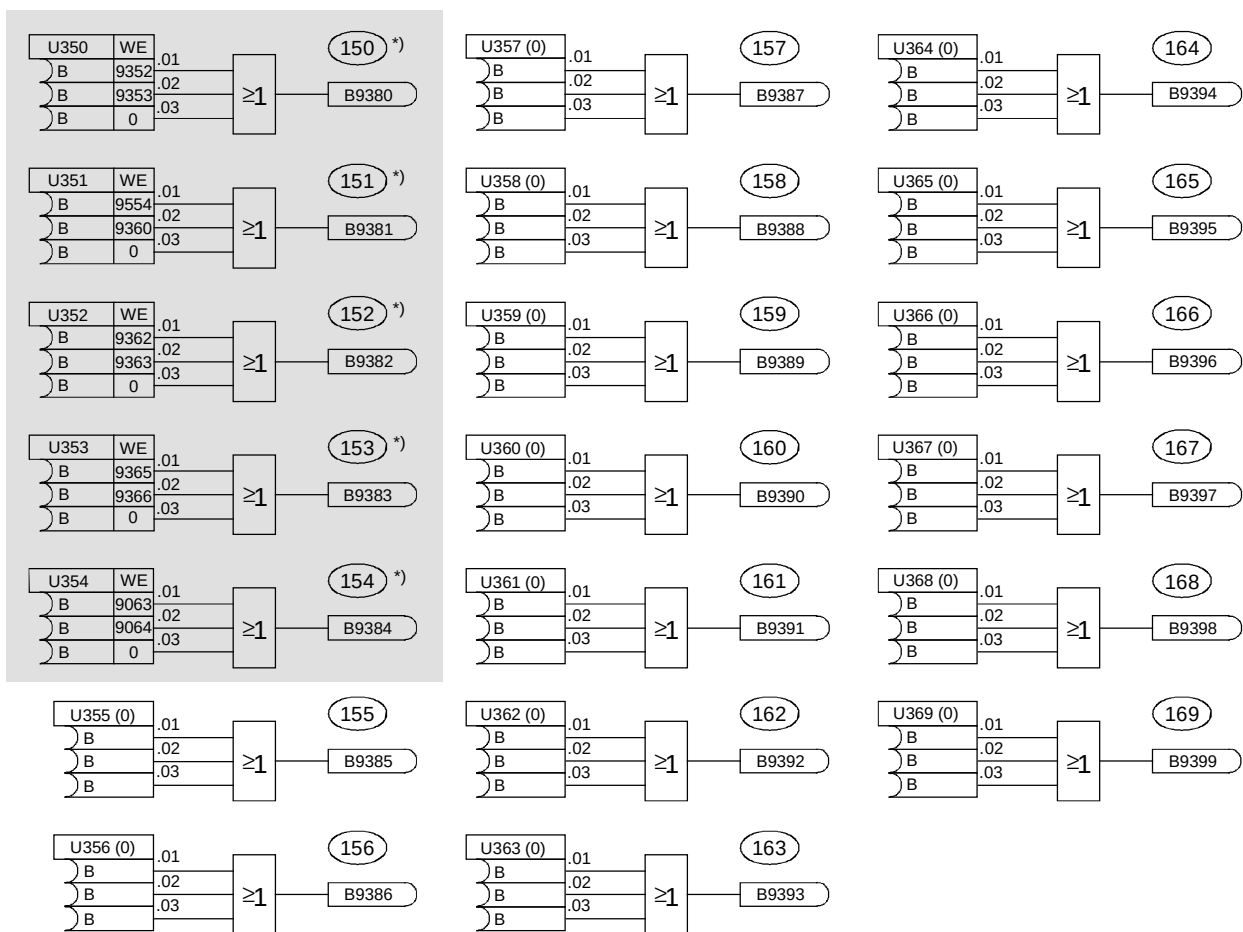
1	2	3	4	5	6	7	8
28 AND elements, each with 3 inputs							

*) These function blocks are wired through their parameter factory setting to the drive-specific (crane) control logic and are therefore not freely available

- B18 -

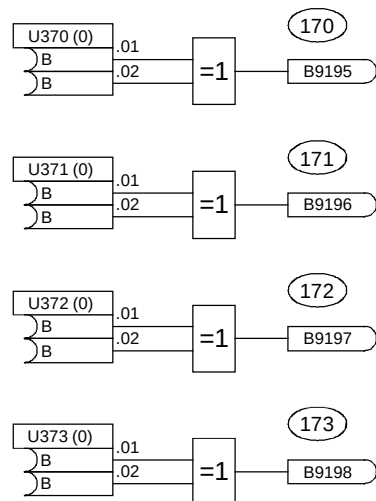
Sheet B19 OR elements, EXCLUSIVE OR elements

20 OR elements, each with 3 inputs



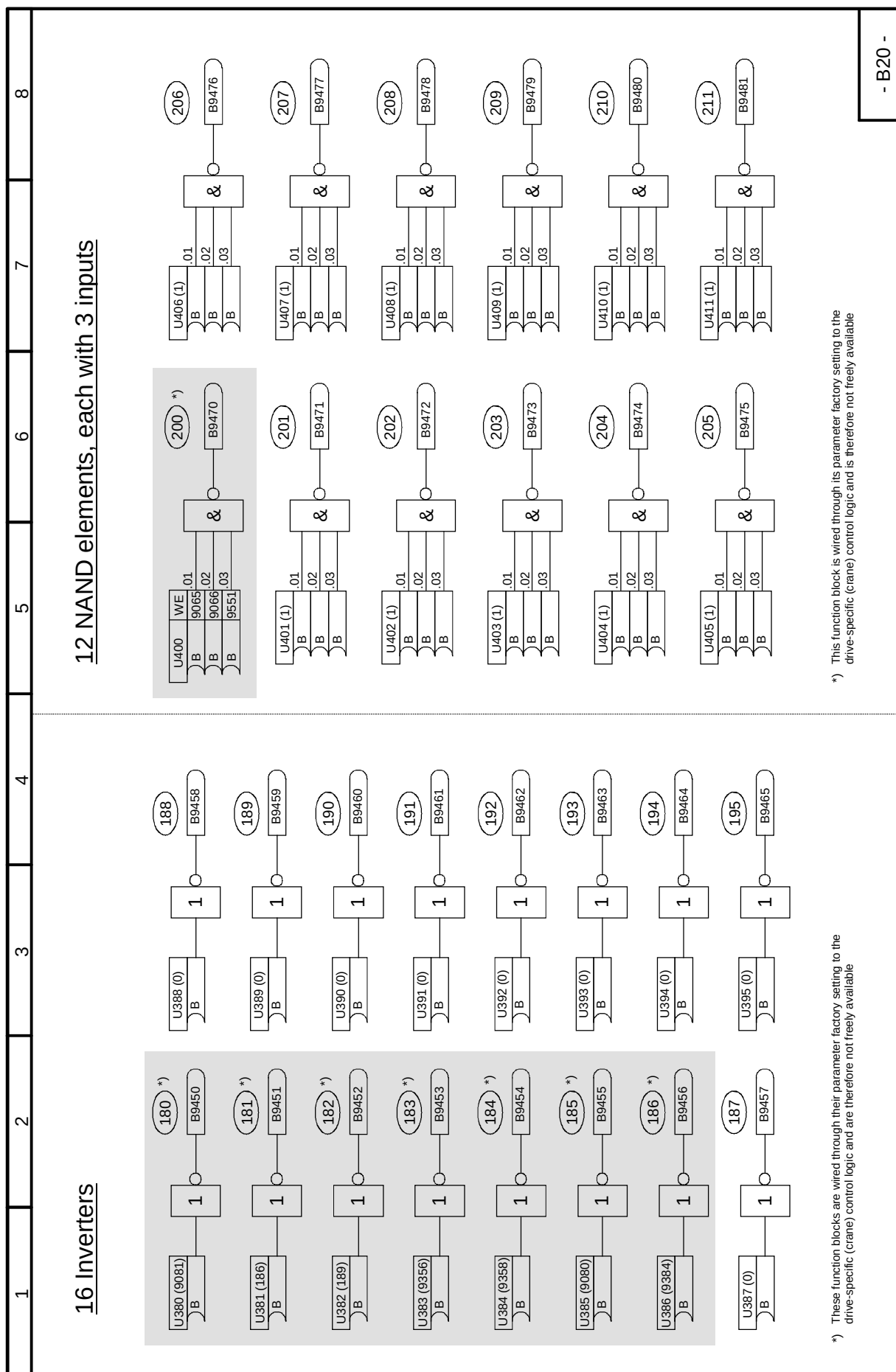
*) These function blocks are wired through their parameter factory setting to the drive-specific (crane) control logic and are therefore not freely available

4 EXCLUSIVE OR elements, each with 2 inputs



- B19 -

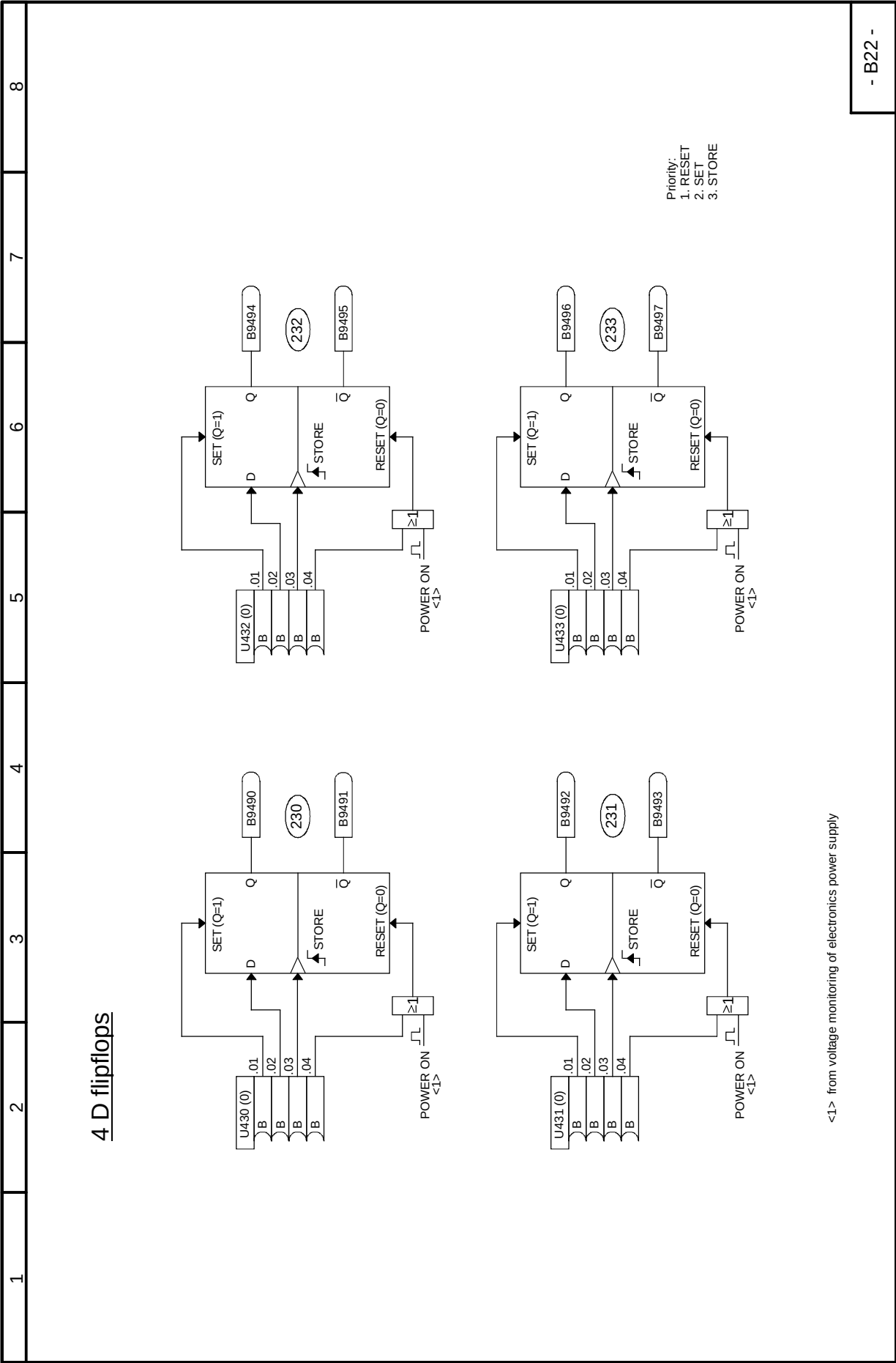
Sheet B20 Inverters, NAND elements



8-68



Sheet B22 D flipflops



Sheet B23 Timers (0.000 to 60.000s)

1	2	3	4	5	6	7	8

6 Timers

U441 (10.500)
(0.000...60.000s)

U442 (0)

Mode

T

ON delay

OFF delay

ON/OFF delay

Pulse generator

3

2

1

0

U440 (9364)
B

240 *)

B9580

B9581

1

U447 (0.000)
(0.000...60.000s)

U448 (0)

Mode

T

ON delay

OFF delay

ON/OFF delay

Pulse generator

3

2

1

0

U446 (0)
B

242

B9584

B9585

1

U453 (0.000)
(0.000...60.000s)

U454 (0)

Mode

T

ON delay

OFF delay

ON/OFF delay

Pulse generator

3

2

1

0

U452 (0)
B

244

B9588

B9589

1

U444 (0.500)
(0.000...60.000s)

U445 (0)

Mode

T

ON delay

OFF delay

ON/OFF delay

Pulse generator

3

2

1

0

U443 (9383)
B

241 *)

B9582

B9583

1

U456 (0.000)
(0.000...60.000s)

U457 (0)

Mode

T

ON delay

OFF delay

ON/OFF delay

Pulse generator

3

2

1

0

U455 (0)
B

245

B9590

B9591

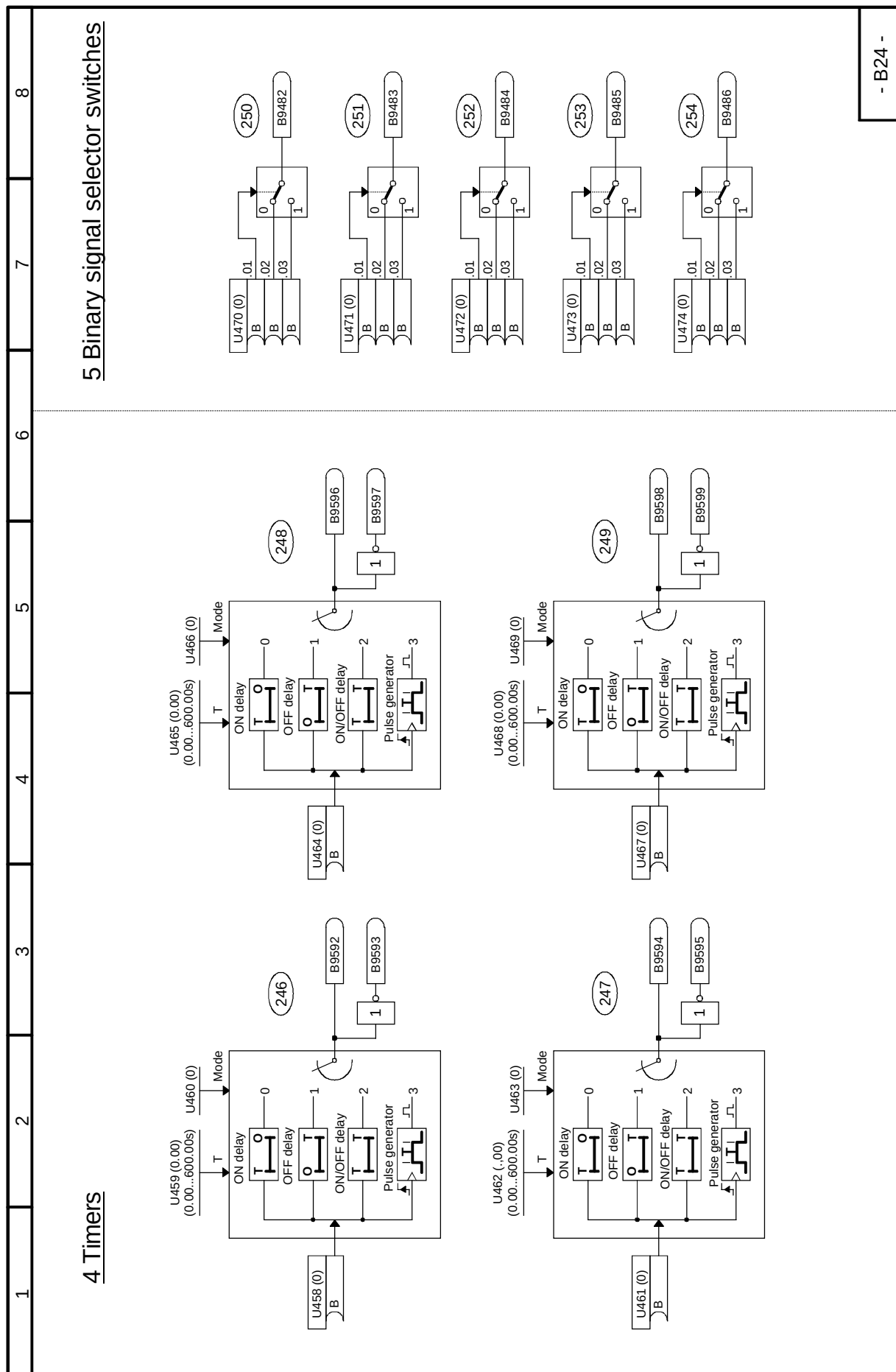
1

*) These function blocks are wired through their parameter factory setting to the drive-specific (crane) control logic and are therefore not freely available

- B23 -

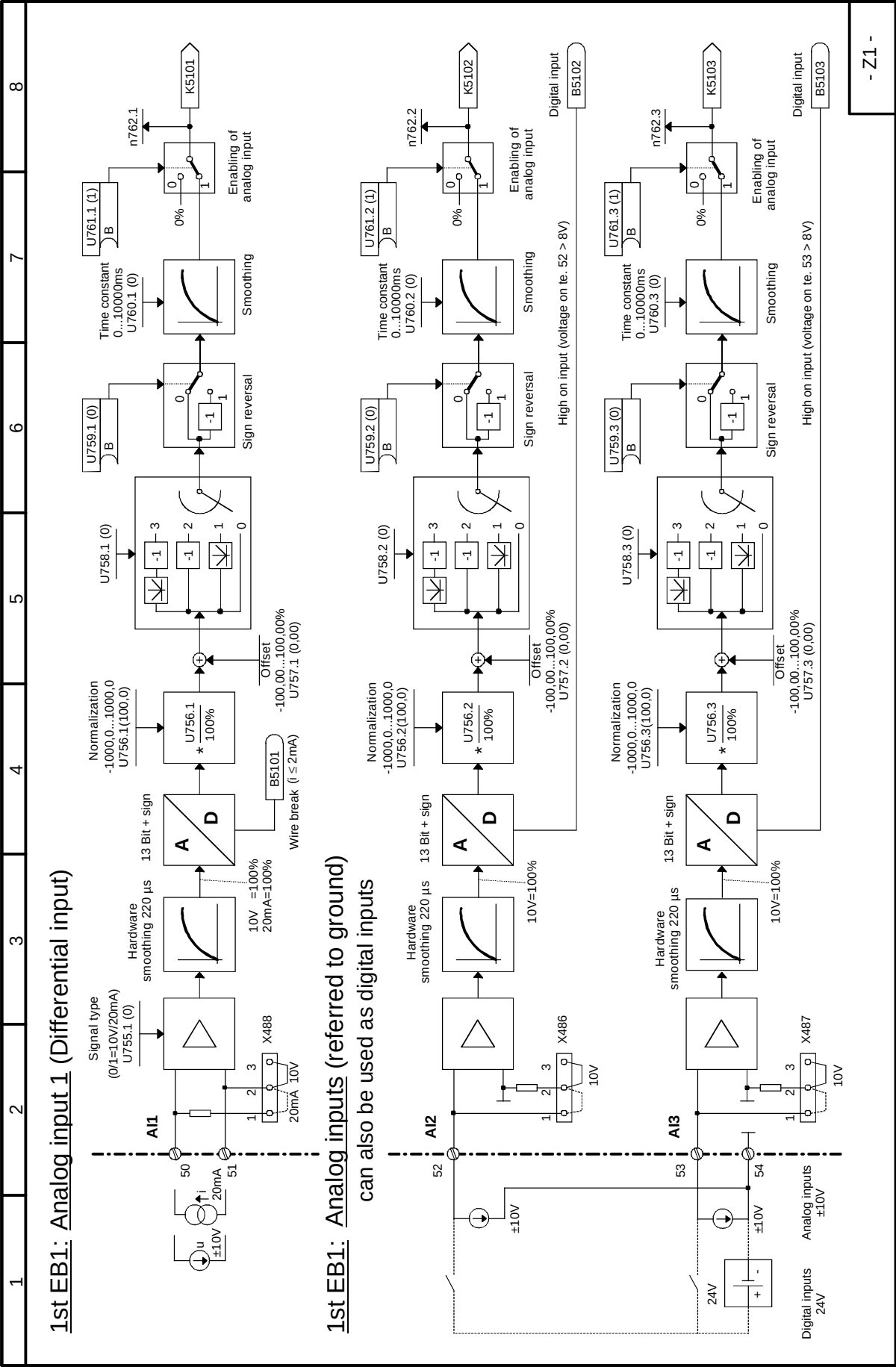
8-70

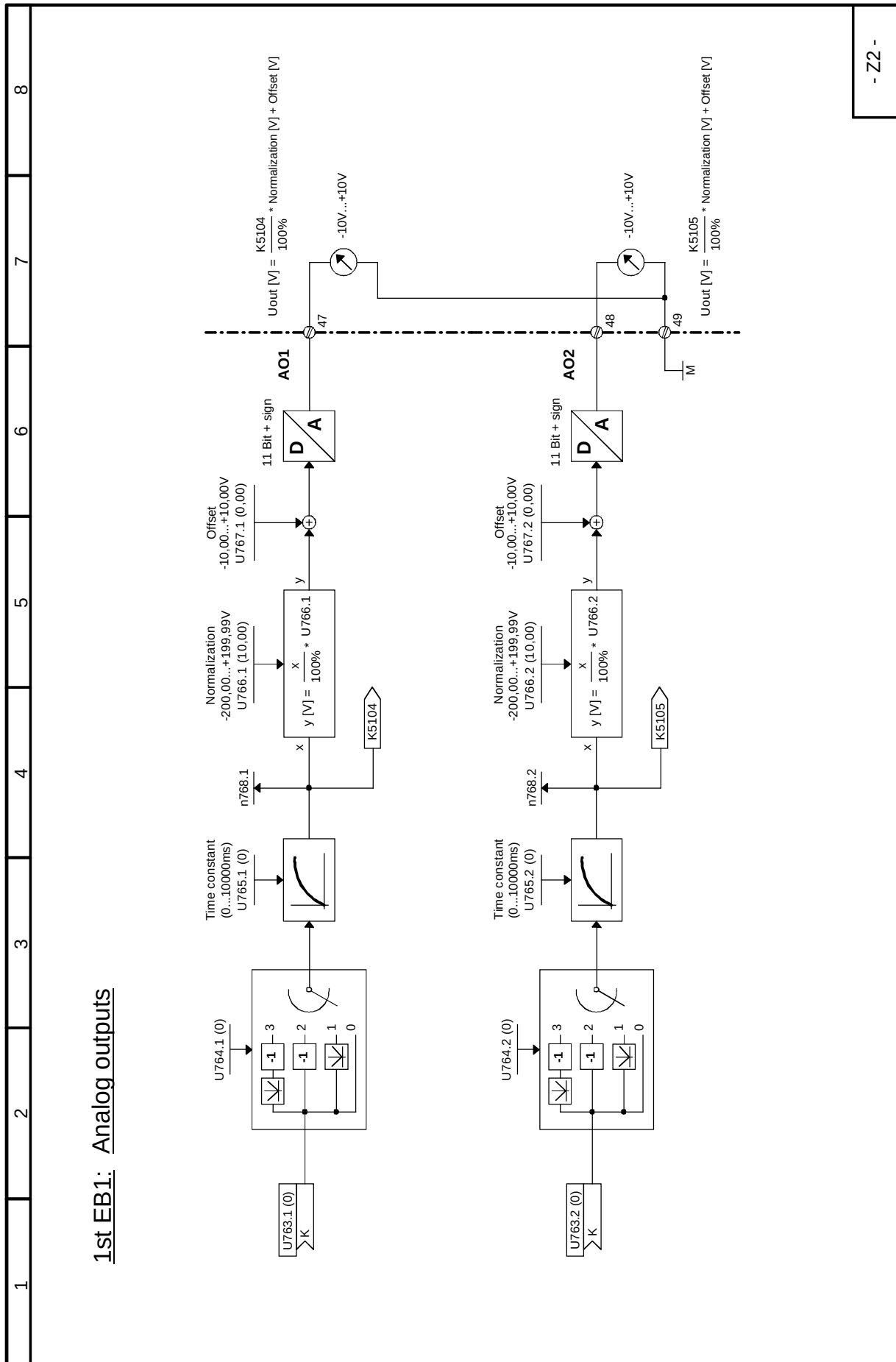
SIEMENS AG 6SG7000-0BA76
SIMOTRAS HD Operating Instructions

Sheet B24 Timers (0.00 to 600.00s), binary signal selector switches


Optional supplementary boards Sheets Z1 to Z12

Sheet Z1 1st EB1: Analog inputs



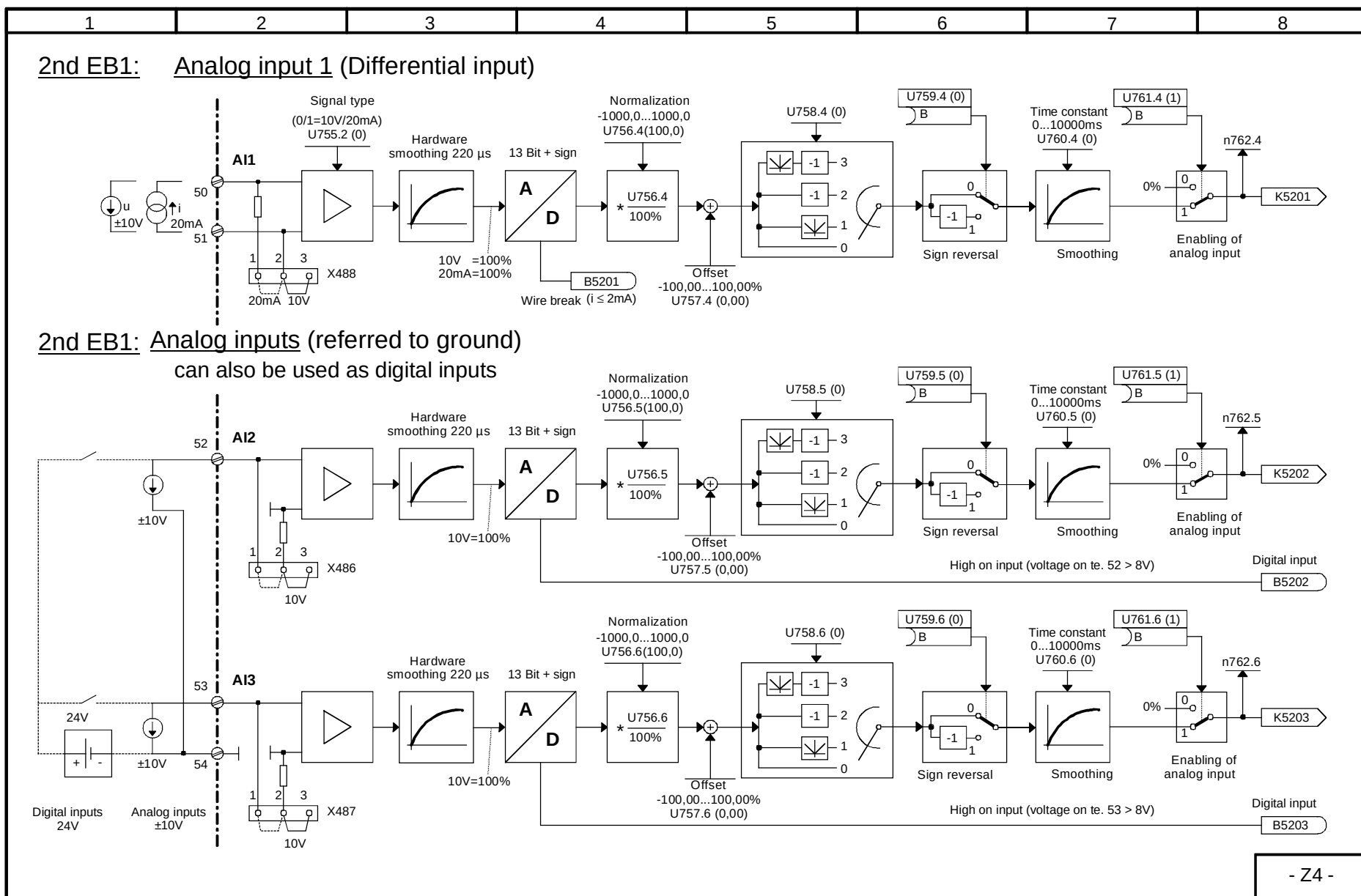
Sheet Z2 1st EB1: Analog outputs

Sheet Z3

1st

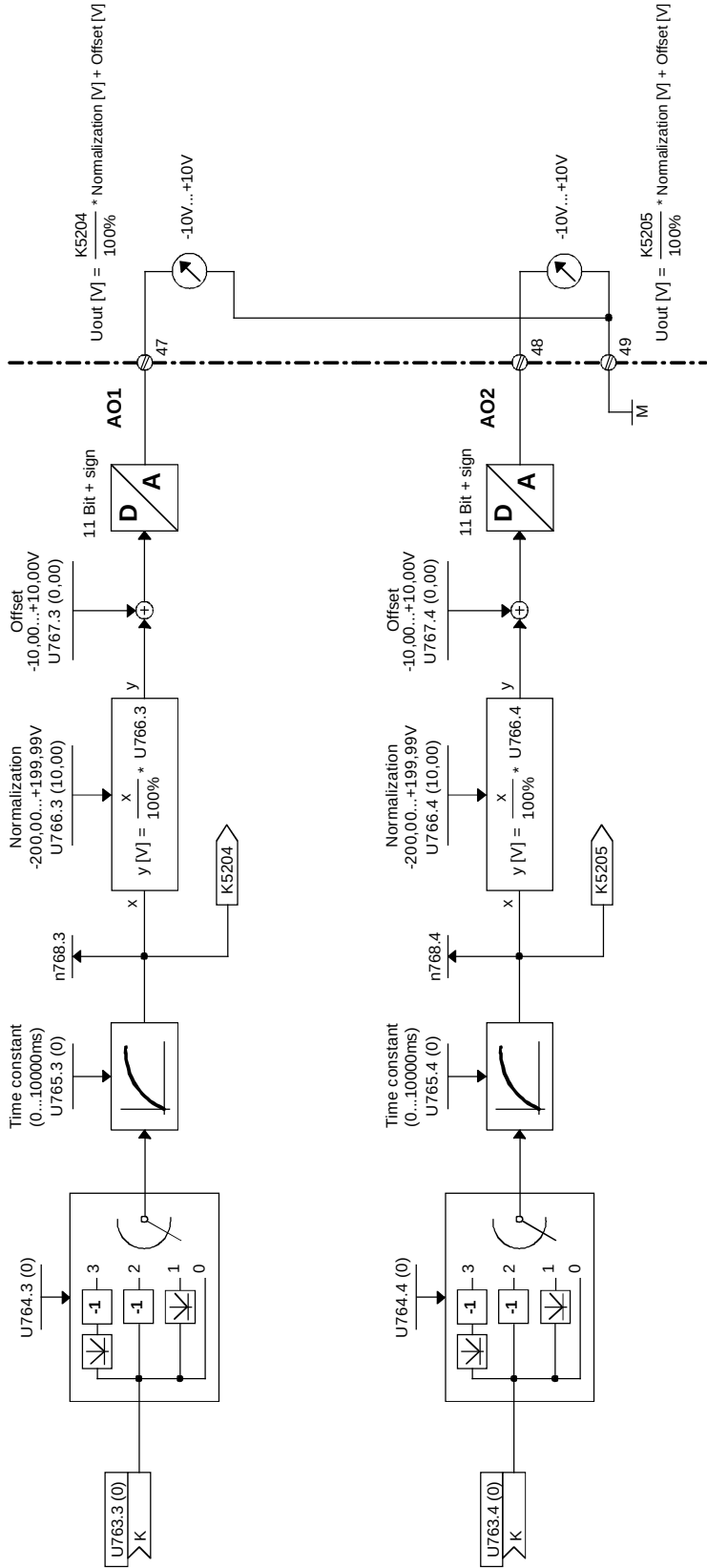
1st EB1: 4 bidirectional inputs/outputs, 3 digital inputs



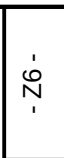


Sheet Z5 2nd EB1: Analog outputs

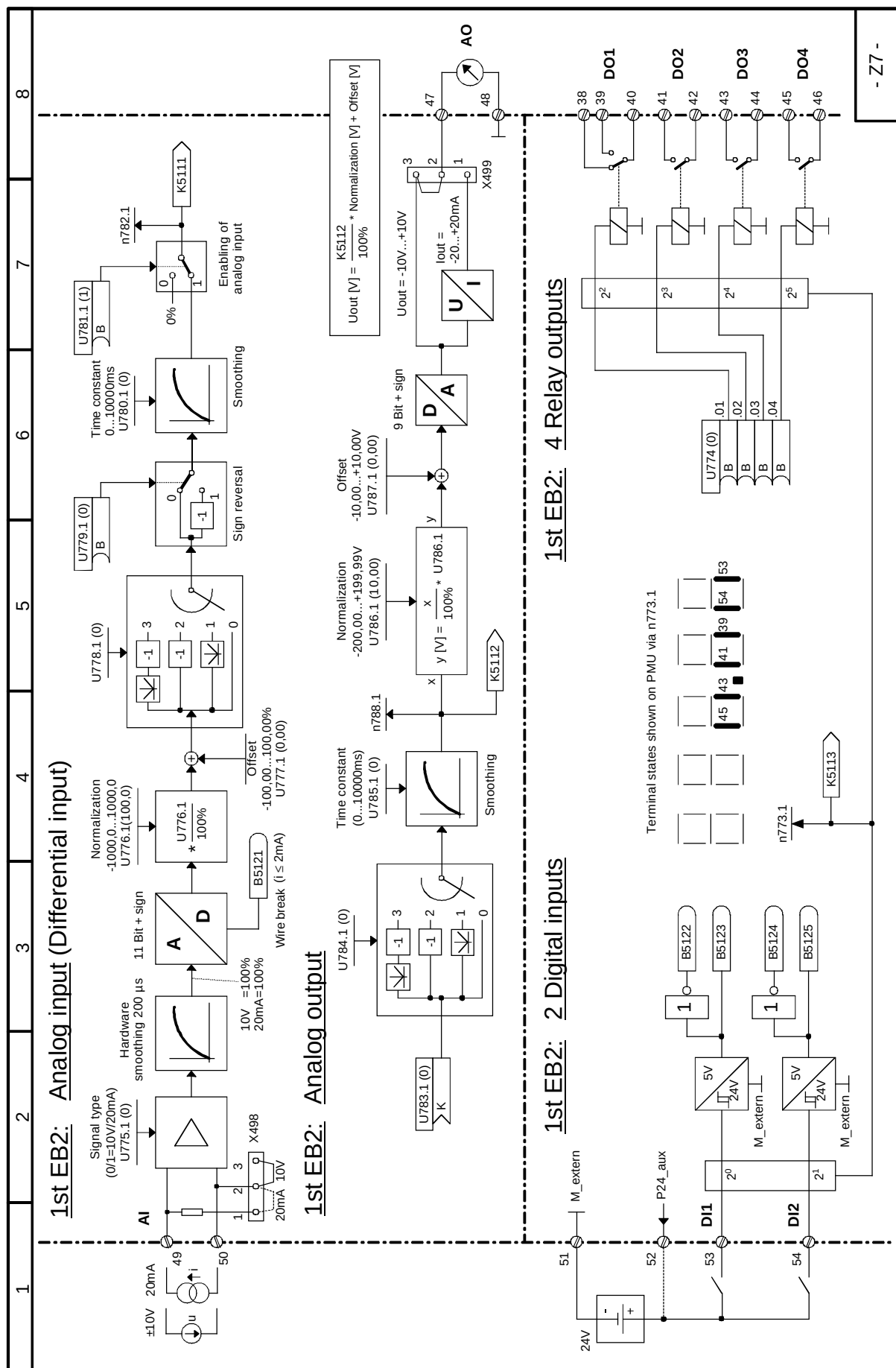
2nd EB1: Analog outputs



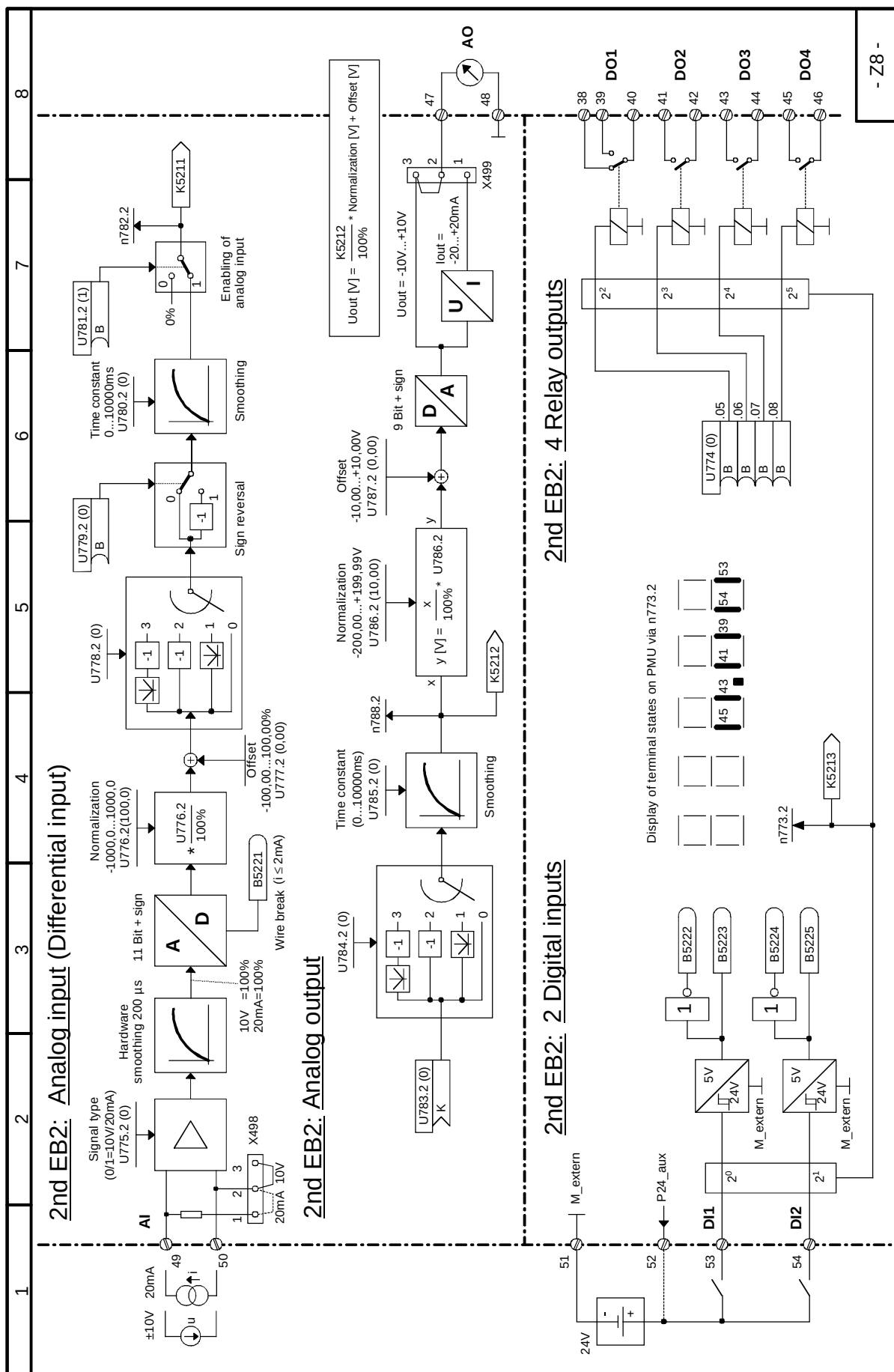
- Z5 -



Sheet Z7 1st EB2: Analog input, analog output, 2 digital inputs, 4 relay outputs



Sheet Z8 2nd EB2: Analog input, analog output, 2 digital inputs, 4 relay outputs



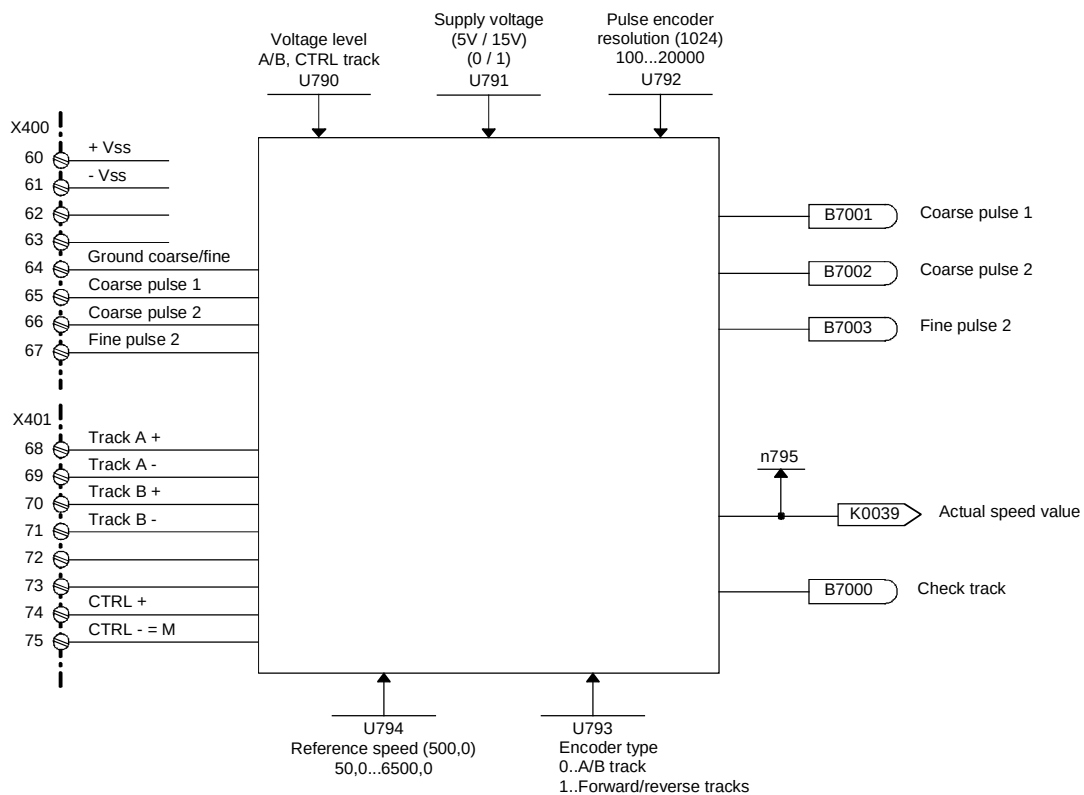
SBP Pulse encoder evaluation

Terminal assignments X400:

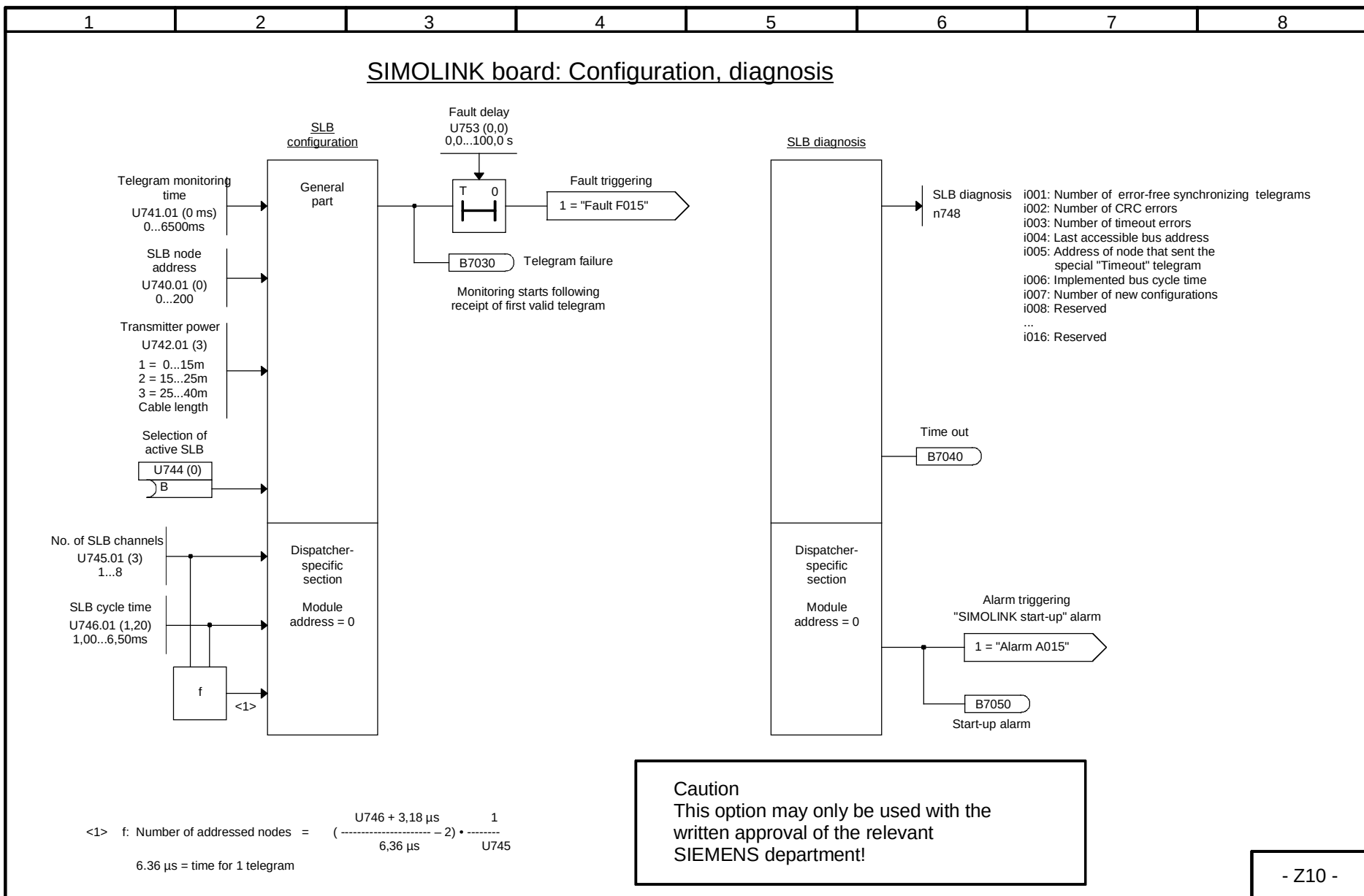
Te.	Designation	Meaning
60	+ Vss	Power supply for pulse encoder (5V/15V)
61	- Vss	Ground for power supply
62	Reserved	
63	Reserved	
64	Ground coarse/fine	Ground
65	Coarse pulse 1	Digital input coarse pulse 1
66	Coarse pulse 2	Digital input coarse pulse 2
67	Fine pulse 2	Digital input fine pulse 2

Terminal assignments X401

Te.	Designation	Meaning
68	Track A +	Plus (+) terminal track A
69	Track A -	Minus (-) terminal track A
70	Track B +	Plus (+) terminal track B
71	Track B -	Minus (-) terminal track B
72	Reserved	
73	Reserved	
74	CTRL +	Plus (+) terminal check track
75	CTRL -	Minus (-) terminal check track (=Ground)



Caution
This option may only be used with the written approval of the relevant SIEMENS department!



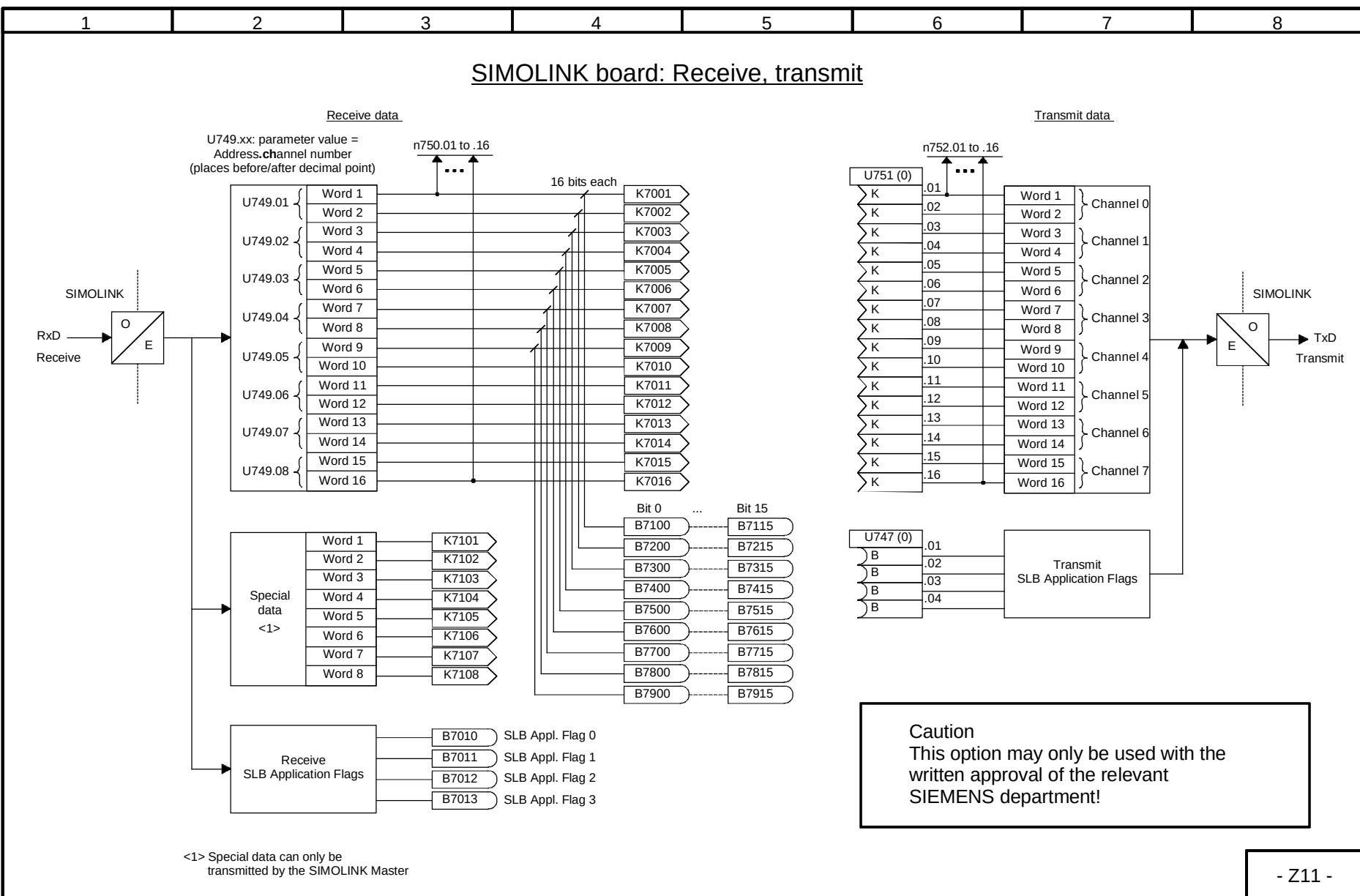
<1> f: Number of addressed nodes = $\left(\frac{U746 + 3,18 \mu s}{6,36 \mu s} - 2 \right) \cdot \frac{1}{U745}$

6.36 μs = time for 1 telegram

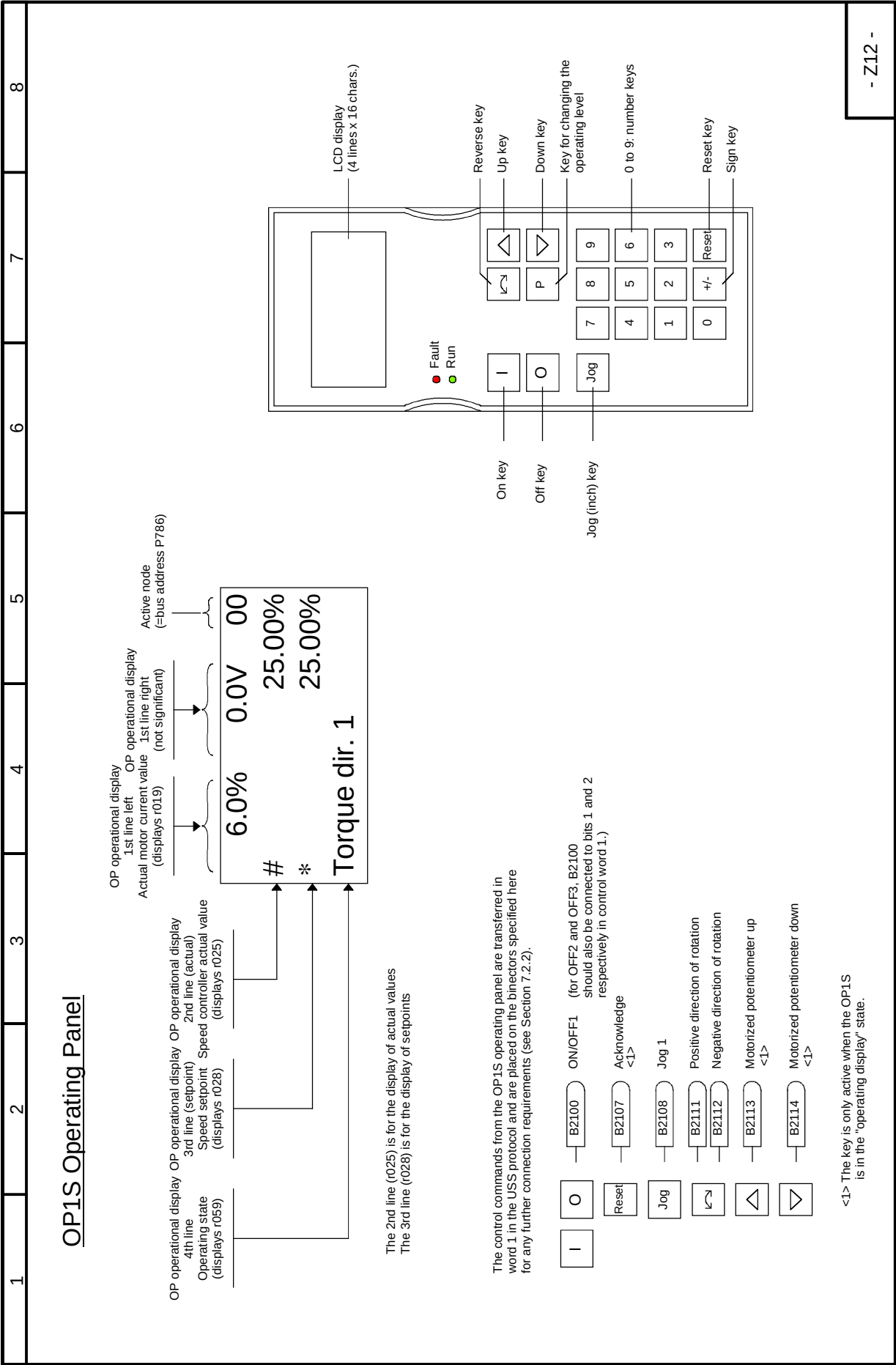
Caution
This option may only be used with the written approval of the relevant SIEMENS department!

- Z10 -

Sheet Z11 SIMOLINK board: Receiving, transmitting



Sheet Z12 OP1S operator panel



Drive-specific (crane) control, Sheets K1 to K18

see also Section 6.1

The drive-specific (crane) control is made up of the freely-assignable function blocks (S00 technology software, Sheets B1 to B24). In the factory settings for the relevant parameters, these function blocks are connected to the drive-specific (crane) controls.

Explanations

for Sheet K4, control word 1 and Sheet K5, control word 2

The control signals are assigned via the binector/connector and the connector/binector converters. The assignment should not be changed as technology boards are being used. Depending on the "PLC required" bit (binector B3110), the sources for the two control words are selected automatically.

for Sheet K6, transmit data

Status word 1 is assigned by default to the actual speed value. The signals generated in the internal drive control unit for the technology board and the PLC are transmitted in status word 2.

for Sheet K8, enable, overload lifting gear

The "mechanical stop" signal (emergency stop, centrifugal switch, emergency limit switch) immediately disables the controller and firing pulse. This terminal signal also needs to be connected during operation via the interface in order to switch the converter off if it is no longer reacting to the interface signals.

On lifting gear drives, a measurement device is used to monitor the permissible load to be lifted and to prevent an overload being lifted. If an overload occurs, the status is saved. If the overload is lowered, the master switch will be in the zero position (no travel command) and the brake is closed, the saved overload signal is acknowledged automatically.

for Sheet K9, travel command, electrical stop, overtemperature

The travel command is enabled in direction 1 if the limit switch in this direction is not being approached, or if, in addition, there is no overload for lifting gear.

The travel command is enabled in direction 2 if the limit switch in this direction is not being approached.

Overtemperature in the machine, motor, activation of the fan monitor or a LOW signal on the binary input "electrical stop" (motor fan, thermistor relay protective switches) disables the general travel command. This cancels the speed setpoint, slows the drive electrically and closes the brake. Acknowledgement is only possible once the fault has been eliminated; an alarm message is displayed at the same time

for Sheet K10, brake control

A travel command is issued by activating the master switch, the converter is enabled (enabling of speed control, firing pulse) and the 'Release brake' signal is issued. Enabling of the setpoint can be delayed to prevent movement against the brake, which will still be closed for a time. The drive then accelerates to the specified speed setpoint.

If the master switch is returned to the zero position, the drive is delayed and closes the brake with the zero speed signal. The firing pulses are disabled after the delay period for the controller disable has elapsed.

for Sheet K11, enable ramp-function generator, brake

If the drive moves to one of the limit switches, the control logic disables the ramp-function generator. The brake closes at the same time and additional electrical braking is applied because of the delayed controller disable. With the master switch in the zero position (no travel command), disabling of the ramp-function generator is cancelled and movement in the opposite direction (see Sheet K9, travel command) out of the limit switch area is possible again.

If an overload occurs whilst lifting, the control logic disables the ramp-function generator immediately and the brake closes straight away. Because of the delayed shutdown of the controller enable function, electrical braking is also applied and the load is held until the brake is closed. This prevents the load dropping during the time it takes for the brake to close.

It will not be possible to lift a load if an overload signal is active (see Sheet K9, travel command). If the master switch is moved to the zero position (no travel command), disabling of the ramp-function generator is cancelled and the load can be lowered with a reduced pre-limit switch speed, lowering is always possible. If there is no overload signal, lifting will be possible again.

for Sheet K12, setpoint processing

The speed setpoint can be specified using the main setpoint analog input (terminals 4/5, $\pm 10V$) or via the CBP interface (word 2). A switch causes an automatic switchover to the interface when the "PLC required" bit is set.

The signal characteriser allows the setpoint to be specified very accurately for low speeds using a linear setpoint potentiometer or a linear interface setpoint. Small deflections of the master switch do not then produce large values (proportional to the deflection angle of the master switch), but much smaller setpoint values.

The maximum value for the controlled speed range can be set using the multiplier.

for Sheet K13, setpoint selection

The "High speed notch" signal causes the speed setpoint to be switched from the variable master switch setpoint (closed-loop speed control range) to the zero delay angle setting. The polarity of the 100% setpoint is controlled using the travel command.

It is possible to switch to a stepped speed input using the selector switch. The travel command for directions 1 and 2 specifies the polarity and the setpoint for the first stage. The other setpoint stages are controlled using three other binary inputs.

for Sheet K14/G19, pre-limit switch, setpoint reduction

The pre-limit switch function means that the limit switch is only approached at low speed. When passing a pre-limit switch in the direction of the limit switch, the machine is switched to the speed setpoint, which is multiplied by a value smaller than one ($0.1 = 10\%$) and therefore limited to this value.

If the pre-limit switch range is left in the opposite direction, the control logic (the travel command passes back over the pre-limit switch that was approached) makes the limit ineffective so maximum speed can be used again.

for Sheet K15, ramp-down monitoring

If the drive is running at maximum speed and the master switch is quickly moved to the zero position, the drive must slow down immediately and the brake close after the specified ramp-down time has elapsed.

When a fault occurs, the drive may not follow the travel command setpoint and the brake may not close. In this case, the monitoring time elapses and triggers a fault message and shutdown (time period: ramp-down time + 0.5s)

for Sheet K16, brake monitoring

The drive brake is controlled by the internal brake control system. A brake feedback signal (e.g. brake position limit switch/brake contactor feedback contact) is used to monitor whether or not the brake is also actually following the control signal. The system monitors brake releasing and closing; if the event of a fault, a shutdown occurs and a fault message is activated.

for Sheet K17, fault acknowledgement, high-speed step

If the converter is shutdown as the result of a fault signal, the fault can only be acknowledged when the fault is no longer active, the converter is not in Run mode and the master switch is in the zero position (no travel command present).

The master switch signal for open-loop operation only takes effect when the actual speed value has reached the high-speed threshold and as long as the pre-limit switch area has not been entered. High-speed mode becomes active again on moving away from the pre-limit switch area.

for Sheet K18, limit-value monitor

Two limit-value monitors output a control signal depending on the current direction of rotation and speed. If the speed exceeds a threshold value, the flag bit is set to zero. A safety circuit can be implemented in an external control unit in connection with pre-limit monitoring limit switches.

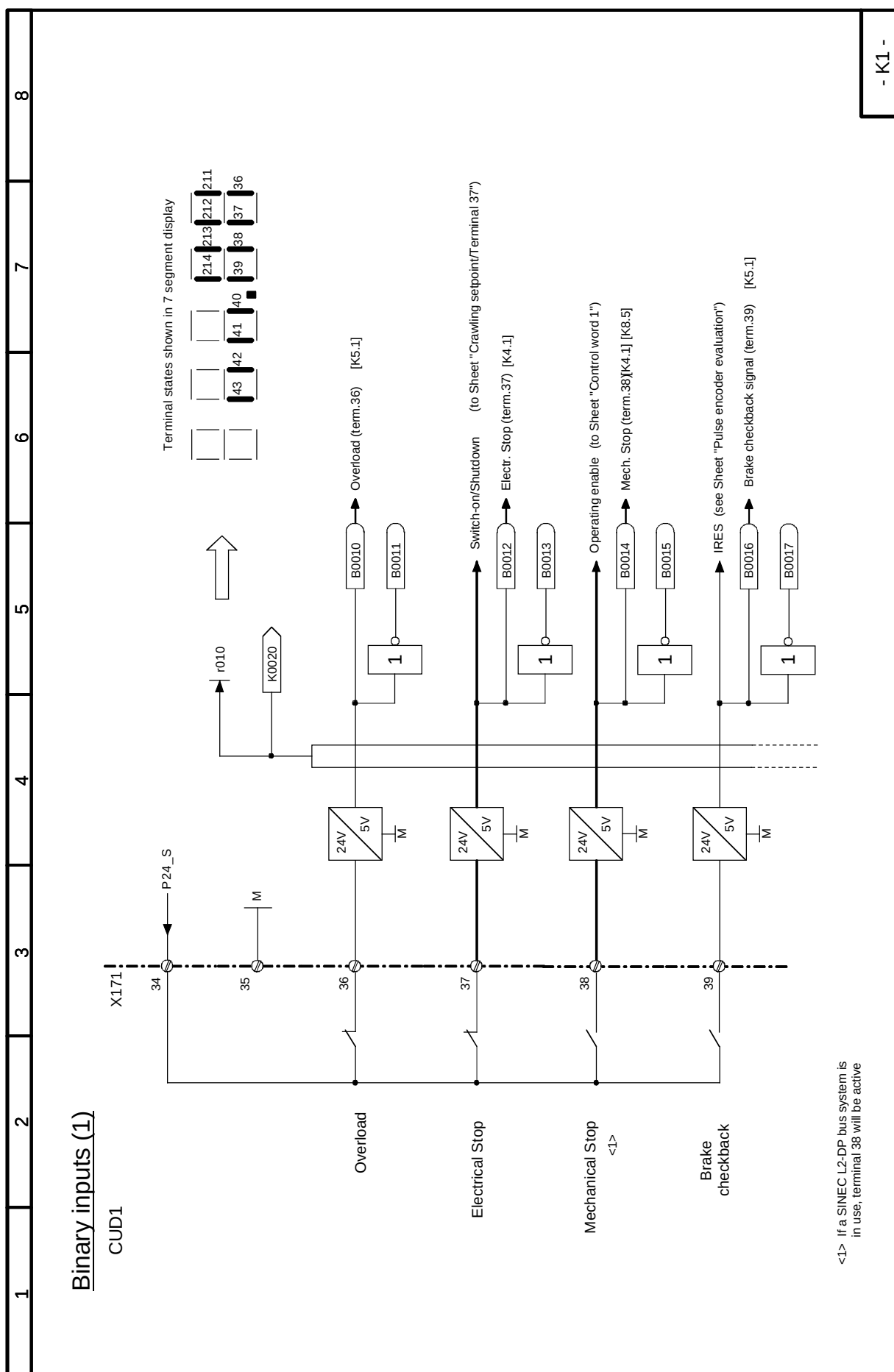
A limit-value monitor issues the signal for switching over the ramp-up times used in the open-loop and closed-loop ranges.

for Sheet G23, start pulse, speed controller

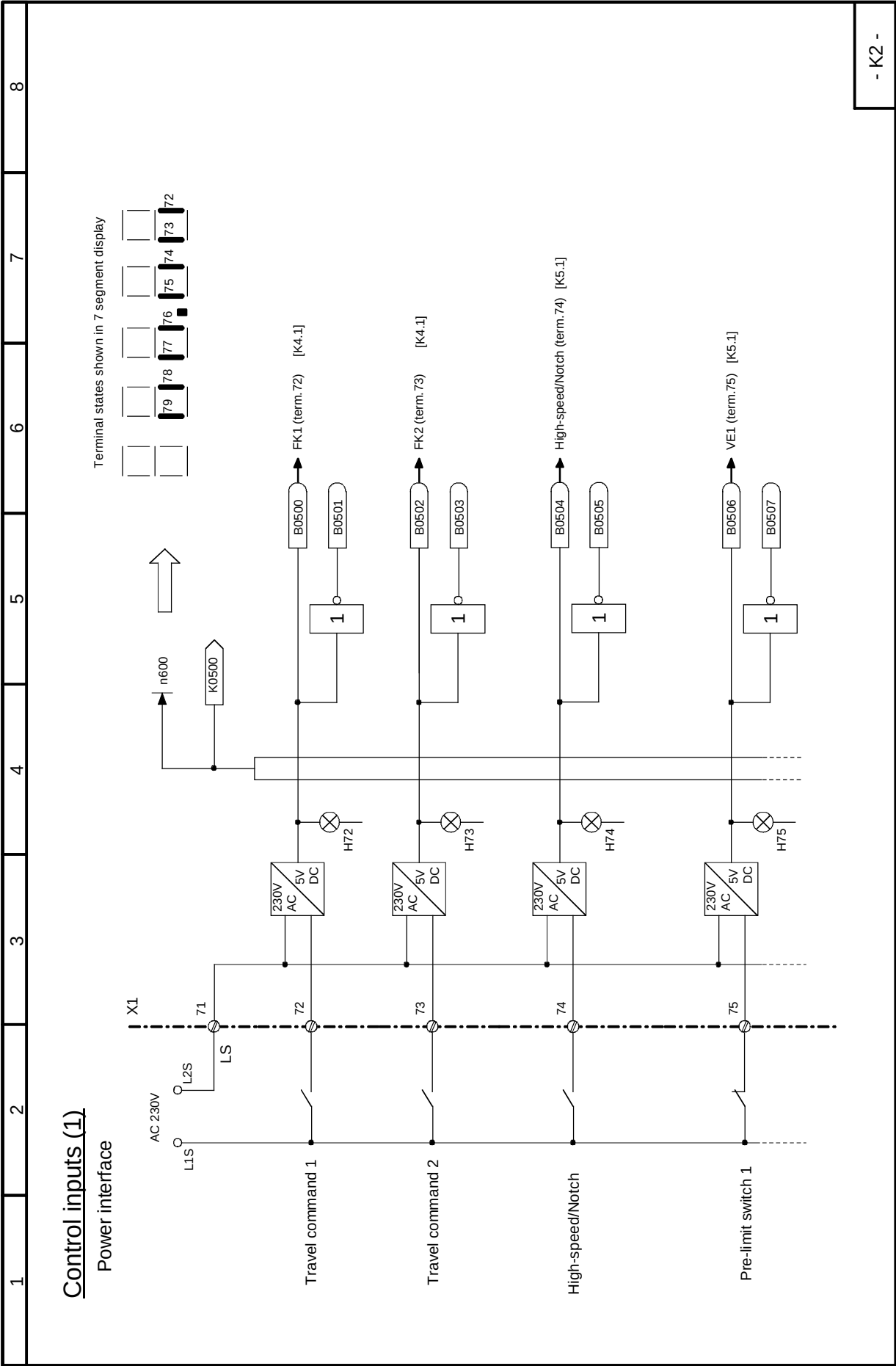
The speed controller starts from a defined value, not 0. With lifting gear, this prevents the load dropping as the movement starts.

A lower start pulse can be used if starting off in a lowering direction.

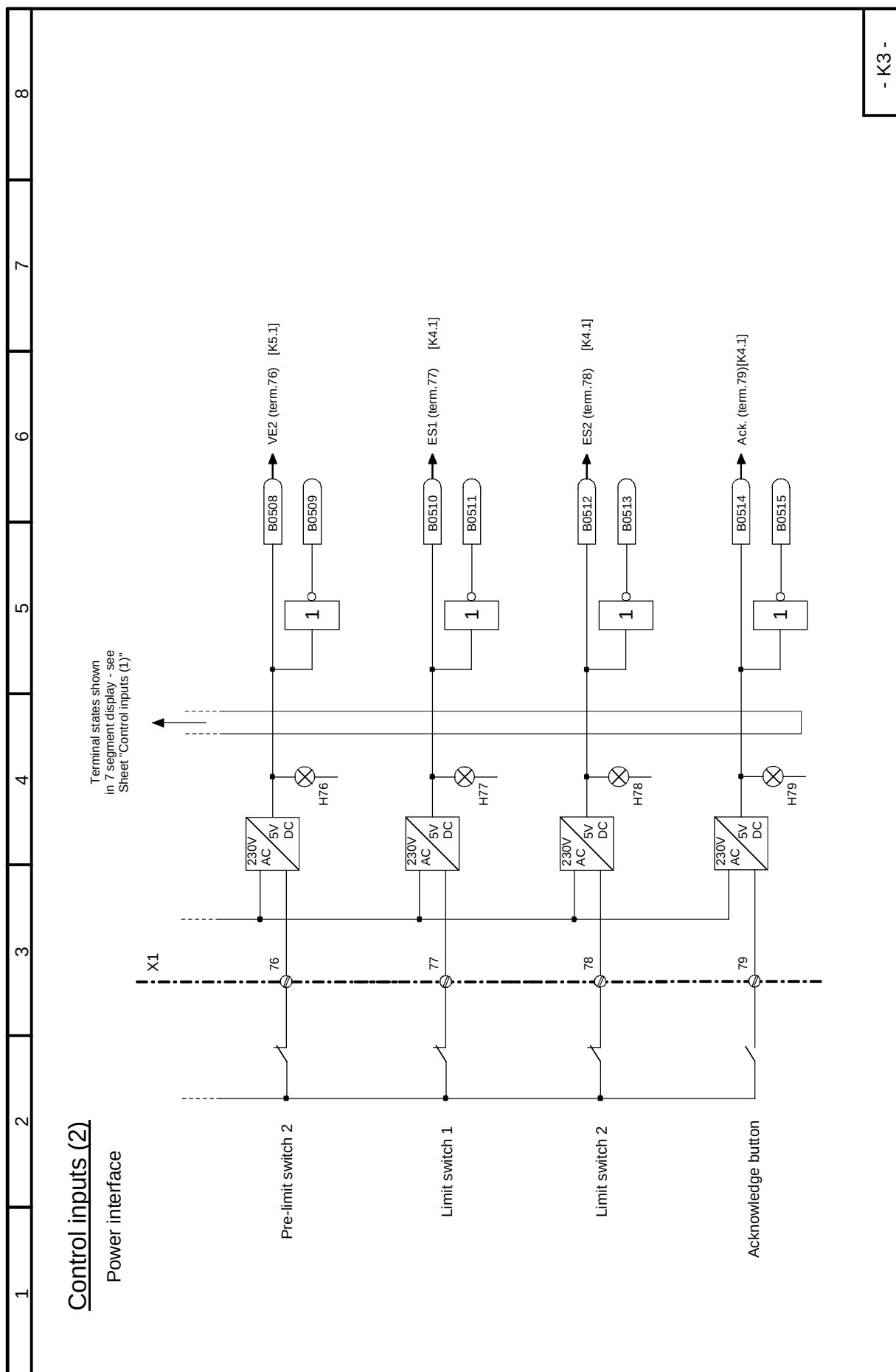
Sheet K1 Binary inputs, terminals 36 to 39



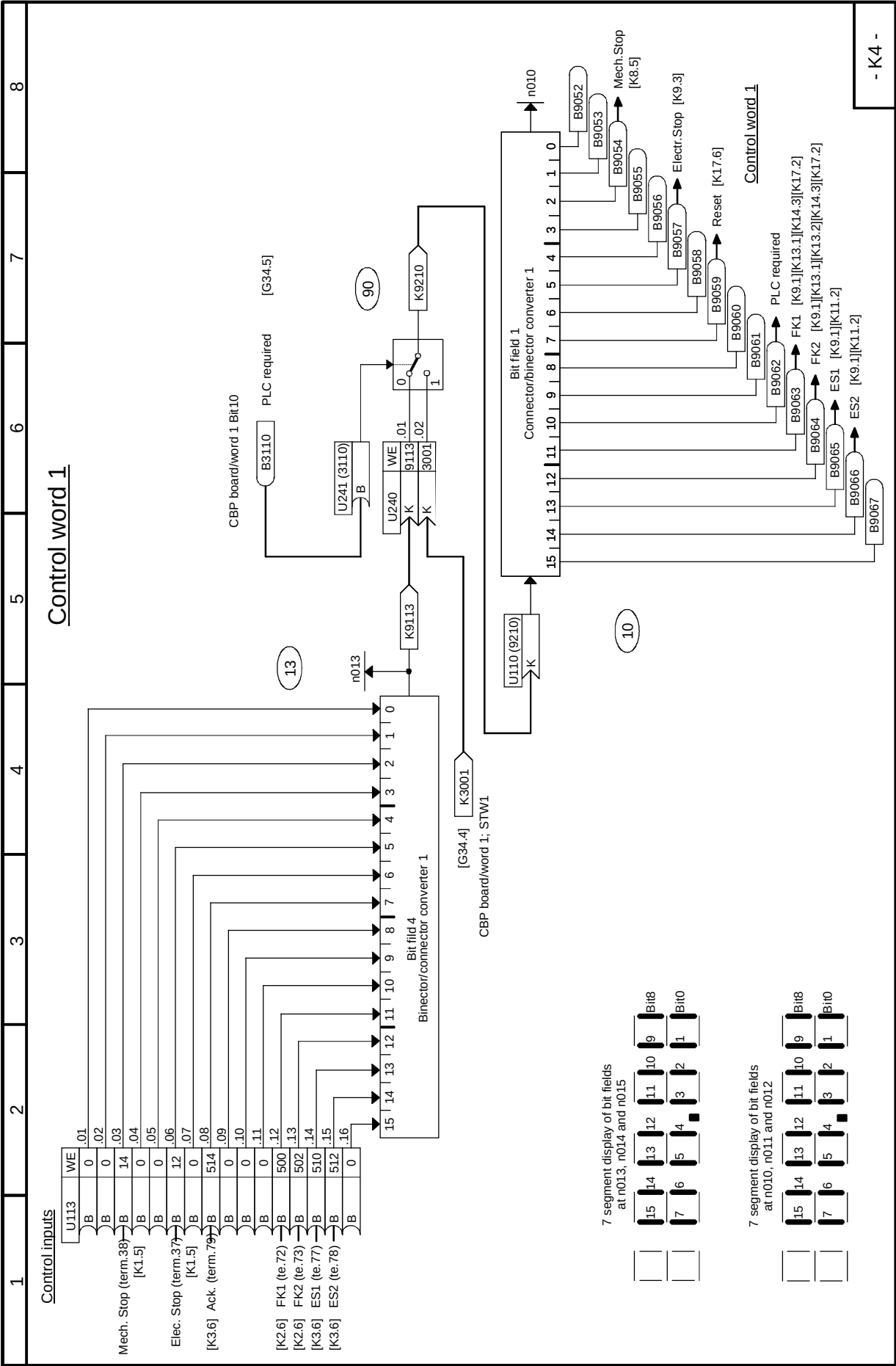
Sheet K2 Control inputs, terminals 71 to 75



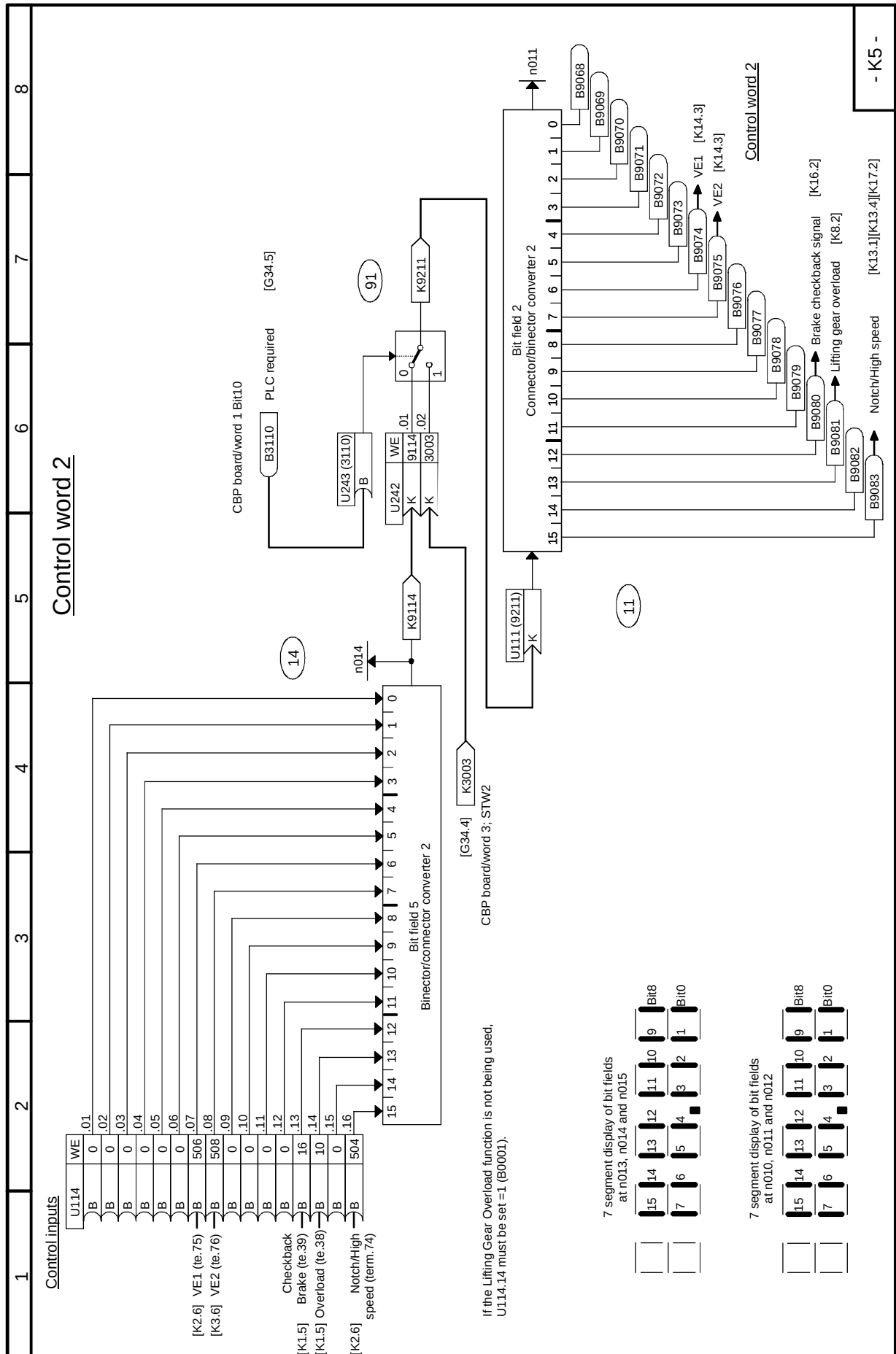
Sheet K3 Control inputs, terminals 76 to 79



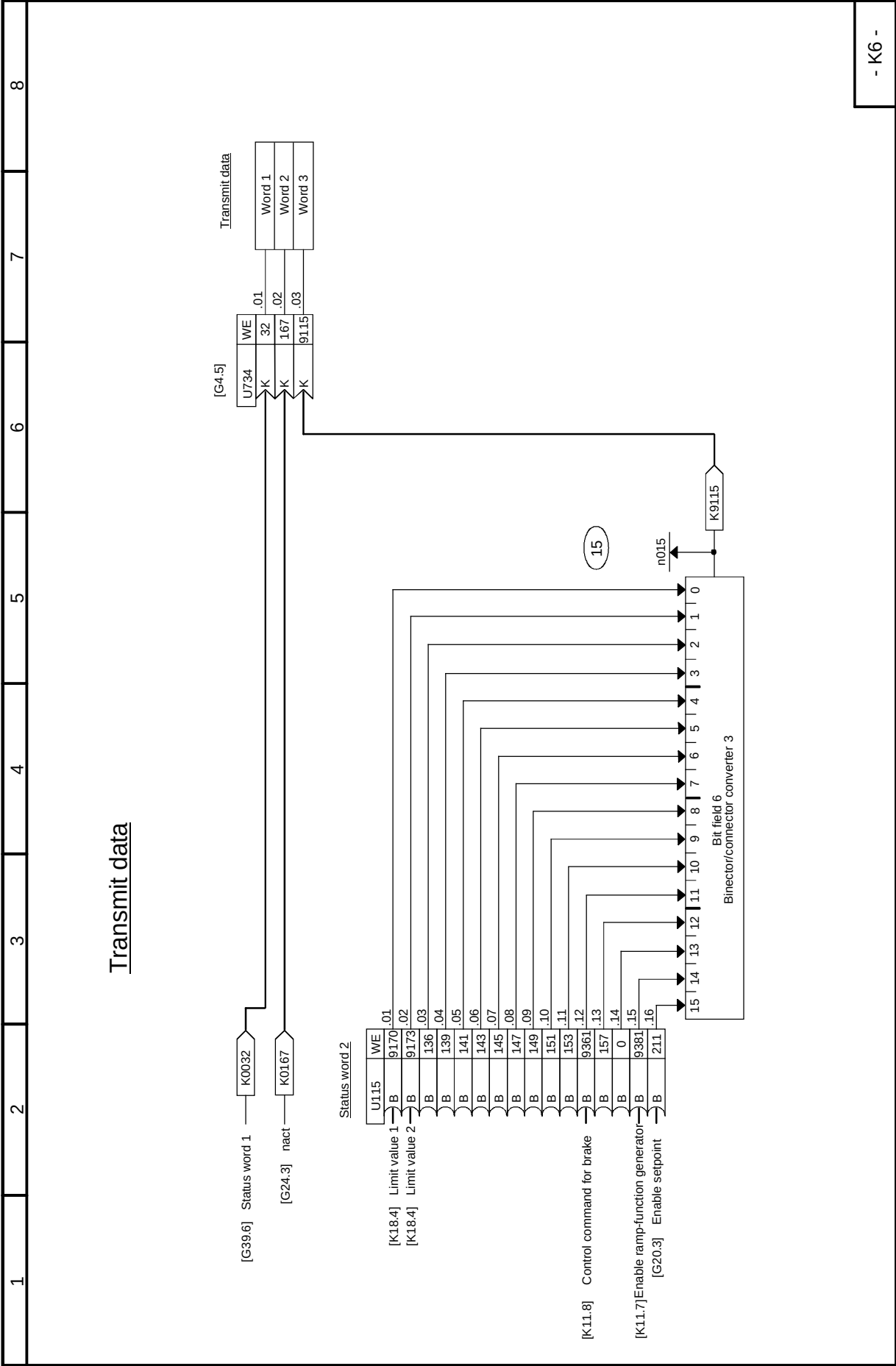
Sheet K4 Control word 1



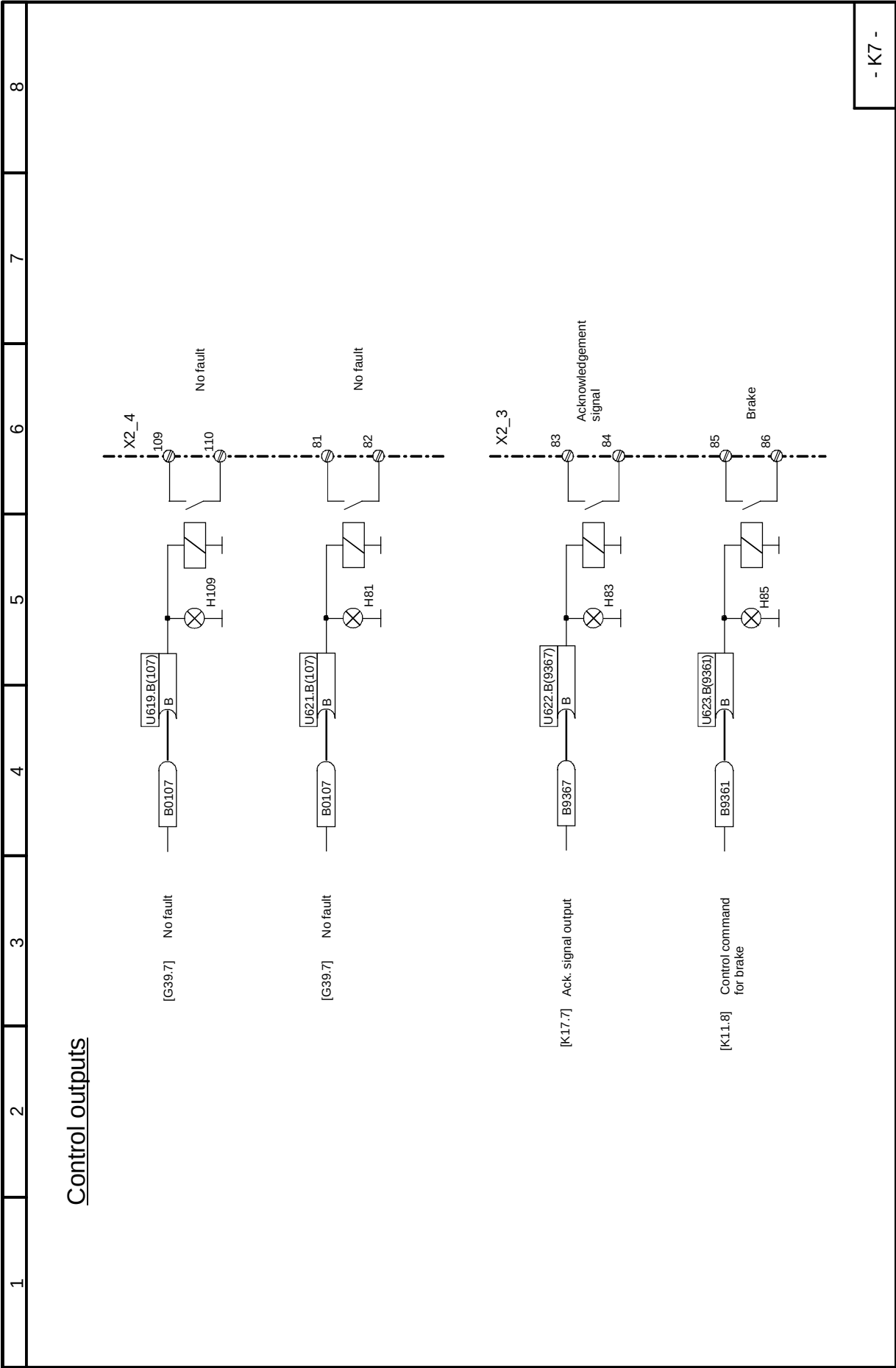
Sheet K5 Control word 2



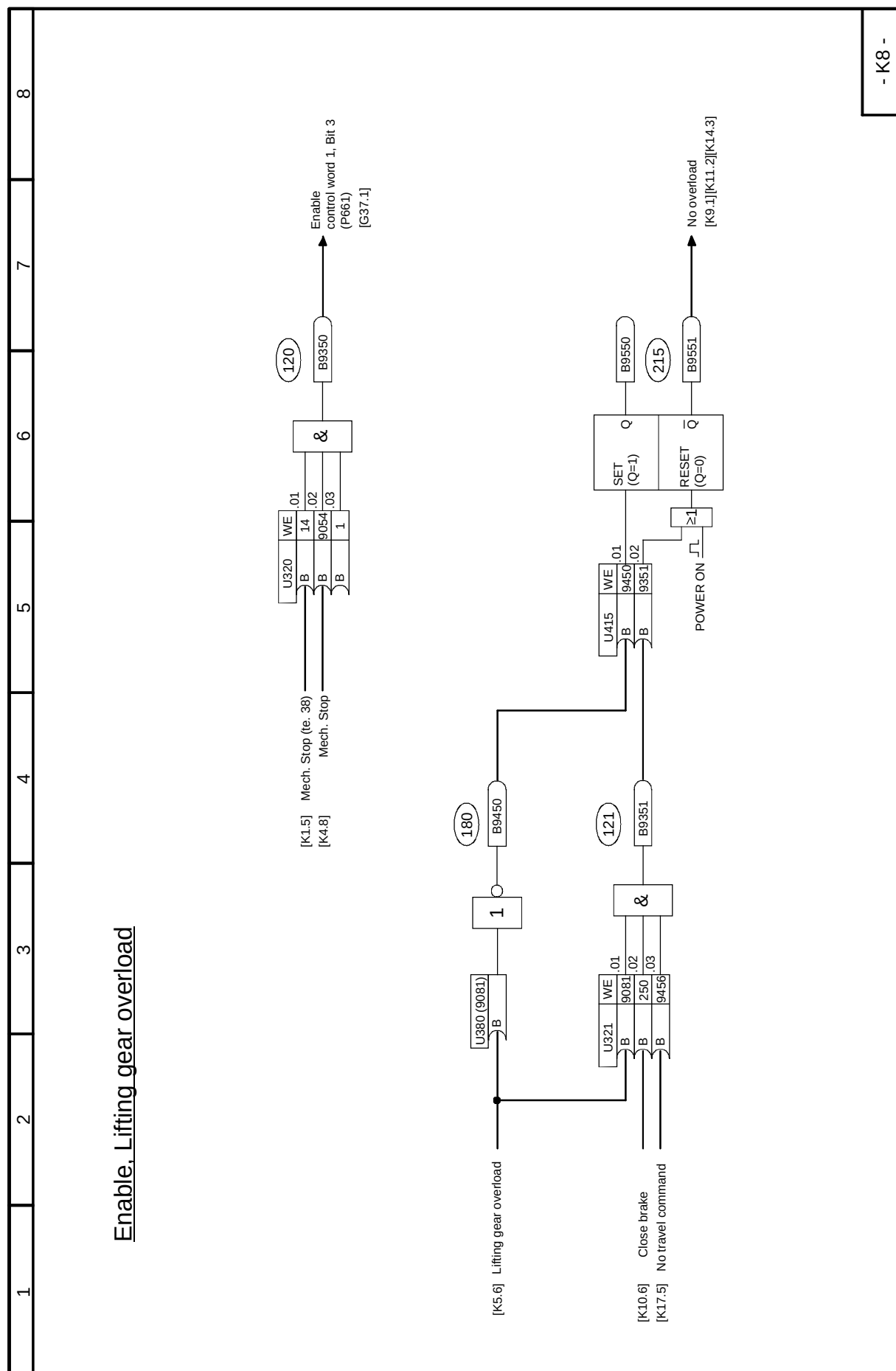
Sheet K6 Transmit data

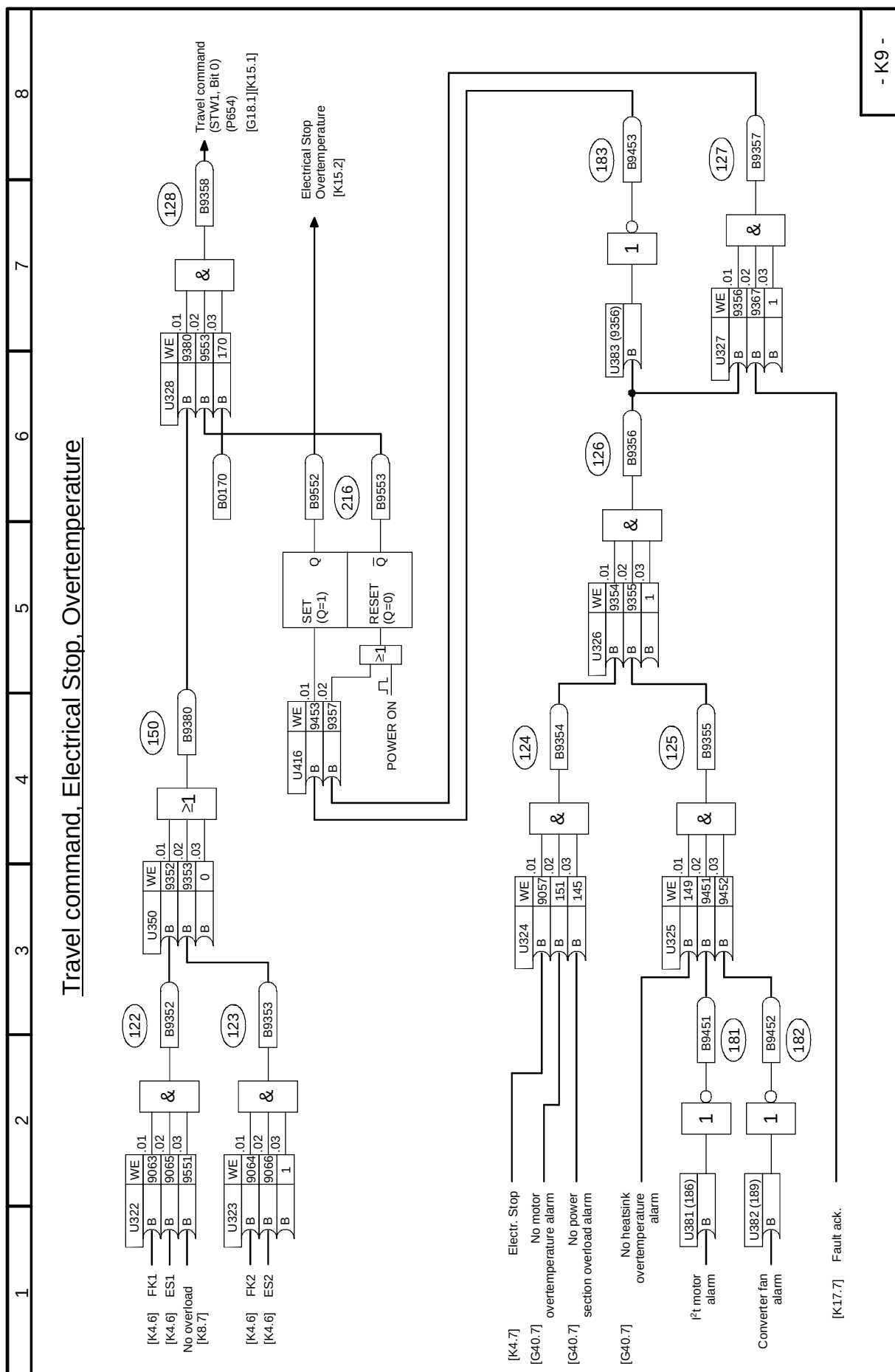


Sheet K7 Control outputs

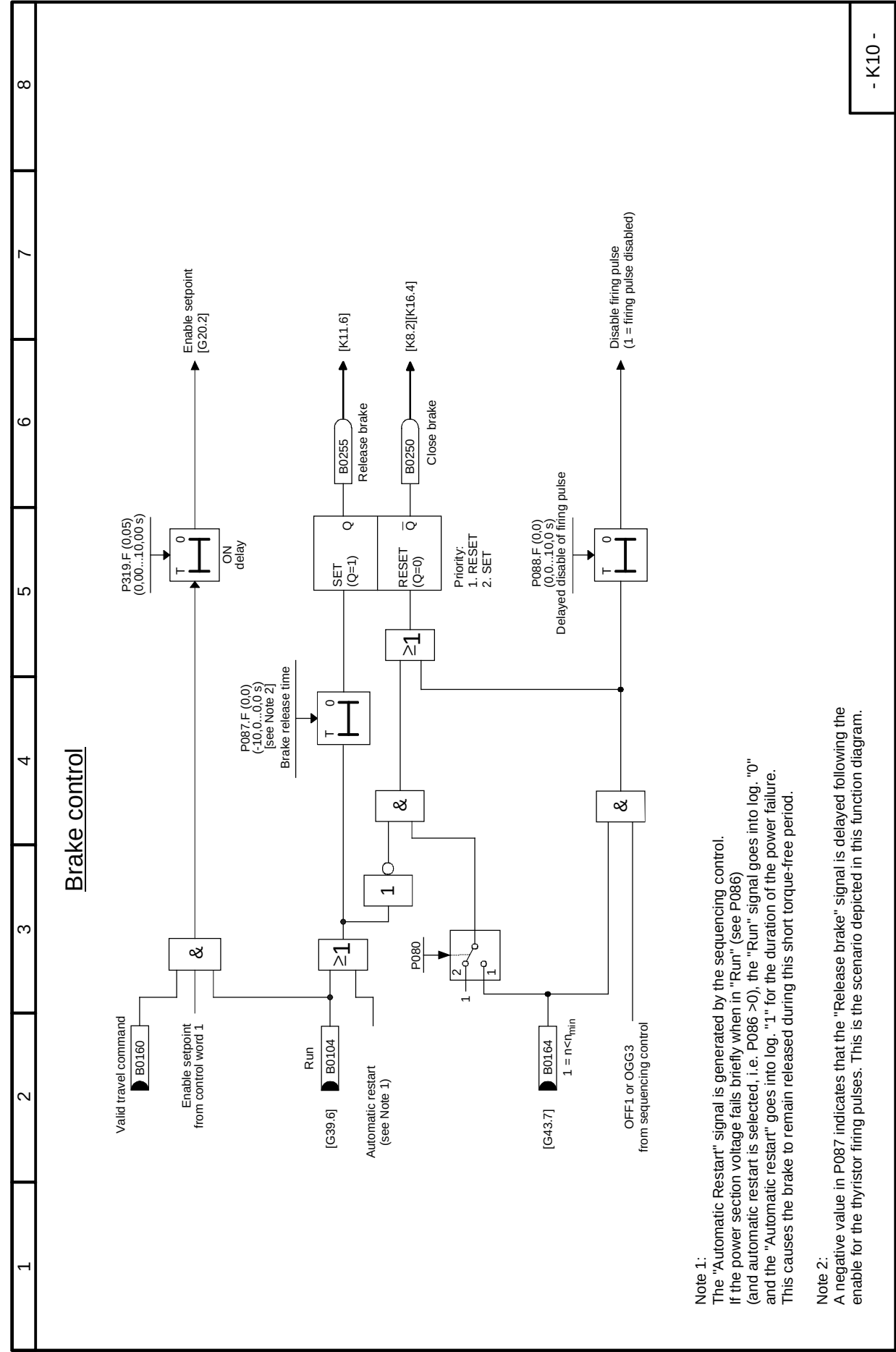


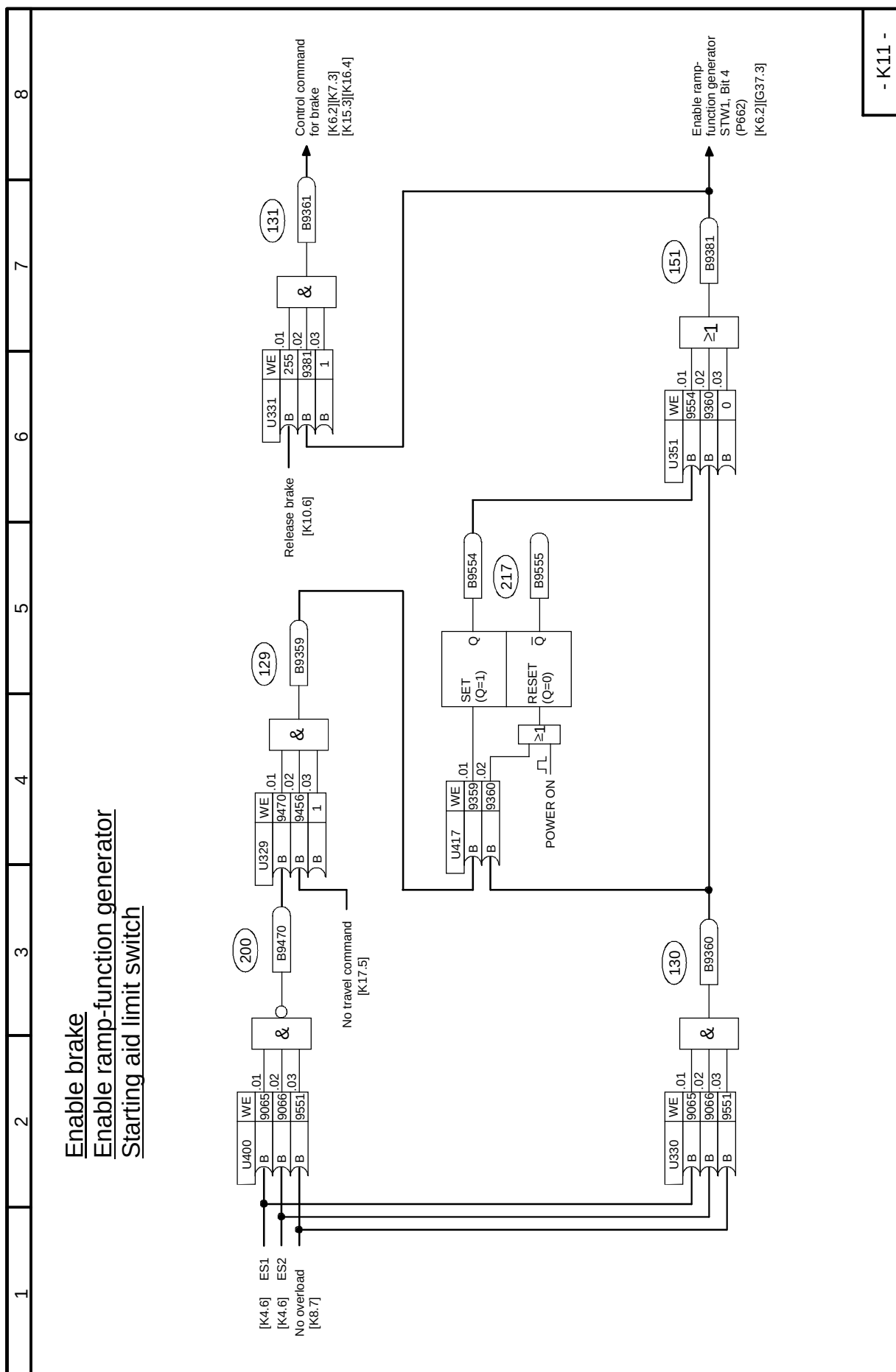
Sheet K8 Enable, lifting gear overload



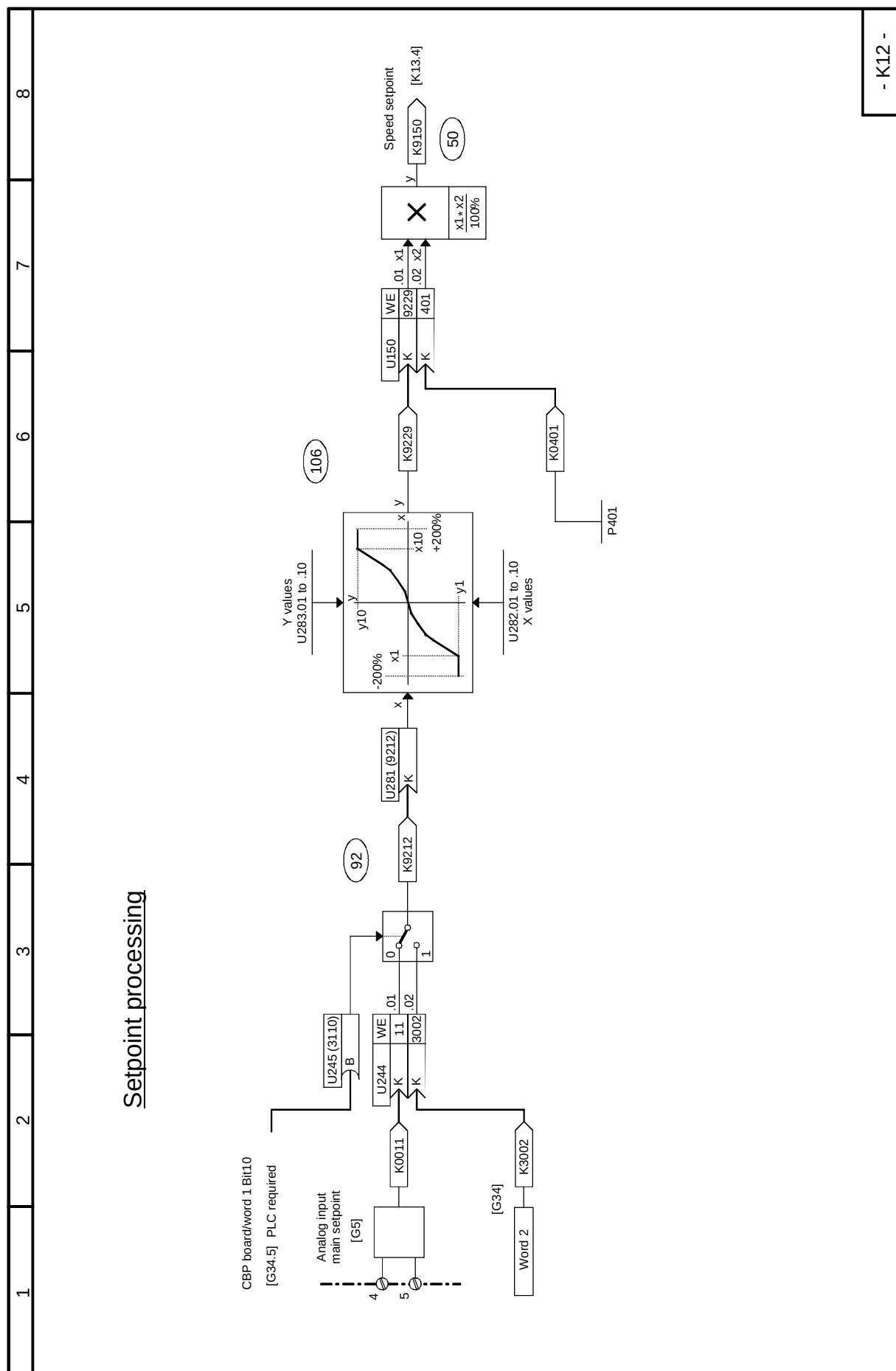
Sheet K9 Travel command, electrical stop, overtemperature

Sheet K10 Brake control

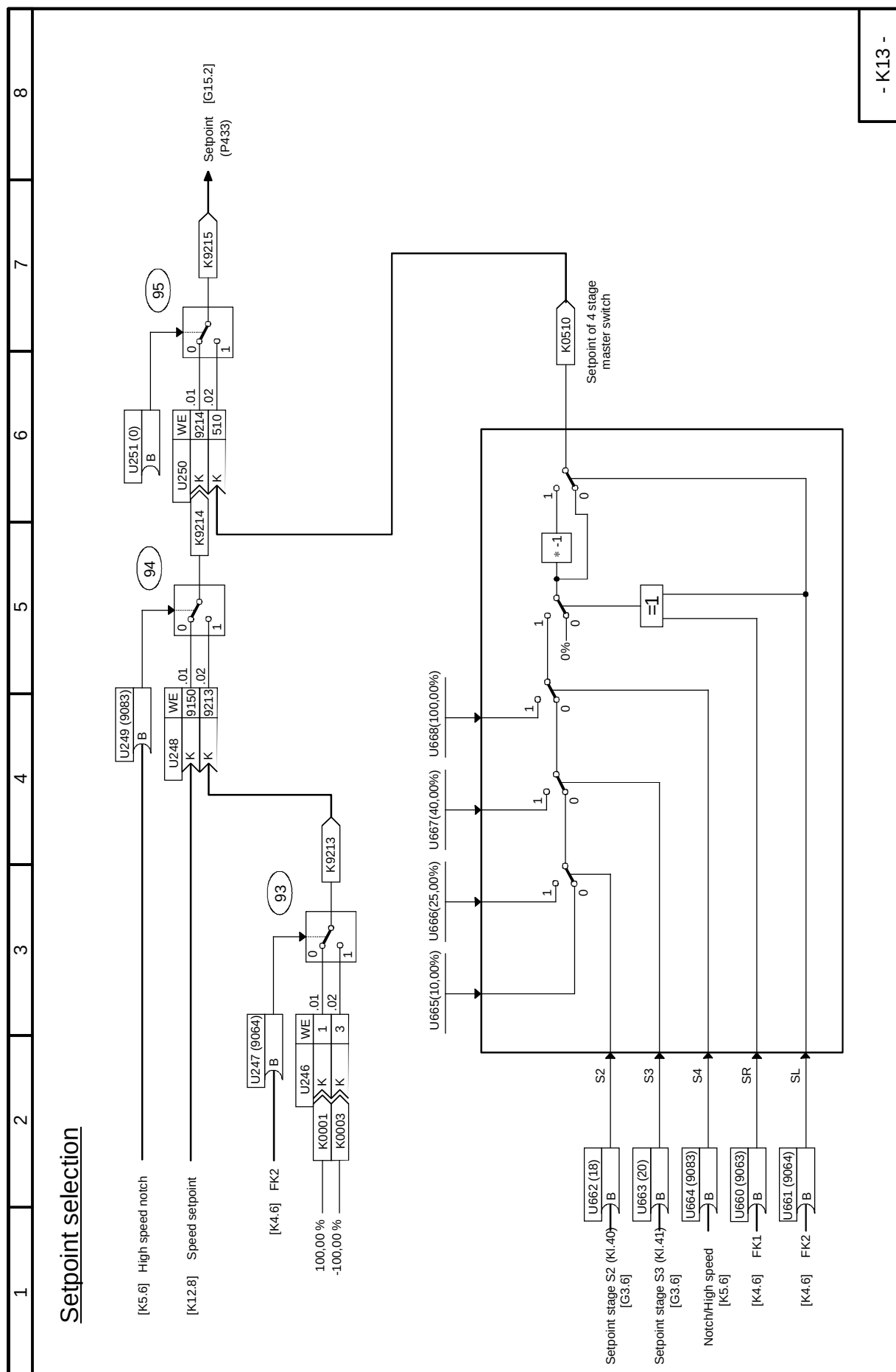


Sheet K11 Enable brake, enable ramp-function generator, starting aid limit switch


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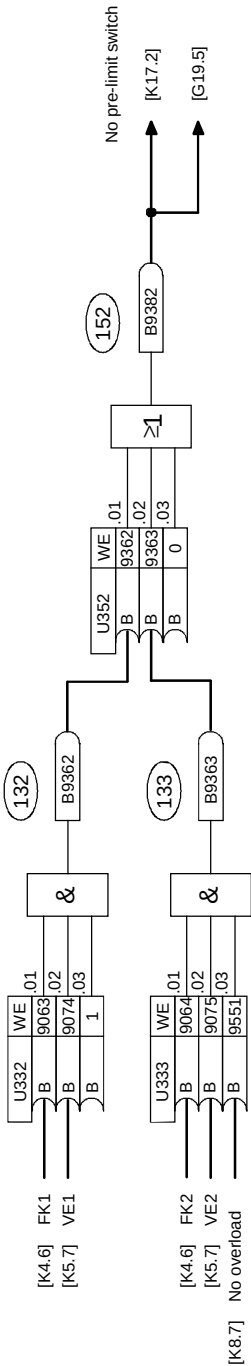
Sheet K13 Setpoint selection

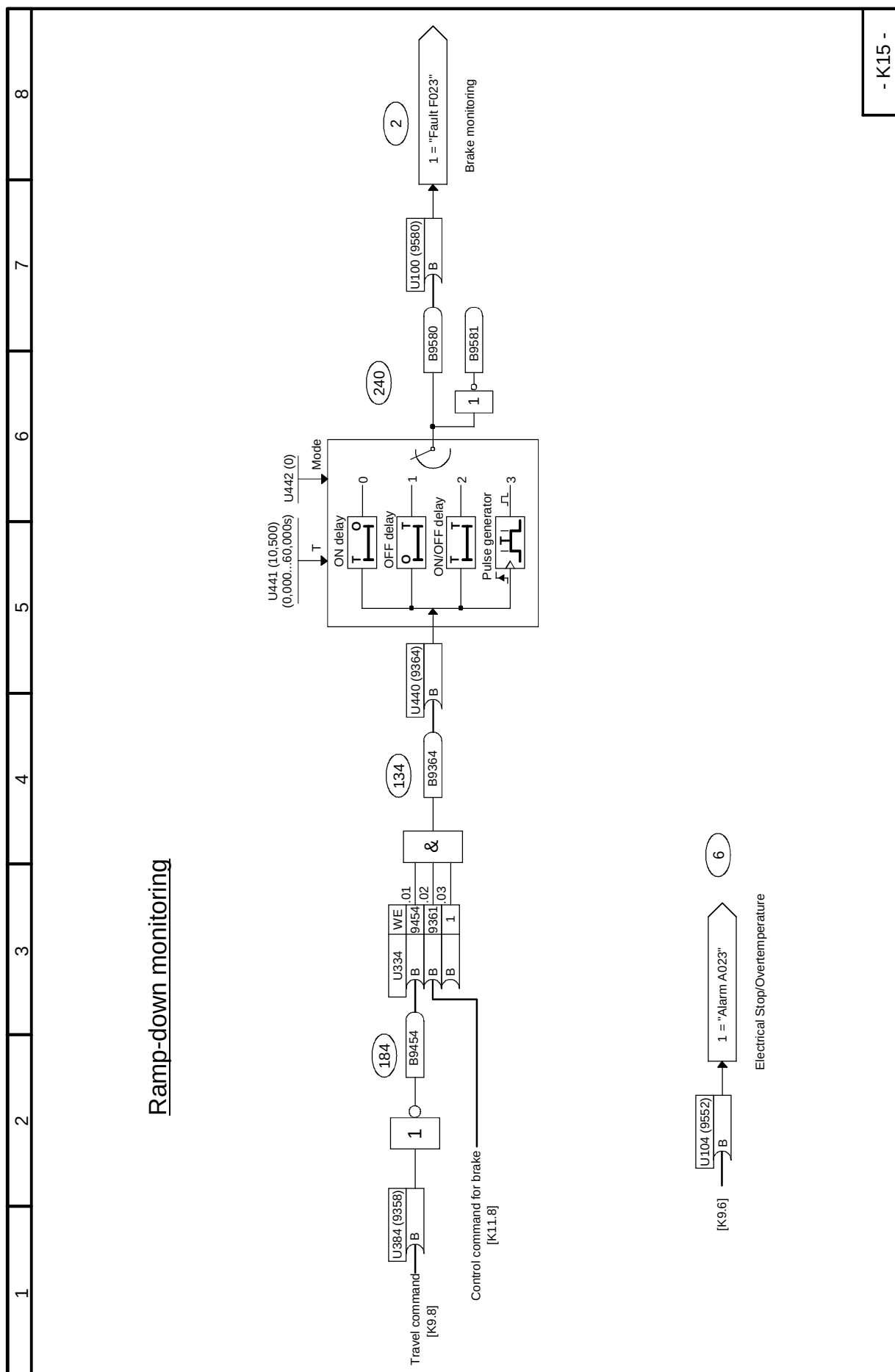


Sheet K14 Setpoint reduction on reaching a pre-limit switch

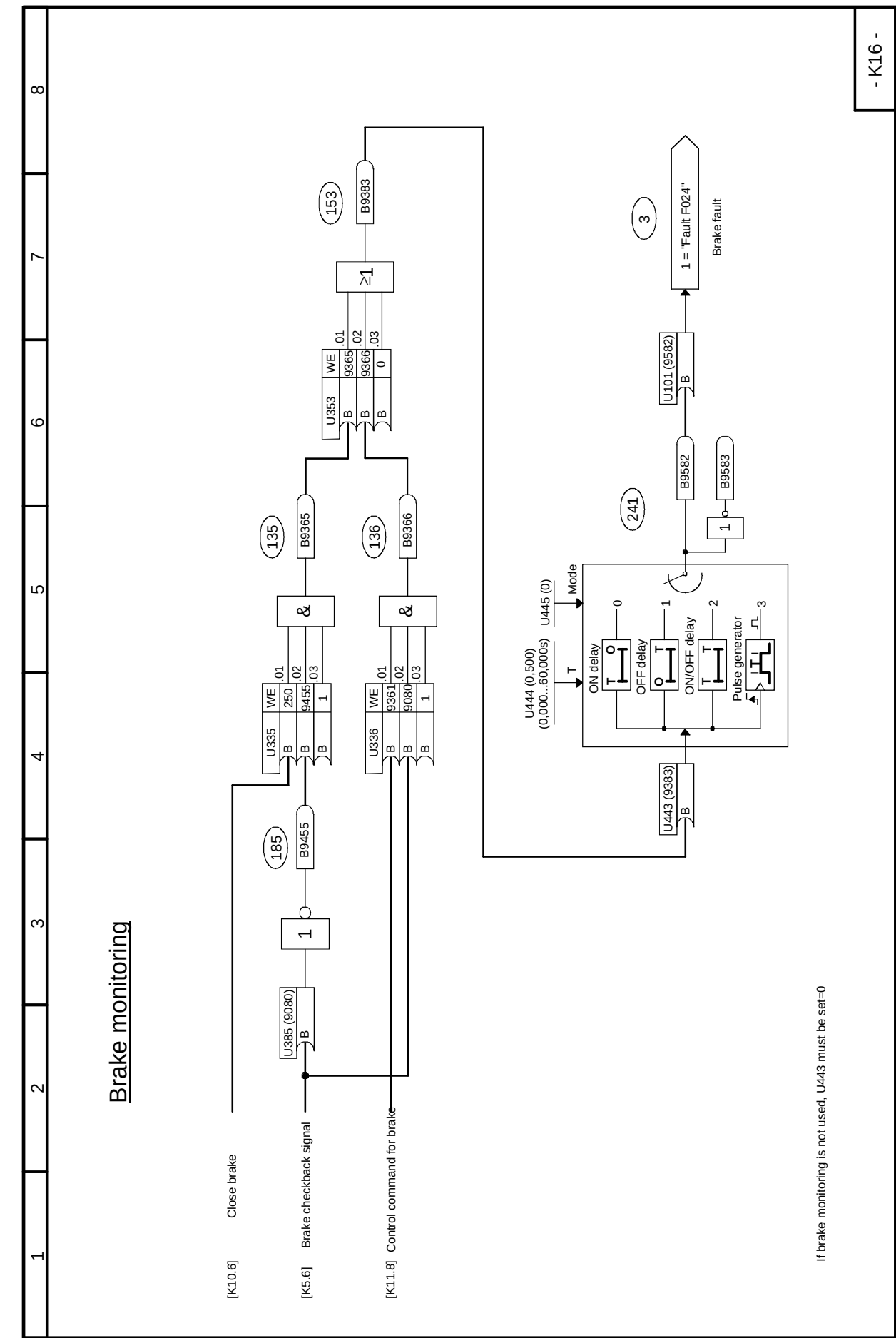
- K14 -

Setpoint reduction on reaching a pre-limit switch

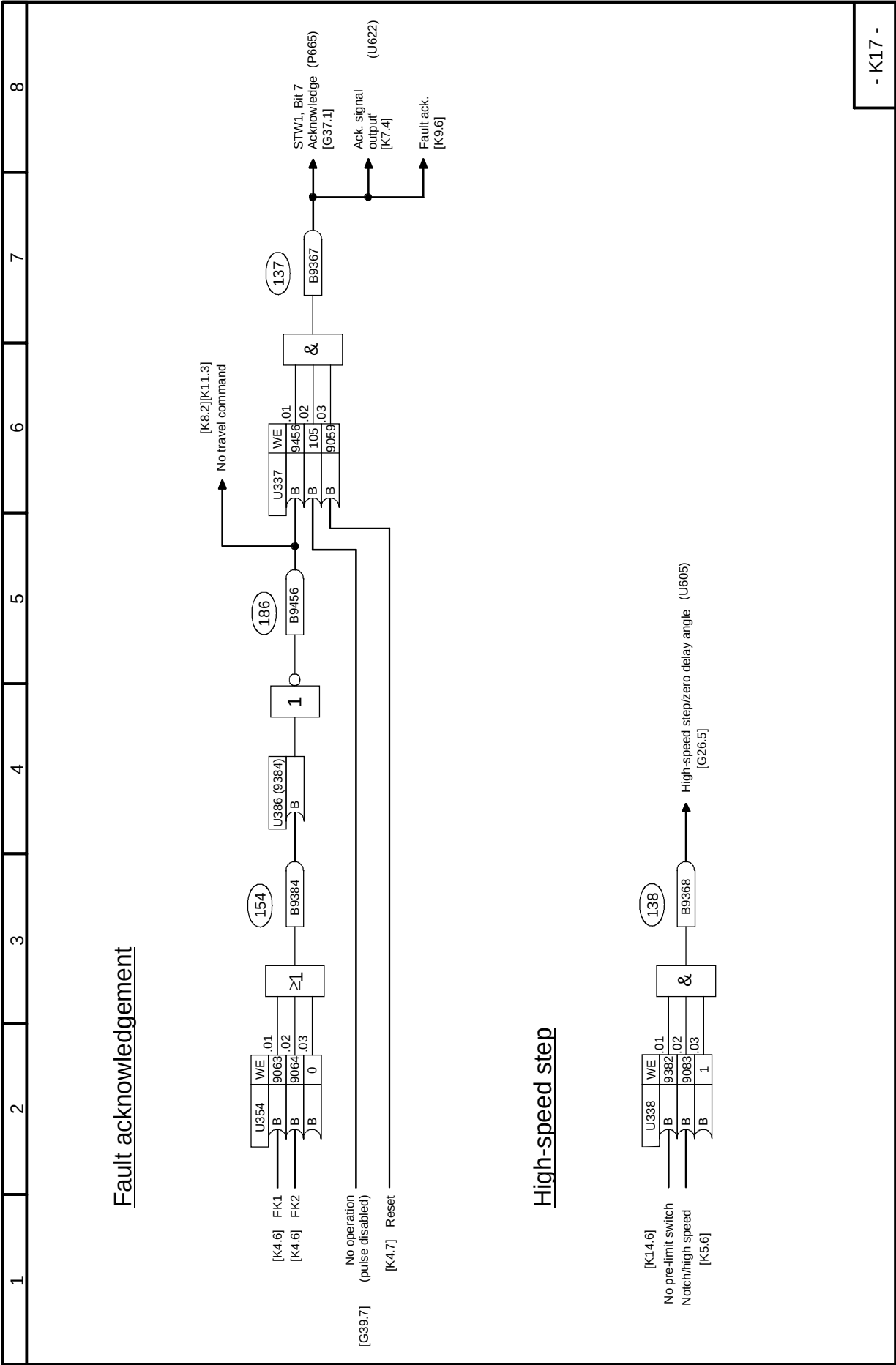


Sheet K15 Ramp-down monitoring

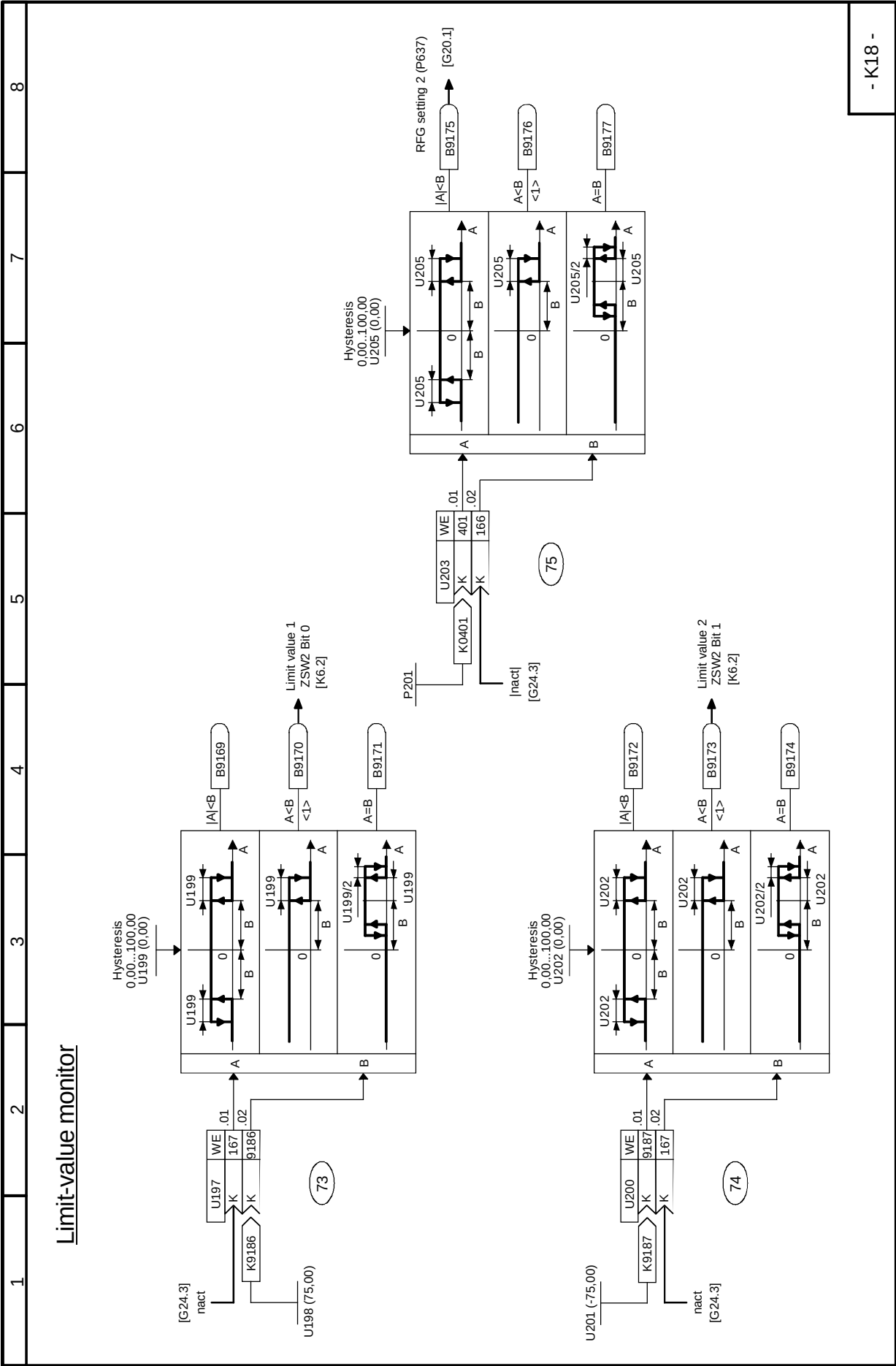
Sheet K16 Brake monitoring



Sheet K17 Fault acknowledgement, high-speed step



Sheet K18 Limit-value monitor



9 Function descriptions

NOTE

The converter functions available can be found in the function diagrams (block diagrams) in Section 8.
Section 9 is not intended to be a complete description of these functions, but is aimed at explaining in more detail individual features which could not be shown graphically in sufficient detail in the figures, and to explain their applications using examples.

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%.

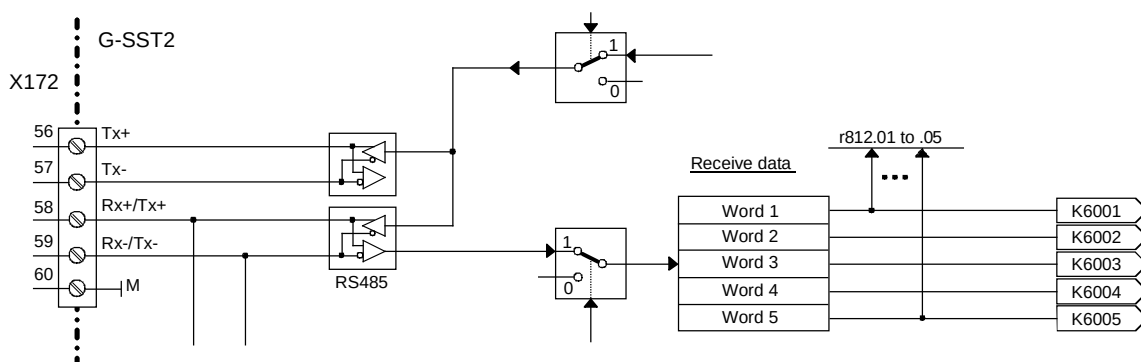
K0009 is assigned to different signal quantities. Which signal quantity it actually refers to is dependent on the selector switch (parameter) at which connector number 9 is set. A description can be found under the relevant parameter number in the Parameter List. If the Parameter List or block diagram 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 28) G32)



Binectors

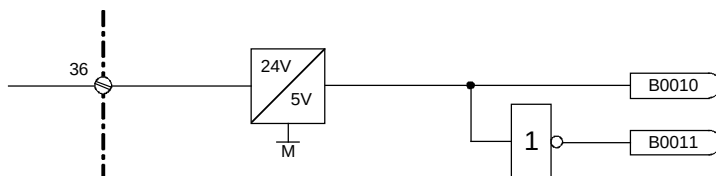
All binary output quantities and important binary output signals of the function blocks are available as "Binectors" (connectors for binary signals). Binectors can assume states log. "0" and log. "1". The quantities accessed via binectors correspond to output signals or measuring points in a digital 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 2) G2)

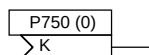


Selection switches, connections

(see also Section "Data sets")

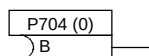
The inputs of function blocks are defined at "selection switches" by setting the appropriate selection parameters. The input is defined by entering the number of the connector or binector to be applied as the input quantity in the parameter for the relevant selection switch.

Representation in function diagrams (examples):



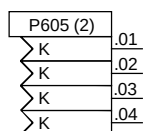
Selection of a connector

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



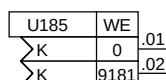
Selection of a binector

Parameter number = P704, factory setting = 0 (i. e. fixed value 0)



Selection of connectors ("indexed" parameter with 4 indices)

Parameter number = P605, factor setting = 2 (i. e. fixed value 200%; this factory setting applies to all the indices of P605)

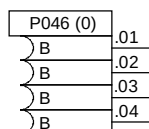


Selection of connectors ("indexed" parameter with 2 indices)

Parameter number = U185

Factory setting for index .01 + 0 (i. e. fixed value 0%)

Factory setting for index .02 = 9181 (i. e. connection with connector K9181)



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)

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.

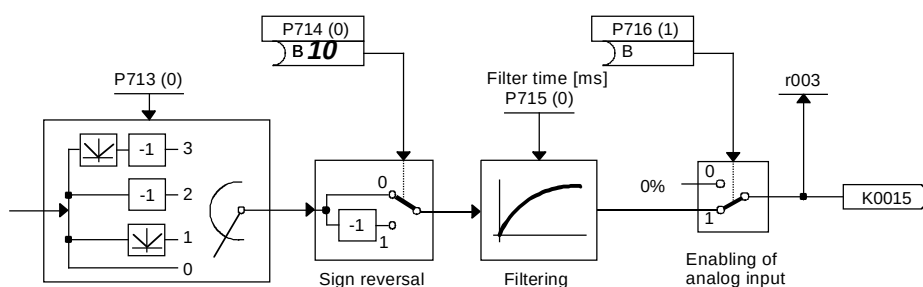
Examples: Some examples of how to handle connectors and binectors are given below.

Example 1: As a function of the status of terminal 36 (B0010 - see Section 8, Sheet G2), 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:

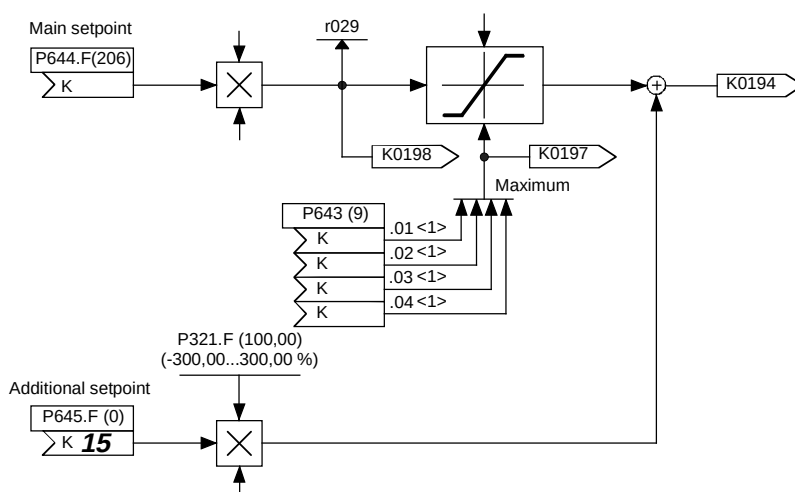
1. P714 = 10: Selects binector B0010 (status of terminal 36) as the control signal for sign reversal. The setting for parameter P716 remains on 1 (= fixed value 1, as supplied). This means the analogue input is always connected.

Section 8, Sheet 15: G5:



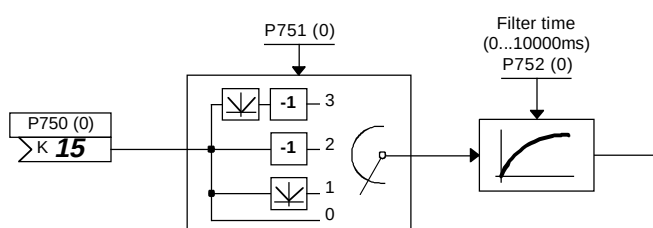
2. P645 = 15: Applies connector K0015 to the additional setpoint input when the setpoint is processed

Section 8, Sheet 15: G19:



3. P750 = 15: Applies connector K0015 to the input of the function block for the analog output terminal 14. This example of K0015 illustrates how it is possible to apply a connector as an input signal to any number of function blocks.

Section 8, Sheet 15: G7:

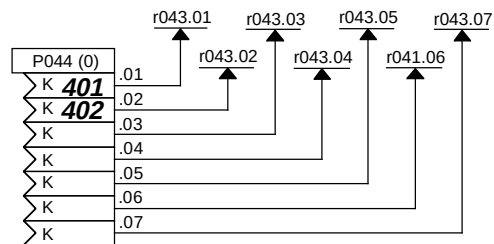


Example 2: The contents of connectors K0401 and K0402 must be output on the connector displays (parameter r043)

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

P044.index.01 = 401: Links connector K0401 to the 1st connector display
 P044.index.02 = 402: Links connector K0402 to the 2nd connector display

Section 8, Sheet 15: G12:



The following values are now displayed in parameter r043:

r043.index.02: Contents of connector K0401
 r043.index.02: Contents of connector K0402
 r043.index.03: 0
 to
 r043.index.07: 0

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.

P749 (0)
 ↓
 Setting parameter
 Parameter number = P749, factory setting = 0

P462.F(10.00s)
 (0.01...300.00s)
 Ramp-up time
 ↓
 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 function diagram Sheet G5 defines the signal type of the analog input (voltage input $\pm 10V$, current input 0...20mA, current input 4...20mA).

P705 in function diagram Sheet G5 determines the filter time for the analog input (adjustable in ms).

Parameters P520 to P530 in Section 8, Sheet G25 determine the shape of the friction characteristic.

P465 in Section 8, Sheet G14 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, Sheet 34). G38). 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, Sheet 34). G38). 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 parameter

The values of certain signals can be output using display parameters (r parameters, n parameters). Connector displays (Section 8, Sheet G9) 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 current controls, are called up and calculated in synchronism with the firing pulses (i.e. every 3.333 ms at a line frequency of 50 Hz).

The parameter settings are processed in a further computation cycle with a cycle time of 20ms.

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 firing pulse cycle.

9.3 Commands for switch on, shutdown and disabling of the firing pulses

NOTE

The commands described here for switch on, shutdown and disabling of the firing pulses are part of the command specified using "control word 1" (see Section 8, function diagram Sheet G37). The Switch on/Shutdown (ON/OFF1) and "enable operation" commands are controlled by default by the crane control contained in the SIMOTRAS HD or by the external safety monitoring system ("mechanical stop") (see Section 6.1). The commands "Disconnect voltage (OFF2)" and "Fast stop (OFF3)" are not used in standard applications.

9.3.1 Switch-on / shutdown (ON / OFF1): terminal 37 - control word 1, bit 0

The "Shutdown" command causes the controlled braking of the drive unit to a standstill, disabling of the firing pulse and dropout of any line contactor present if controlled by binector B0124.

The switch on command (bit 0 in control word 1) is formed from the logical operations:

- ON / OFF1 from the crane control (see Section 6.1), applied by P654=9360
- "Switch-on / Shutdown" signal from terminal 37 (ext. "electrical stop")
- Bit 0 on the connector selected via P648
- Switch on commands from INCH and CRAWL

See also Section 8 function diagrams, Sheets G18 and G37.

Operating modes:

U617 = 0: Signal from terminal 37 not active, ON command comes from the crane control

U617 = 1: AND operation between terminal 37 and ON from the crane control (ON only if both are log. 1). External "Electrical stop" via terminal 37

P648 = 9: The control bits in control word 1 are input bit-serially.
Bit 0 on the connector selected via P648 is not active.
The ON command is created depending on U617 (see above).

P648 ≠ 9: The connector selected via P648 is used as control word 1.
The ON command is created depending on U617 (see above). In addition, the signal generated there is ANDed with bit 0 of the connector selected via P648 (ON only if both signals are log. "1").

P445 = 0: The ON command is level-triggered.
The ON command is created depending on U617 and P648 (see above):
1=ON, 0=OFF

P445 = 1: The ON command is edge-triggered.
The ON command created depending on U617 is saved at the 0 → 1 transition. The binector selected in P444 must be in the log. "1" state. The memory and thus the OFF command is reset when this binector switches to the log. "0" state.

Sequence of operations for switching on drive:

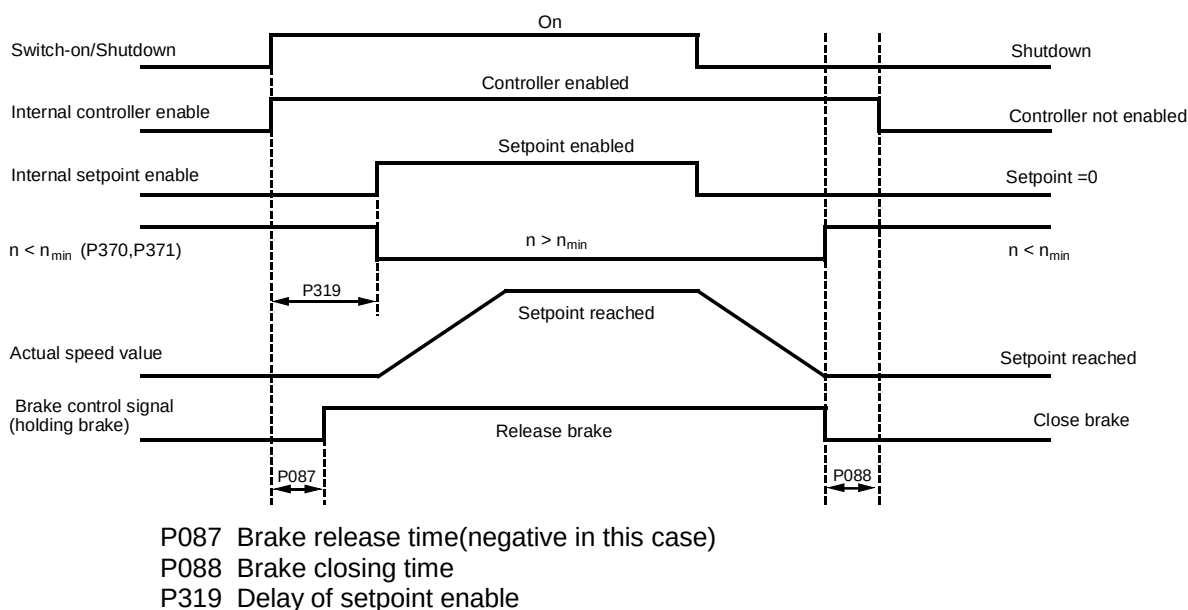
1. Enter the "Switch-on" command (e.g. via terminal "Switch-on/shutdown")
2. The converter exits operating state 07
3. Any "line contactor" present will pull in if controlled via B0124

If "Enable operation" signal is applied:

5. 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 6 immediately, brake remains closed (binector B0250 = 0)
6. Technology controller, ramp-function generator, n and I controllers are enabled
7. When a negative brake release time (P087) has run down, output signal "Release holding or operating brake" (binector B0250 = 1).

Sequence of operations for shutting down drive:

1. Enter the "Shutdown" command (e.g. via terminal "Switch-on / shutdown")
2. Decelerate along ramp-function generator ramp
3. Wait until $n < n_{\min}$ (P370, P371)
4. Output signal "Close holding or operating brake" (binector B0250 = 0)
5. Wait for brake closing time (P088) to run down
6. Input $i_{\text{set}} = 0$
7. Technology controller, ramp-function generator and n controller are disabled
8. The pulses are disabled when $I = 0$
9. Any "line contactor" present will drop out if controlled via B0124
10. The converter reaches operating state o7.0 or higher



- 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.

9.3.2 Operating enable: terminal 38 - control word 1, bit 3

The command "No enable operation" causes the fastest possible disabling of the firing pulses, but no drop out of any line contactor present, if controlled using binector B0124.

The enable operation command (bit 3 control word 1) is formed from the logical operations :

- Enable from the crane control (see Section 6.1), applied via P661=9382 and
- "Enable operation" signal from terminal 38 with crane drive control as described in Section 6 or
- Bit 3 on the connector selected via P648

See Section 8, Sheet G37.

Operating modes:

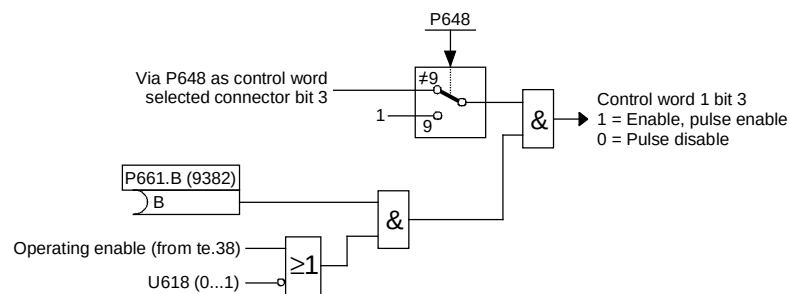
U618 = 0: Signal from terminal 38 not active, enable comes from the crane control

U618 = 1: AND operation between terminal 38 and enable from the crane control (enable only if both are log. 1).

P648 = 9: The control bits in control word 1 are input bit-serially.
Bit 3 on the connector selected via P648 is not active.
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 33). G37).

P648 ≠ 9: The connector selected via P648 is used as control word 1. Bit 3 on this connector is ANDed with the enable operation signal as for the log. AND signal with P648=9.

To ensure that the "Operating enable" function can be activated, the conditions defined in the following diagram must be fulfilled:



Sequence of operations for enabling operation (if a switch-on command is applied):

1. Enter the "Enable operation" command
2. With a positive brake release time (P087), output a "Release holding or operating brake" signal (binector B0250 = 1) and wait for P087 to run down in operating state 01.0, with a negative brake release time (P087 negative), go to step 3 immediately, brake remains closed (binector B0250 = 0)
3. 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 $I_{\text{set}} = 0$
4. The pulses are disabled when $I = 0$
5. Output signal "Close operating brake" (binector B0250 = 0, when P080 = 2)
6. The converter reaches operating state 0.10 or higher
7. Drive coasts to a standstill (or is braked by the operating brake)
8. When $n < n_{\text{min}}$ (P370, P371) is reached, the signal "Close holding brake" is output (binector B0250, when P080 = 1)

9.3.3 OFF2 (voltage disconnection): control word 1, bit 1

The "voltage disconnection" command causes the fastest possible disabling of the firing pulses, and drop out of any line contactor present, if controlled using binector B0124.

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 33). G37).
- P648 ≠ 9: The connector selected via P648 is used as control word 1. Bit 1 of this 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. $I_{\text{set}} = 0$ 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. Any "line contactor" present will drop out if controlled via B0124
8. Drive coasts to a standstill (or is braked by the operating brake)
9. When $n < n_{\text{min}}$ (P370, P371) has been reached, the "Close holding brake" signal is output (binector B0250 = 0, when P080 = 1)

9.3.4 OFF3 (Fast stop): control word 1, bit 2

The "fast stop" command causes the fastest possible braking of the drive to a standstill and then disabling of the firing pulses and drop out of any line contactor present, if controlled using binector B0124.

The OFF3 signal is LOW active (log."0" state = fast stop).

The following operating modes are possible:

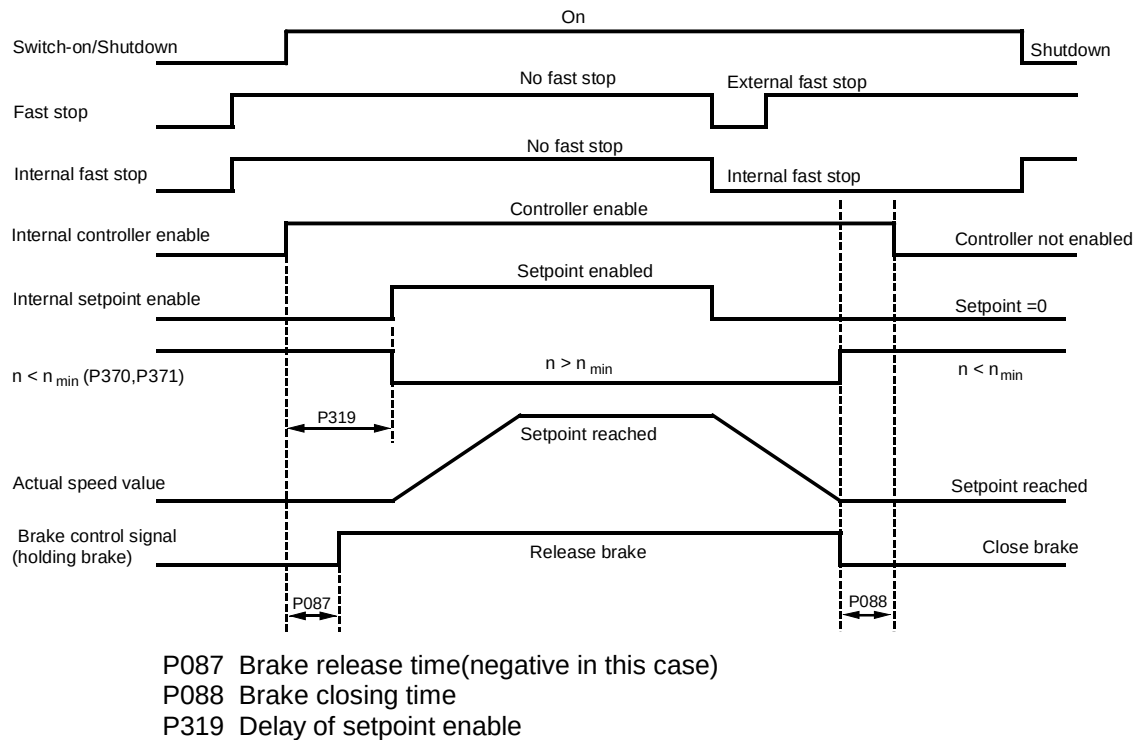
- P648 = 9: The control bits in control word 1 are input bit-serially. OFF3 is generated from the AND operation between the binectors selected with P658, P659 and P660 (see Section 8, Sheet 33). G37).
- P648 ≠ 9: The connector selected via P648 is used as control word 1. Bit 2 of this then controls the 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 $n_{\text{set}} = 0$
4. Decelerate along current limit (plugging)
5. Wait until $n < n_{\text{min}}$ (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 $I_{\text{set}} = 0$
9. Ramp-function generator and n controller are disabled
10. The pulses are disabled when $I = 0$
11. Any "line contactor" present will drop out if controlled via B0124
12. Converter reaches operating state o9.0 or higher

Sequence of operations for cancellation of "Fast stop":

1. Stop applying "Fast stop" command
2. Enter the "Shutdown" command (e.g. via terminal "Switch-on / shutdown")
3. Converter exits operating state o8



- 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 ("0" signal on the terminal).
- All "Fast stop" commands are ANDed by the SIMOTRAS 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.

9.4 Commands for specifying setpoints

NOTE

The commands described here for specifying setpoints are not used for standard applications.

9.4.1 Inching

See also Section 8, function diagram Sheet G17

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.

When the control word option is used, the following operating modes are possible (see also function diagram, Sheet G37):

- 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 via P648 is used as control word 1. Bits 8 and 9 of this control the INCHING input.

The "inching" function can only be executed when "Shutdown" ("0" signal on terminal 37) and "enable operation" ("1" signal on terminal 38) 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 "Inch" is specified, any "line contactor" which may be used is switched on (if controlled using B0124) and the inching setpoint is applied (procedure as for "Switch on / Shutdown").

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". 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 sec. if controlled via B0124 (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.

9.4.2 Crawl

See also Section 8, function diagram Sheet G18

The "Crawling" function can be activated in operating state 07 and, with "Operation enabled", in the Run state.

The "Crawl" command is entered when one or several of the binectors selected in P440 switches to the log. "1" state. A setpoint selected in parameter P441 is assigned to each binector. If the "Crawl" command is entered via several binectors, the setpoint values are added (limited to $\pm 200\%$).

Parameter P442 can be set to define for each possible crawl command source (binector) whether or not the ramp-function generator must be bypassed. When the ramp generator is bypassed, it operates with ramp-up/down times of 0.

Level / edge

P445 = 0: Level-triggered
Binector selected in P440 = 0: No crawl
Binector selected in P440 = 1: Crawl

P445 = 1: Edge-triggered
The input of "Crawl" is stored when the binector state changes from 0 $\rightarrow$ 1 (see Section 8, Sheet 18). The binector selected in P444 must be in the log. "1" state at the same time. The memory is reset when this binector switches to the log. "0" state.

Sequence of operations for entering Crawl command:

If "Crawl" is specified in operating condition o7, any "line contactor" used (if controlled via B0124) is switched on and the crawl set value is applied.

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 any line contactor present is de-energized if controlled via B0124 (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 9.3.1(Switch on / Shutdown) with regard to edge triggering and automatic re-start.

9.4.3 Fixed setpoint

See also Section 8, function diagram Sheet G15

The "Fixed setpoint" function can be activated in the "Run" state.

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 G34):

- P649 = 9: The control bits in control word 2 are input bit-serially. The binectors selected via P680 and P681 determine bits 4 and 5 of control word 2 (= bits 20 and 21 of complete control word), and thus input of the "Fixed setpoint" function.
- P649 ≠ 9: The connector selected via P649 is used as control word 2. Bits 4 and 5 of this word control the input of "Fixed setpoint".

The "Fixed setpoint" function is input when one or several of the named sources (binectors, bits in control word) switch to the log. "1" state. In this case, a setpoint selected in parameter P431 is assigned to each source. If "Fixed setpoint" is input via several sources simultaneously, the associated setpoints are added (limited to $\pm 200\%$).

Parameter P432 can be set to define for each possible fixed setpoint source (binector, bit in control word - logic operation, see block diagram in Section 8) whether or not the ramp-function generator must be bypassed. When the ramp generator is bypassed, it operates with ramp-up/down times of 0.

Sequence for entering Fixed setpoint function:

The fixed setpoint is injected instead of the main setpoint.

Sequence for cancellation of Fixed setpoint function:

When all the possible sources for injecting the fixed setpoint (binectors, bits in control word) have changed back to log. "0", the setpoint selected in parameter P433 (main setpoint) is switched through again.

9.5 Ramp-function generator

See also Section 8, function diagram Sheet G20

NOTE

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)

9.5.1 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%:

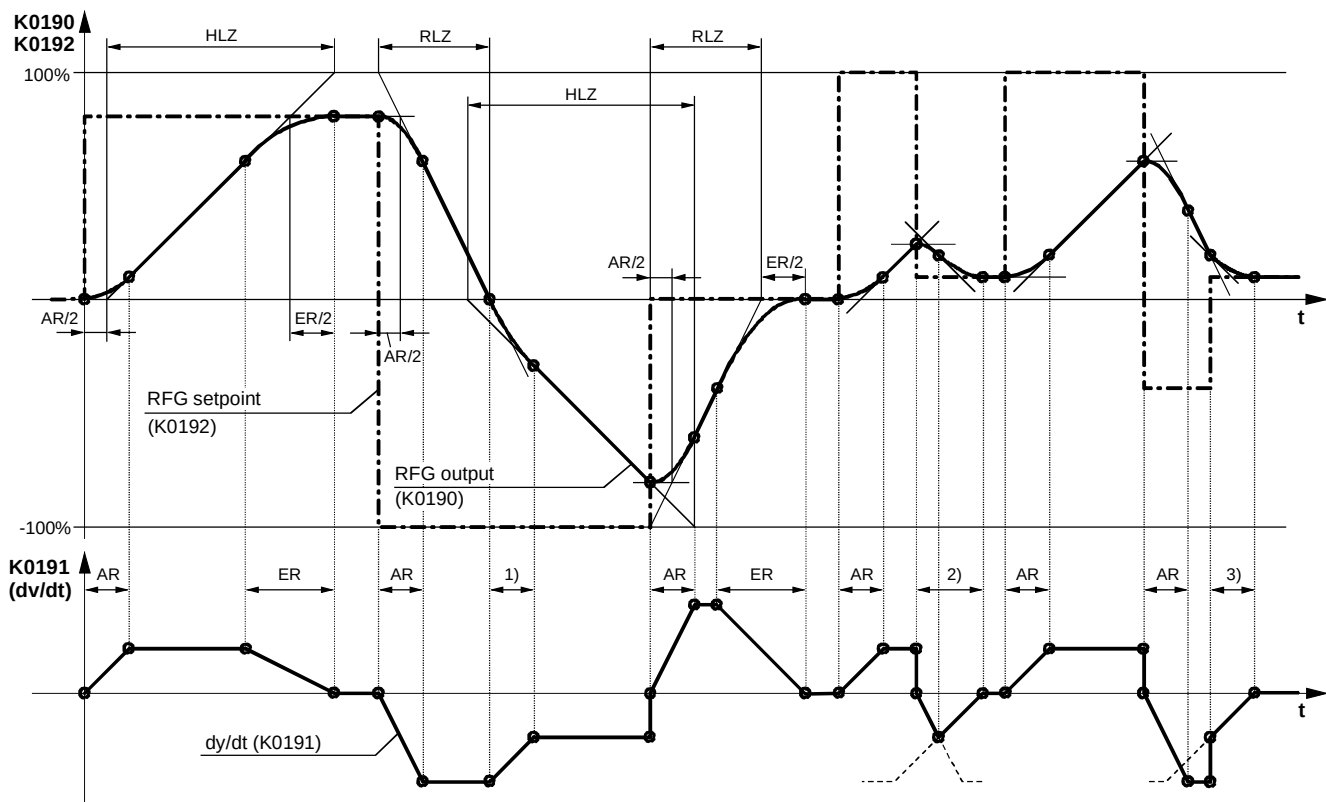
From -10% to 0 = ramp-down and

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 0% 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.

9.5.2 Operating principle of ramp-function generator



HLZ ... Ramp-up time (P303, P307, P311),

RLZ ... Ramp-down time (P304, P308, P312)

AR ... Lower transition rounding (P305, P309, P313), ER ... Upper transition rounding (P306, P310, P314)

1) Transition from the ramp-down gradient to the ramp-up gradient

2) A transition from the lower rounding to upper rounding takes place before the maximum ramp-down gradient is reached

3) The ramp-function generator input step means that only the final part of the upper transition rounding is performed

9.5.3 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.

9.5.4 Ramp-function generator settings 1, 2 and 3

Selection via binectors selected in parameters P637 and P638

Status of binector selected by parameter		Ramp function generator setting	Effective runup time	Effective rundown time	Effective lower transition rounding	Effective upper transition 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.

The selection parameter for the switchover to RFG setting 2 is set to 129 in the factory setting (binector B0129: 0=positive speed setpoint / hoist, 1=negative speed setpoint / lower). Thus, switching takes place automatically to RFG setting 1 for hoisting and to RFG setting 2 for lowering.

9.5.5 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 generator setting then changes to that selected in P302.

When the enable signal for ramp-up integrator switchover is cancelled ($\rightarrow 0$), ramp-function generator setting 1 is activated again and, with a new enable command ($\rightarrow 1$), this setting continues to remain active until the generator output has reached its setpoint again. The ramp generator setting selected in P302 is then activated again.

When a "Shutdown" command is given, the drive is shut down according to setting 1.

Note:

Activation of "Ramp-function generator setting 2" (P307 to P310, selected in P637), or "Ramp-function generator setting 3" (P311 to P314, selected in P368), has priority over the generator setting selected by means of the "Ramp-up integrator" function.

9.5.6 Ramp-function generator tracking

The ramp-function generator output (K0190) is limited to the following values when ramp-function generator tracking is activated:

$$\frac{-I_{A, \text{grenz}} * 1,25}{K_p} + n_{\text{ist}} < HLG - \text{Ausgang} < \frac{+I_{A, \text{grenz}} * 1,25}{K_p} + n_{\text{ist}}$$

n_{ist}	Actual speed value (K0167)
$+ I_{A, \text{grenz}}$	Lowest positive current limit (K0131)
$- I_{A, \text{grenz}}$	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 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).

9.5.7 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%

9.5.8 Velocity signal dv/dt (K0191)

This signal specifies the change in the ramp-function generator output K0190 in the time period set in P542.

9.6 Speed controller

See also Section 8, function diagram Sheet G24

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 G38):

- P649 = 9: The control bits in control word 2 are input bit-serially.
The binectors selected in P684, P685 and P687 determine bits 8, 9 and 11 of control word 2 (= bits 24, 25 and 27 of complete control word), and thus the functions "Enable speed controller droop", "Enable speed controller" and "Switch over master/slave drive".
- P649 ≠ 9: The connector selected in P649 is used as control word 2.
Bits 8, 9 and 11 control the functions "Enable speed controller droop", "Enable speed controller" and "Switch over master/slave drive".

Enable speed controller:

- 0 = Disable controller, controller output (K0160) = 0, P component (K0161) = 0, I component (K0162) = value of connector selected in P631
- 1 = Enable controller

Enable droop:

- 0 = Droop is not active
- 1 = Droop is active

Switch over master/slave drive:

- 0 = Master drive
- 1 = Slave drive

When "Slave drive" is selected, the I component of the speed controller is made to "track" such that $M(\text{set, n contr.}) = M(\text{set, limit.})$, the speed setpoint is set to equal the actual speed (K0179) (enable tracking with P229).

Set I component

The I component is set to the setting value (selected via parameter P631):
When 0 ⇒ 1 signal transition of binector selected via parameter P695

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 reaches the 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.
Enabling of function via P698

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.

9.7 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 and inverted on B0256:

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 G4, 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). Any "line contactor" used will then be activated if controlled via B0124

When the "Shutdown" command is entered, the firing pulses are disabled when $n < n_{\min}$ is reached and any line contactor used drops out (if controlled via B0124). 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 any line contactor used is closed immediately instead (if controlled via B0124).

9.8 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 (using P055 or P057). The intentional changes vis-à-vis the "basic" version should then be entered in each parameter set.

The "Switch over parameter sets" function affects function parameters (identified by an ".F" next to parameter number in block diagrams in Section 8) and Bico parameters (identified by a ".B" next to parameter number in block diagrams in Section 8).

The following operating modes are possible (see also Section 8, Sheet G38):

- 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 (active index)
Bit 16	Bit17	
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:

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.

9.9 Serial interfaces

The SIMOTRAS 6SG70 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 G29 to G33.

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.

9.9.1 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 SIMOTRAS 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 G29 to G31 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.

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.

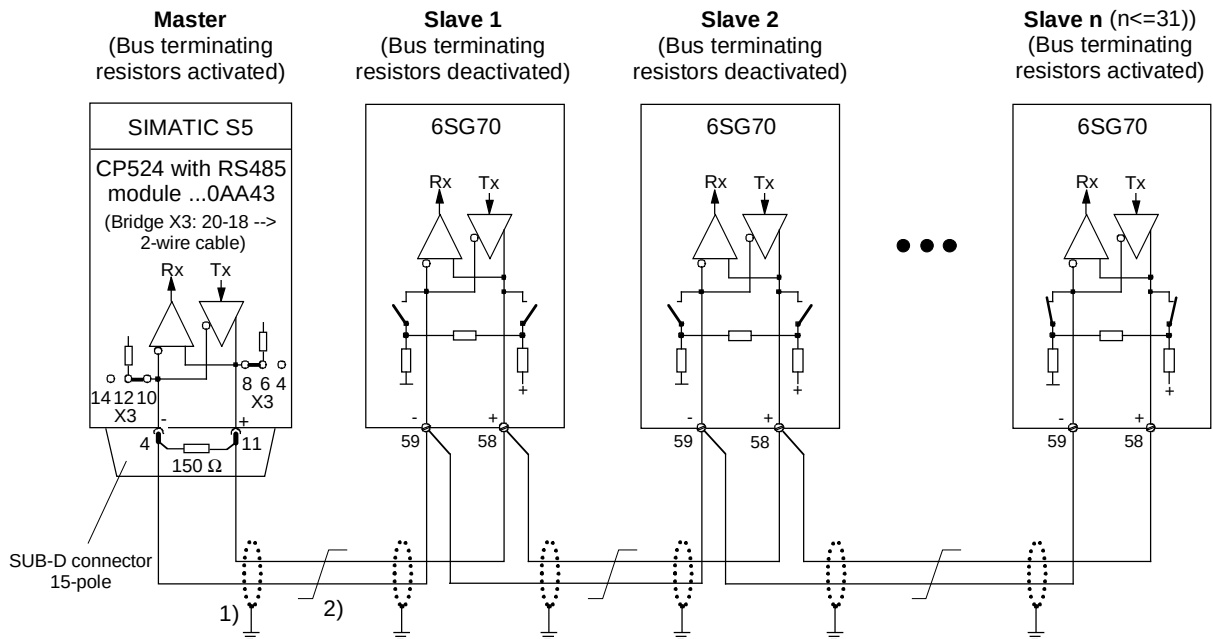
Important !

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 6SG70 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): Meaning of control bit 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 terminator	P785 = 0: bus terminator OFF 1: bus terminator ON	P785 = 0: bus terminator OFF 1: bus terminator ON	P795 / P805 = 0: bus terminator OFF 1: bus terminator 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 25 in Sect. G29	See operating instructions for OP1S operator panel	Connector assignments, see Sect. 6.8 or Sheets 26, 27 in Sect. G30, G31

Connection example for a USS bus



- 1) The interface cable shields should be connected at low impedance directly to the converters on the converter or cabinet ground (e.g. using a clamp).
- 2) Twisted-pair cable, e.g. LIYCY 2x0.5 qmm; in the case of longer cable runs, an equipotential bonding conductor should be used to ensure that the difference of the frame potentials between the connected units remains below 7V.

9.9.2 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
- Torque setpoints
- Acceleration setpoints (dv/dt)
- Control commands

Useful data which can be transferred via the peer-to-peer link

Sheets G32 and G33 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.

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

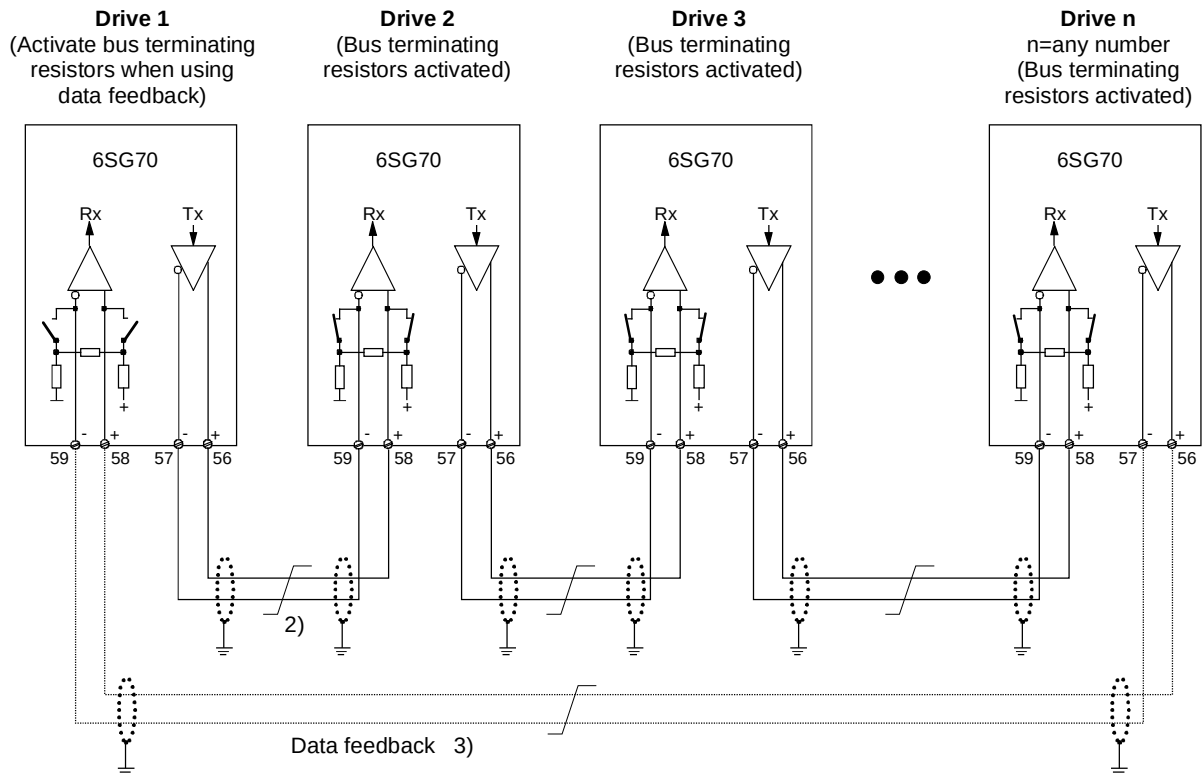
Serial linking of converter to converter (partners of equal status).

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 6SG70 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 terminator	P795 = 0: bus terminator OFF 1: bus terminator ON (depending on type of link)	P805 = 0: bus terminator OFF 1: bus terminator 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 29 in Section 8 G32	Terminal assignments, see Section 6.8 or Sheet 29 in Section 8 G33

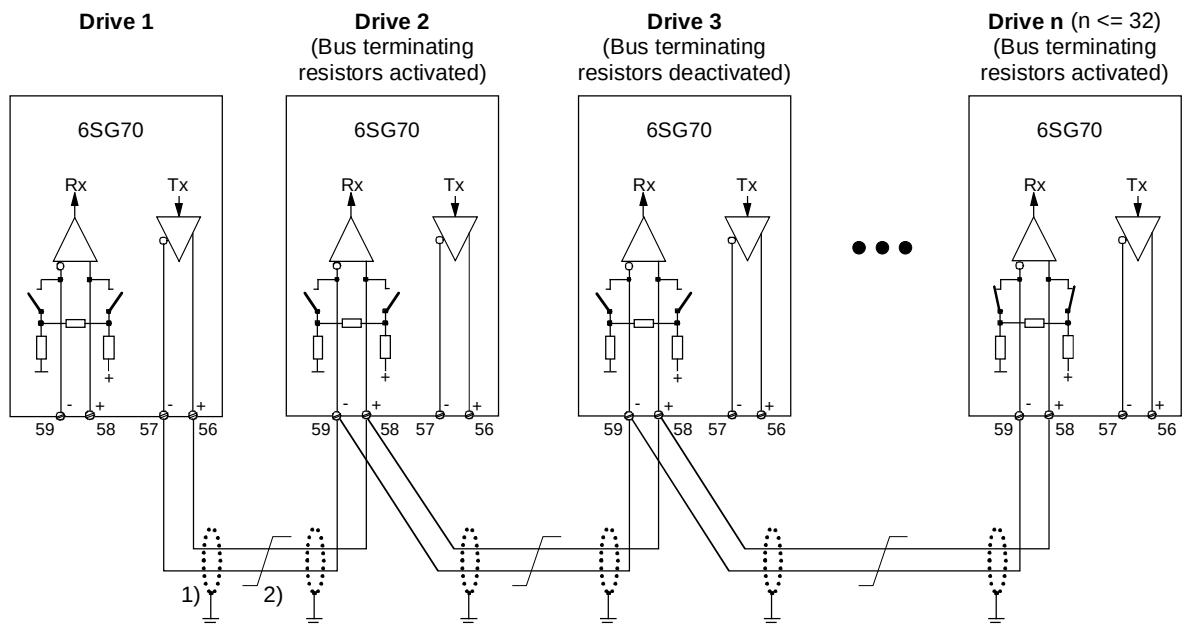
Examples of peer-to-peer links



Type of peer connection "Series connection"

Each drive receives its setpoint from the preceding drive (classical setpoint cascade)

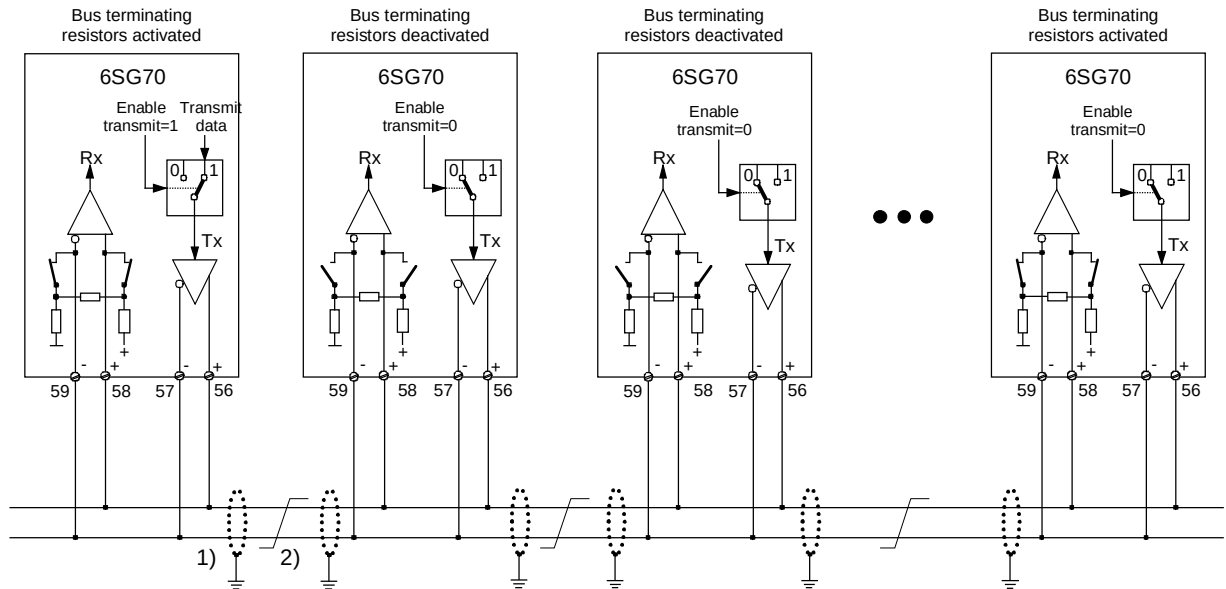
- 1) The interface cable shields should be connected at low impedance directly to the converters on the converter or cabinet ground (e.g. using a clamp).
- 2) Twisted-pair cable, e.g. LIYCY 2x0.5 qmm; in the case of longer cable runs, an equipotential bonding conductor should be used to ensure that the difference of the frame potentials between the connected units remains below 7V.
- 3) Optional data feedback that drive 1 uses to monitor the operation of the entire peer-to-peer network.



Type of peer connection "Parallel connection"

Up to 31 drives receive identical setpoints from drive 1

- 1) The interface cable shields should be connected at low impedance directly to the converters on the converter or cabinet ground (e.g. using a clamp).
- 2) Twisted-pair cable, e.g. LIYCY 2x0.5 qmm; in the case of longer cable runs, an equipotential bonding conductor should be used to ensure that the difference of the frame potentials between the connected units remains below 7V.



Type of peer connection "Bus connection"

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

- 1) The interface cable shields should be connected at low impedance directly to the converters on the converter or cabinet ground (e.g. using a clamp).
- 2) Twisted-pair cable, e.g. LIYCY 2x0.5 qmm; in the case of longer cable runs, an equipotential bonding conductor should be used to ensure that the difference of the frame potentials between the connected units remains below 7V.

9.10 Thermal overload protection of motor (I²t monitoring of motor)

The I²t 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).

Adaptation

P114: A time constant T_{motor} in minutes for the I²t monitoring function must be entered in parameter P114.

P100: The rated motor current in amperes as specified on the rating plate must be entered in parameter P100.

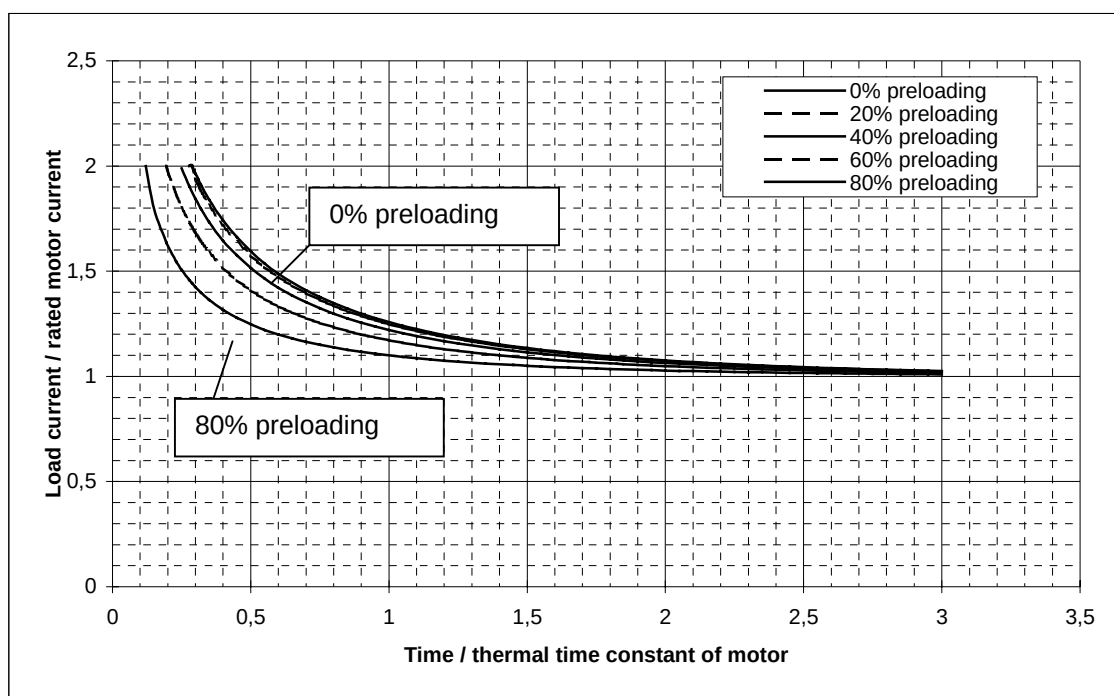
Warning characteristic / switch-off characteristic

If the motor is loaded constantly, for example, with about 125% of the rated 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 I²t monitoring function

This diagram shows how long it takes for an alarm message to be triggered if, after a long preloading period ($> 5 \cdot T_{\text{th}}$), a new constant load value is injected abruptly.

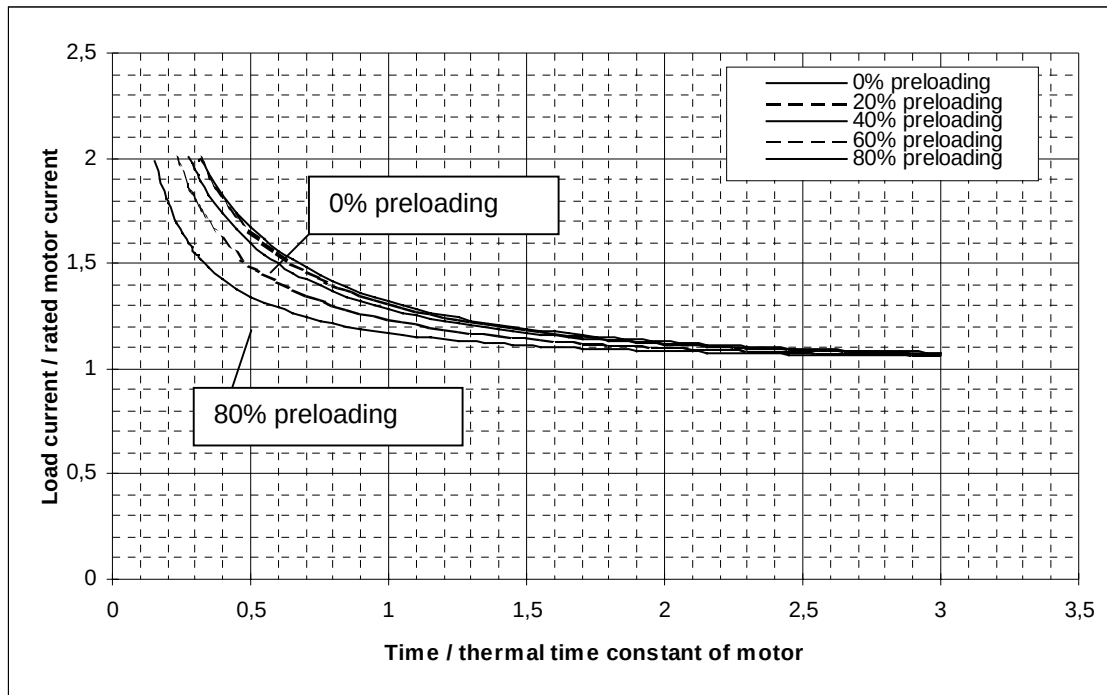
$T_{\text{th}} = P114$.. thermal time constant of motor



Fault message triggering by motor I²t monitoring function

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

T_{th} = P114 .. thermal time constant of motor



NOTE

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 converter is switched on again (e.g. with "Automatic restart function") within 2 s of the electronics power supply failing, then the last calculated I²t value of the motor is applied.

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.

9.11 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 SIMOTRAS 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, excessively high or low line frequencies.

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"):

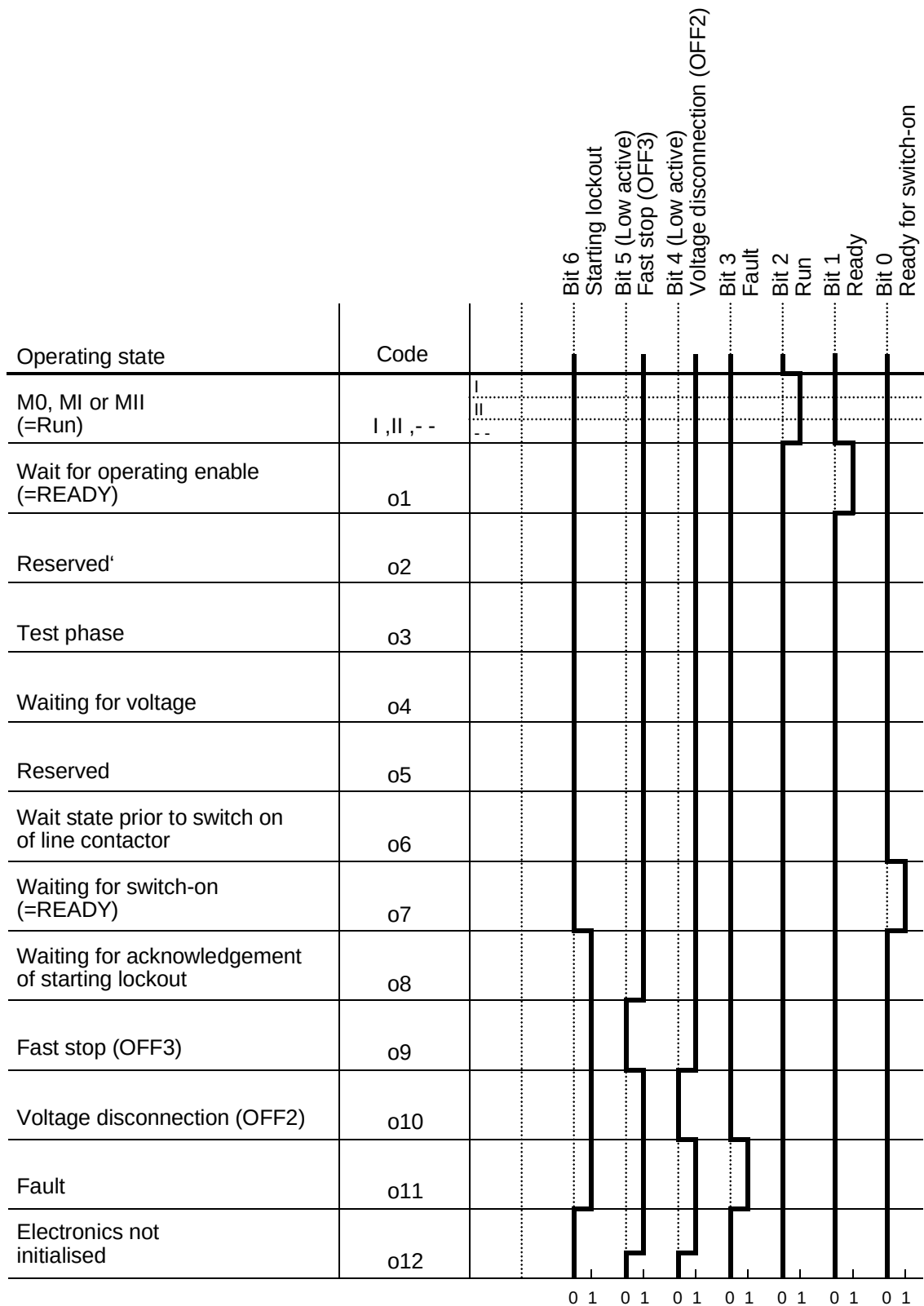
- F001 Failure of electronics supply in operation (5U1, 5W1)
- F004 Phase failure in the supply to the power section (1U1, 1V1, 1W1)
- F006 Undervoltage in the supply to the power section
- F007 Overvoltage in the supply to the power section
- F008 Mains frequency below 45Hz
- F009 Mains frequency above 65Hz

When one of the fault conditions associated with faults F004, F006, F008, F009 is active and the automatic restart time delay is still running, the converter dwells in operating state 04.0.

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.

9.12 Status description of some bits of status word ZSW1



10 Faults and alarms

When a fault or alarm message is activated, it is displayed both on the simple operator control panel (PMU) and on the OP1S user-friendly operator control panel (see also Section 7.2, Operator control panels).

An alarm stops being displayed immediately the cause of the alarm signal has been eliminated.

A fault message must be cancelled by pressing the P key on the PMU or Reset key on the OP1S (panel must be in "Operational display" status) as soon as the cause has been eliminated.

NOTE

Setting parameters when fault or alarm message is active

On the PMU:

You can shift an active fault message or alarm "to the background" by pressing the P key and Higher key simultaneously on the PMU.

If you do not press any key on the PMU within a 30 s period, the fault message or active alarm in the background is automatically displayed again.

You can fetch a message back to the foreground earlier by pressing the P key and Higher 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 can only occur in certain operating states.
(see list of fault messages)

The system responses to a fault are as follows:

- The stator current is reduced, the firing pulses are disabled and the SIMOTRAS 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	Description	
No.	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	-
F002	Anti-clockwise field on power connections (1U1, 1V1, 1W1) (active in all operating states)	
F004	Phase failure on power connections (1U1, 1V1, 1W1) (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 before activating the fault message. Possible fault causes: •Parameter P353 is incorrectly set •Line contactor has opened in operation •Fuse has blown in incoming power section supply •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 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) 5 2-phase current (e.g. because a phase is missing)	
F006	Undervoltage (active in operating states of = o4) The voltage at terminals 1U1, 1V1 or 1W1 is lower than the response threshold for longer than the "restart time" set in P086. Response threshold for supply voltage: $P078.001 * (1 + \frac{P351}{100\%})$ Possible causes of fault • Line undervoltage • Monitoring values set too sensitively or incorrectly (P351, P078) Fault value: r047 Index 002 to 016:	
	1 Undervoltage has occurred	i002 Number of phase that has activated fault message 0 ... Phase UV 1 ... Phase VW 2 ... Phase WU 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 is higher than the response threshold (for longer than the "restart time" set in P086). Response threshold for supply voltage: $P078.001 * (1 + \frac{P352}{100\%})$ Possible causes of fault • Line overvoltage • Monitoring values set too sensitively or incorrectly (P352, P078)	
	NOTE 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	i002 Number of phase that has activated fault message 0 ... Phase UV 1 ... Phase VW 2 ... Phase WU i003 Incorrect voltage value (normalized to 16384)
	4 Overvoltage persists for longer than time set in parameter P086 (if this is >0)	-
F008	Line frequency lower than 45Hz (active in operating states of = o5) This fault message is activated when the line frequency drops below 45Hz (for longer than the "restart time" set in parameter P086). Fault value:	
	1 Line frequency lower than 45Hz	
	4 Line frequency lower than 45Hz for longer than time set in P086 (if this is >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)
F009	Line frequency higher than 65Hz (active in operating states of = 05)	
	This fault message is activated when the line frequency exceeds 65Hz (for longer than the "restart time" set in parameter P086)..	
	Fault value:	
	1	Line frequency higher than 65Hz
	4	Line frequency higher than 65Hz for longer than time set in P086 (if this is >0)

10.1.2.2 Interface error

F011	Telegram failure at GSST1 when <u>P780 = 2</u> : 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 causes of fault •Cable break •Error in USS master
	Telegram failure at GSST2 when <u>P790 = 2</u> : 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 causes of fault •Cable break •Error in USS master when <u>P790 = 4 or 5</u> and <u>P798 = 32 or 33</u> : Peer-to-peer telegram failure at G-SST2 (active in operating states of ≤ 06) After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P797. Possible causes of fault •Break in connecting cable •EMC interference on connecting cable •P797 is set too low
F013	Telegram failure at GSST3 when <u>P800 = 2</u> and <u>P808 = 32 or 33</u> : 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 causes of fault •Cable break •Error in USS master when <u>P800 = 4 or 5</u> : Peer-to-peer telegram failure at G-SST3 (active in operating states of ≤ 06) After the receipt of the first valid protocol, no further telegrams have been received within the time period set in parameter P807. Possible causes of fault •Break in connecting cable •EMC interference on connecting cable •P807 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)
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 causes of fault • 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 1 st 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	
F018	Short circuit or overloading of binary outputs (active in all operating states) Possible causes of fault • Short circuit or overload at terminals 46, 48, 50 or 52 and 26 or 34	
	Fault value: 1 Short circuit or overload at binary outputs	r047 Index 002 to 016: 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 or 210 (24 V output)

10.1.2.3 External faults

F021	External fault 1 (active in all operating states) Bit 15 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 control word 2 was in the log. "0" state for longer than the time set in P360 index 002.	
F023	Ramp-down monitoring (active in all operating states) The travel command has been cancelled but the minimum speed (P370) has not been reached within the period specified in U444. For further details, see the description of the crane control in Section 6.1 (suggested connection)	
F024	Electrical stop (active in all operating states) The SIMOTRAS HD has initiated the "Electrical Stop" function (controlled shutdown of drive) as the motor or the SIMOTRAS power section is overloaded. For further details, see the description of the crane control in Section 6.1 (suggested connection)	
F025	External fault 5 (active in operating states of ≤ 03 if P495=2) A log. "0" signal has been on terminal 211 for more than 10s.	

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)
F026	External fault 6 (active in operating states of ≤ 06 if P496=2) A log. "1" signal has been on terminal 212 for more than 2s.	
F027	External fault 7 (active in operating states of <06 if P497=2) A log. "0" signal has been on terminal 213 for more than 40s.	
F028	External fault 8 (active in operating states of ≤ 06 if P498=2) A log. "0" signal has been on terminal 214 for more than 10s.	

10.1.2.4 Fault messages from motor sensors

F029	Motor overtemperature (active in all operating states) Selection via P493=2 or 3 (temperature sensor at terminals 22 / 23) or P494=2 or 3 (temperature sensor at terminals 204 / 205) <u>When parameter P490.01=1 (KTY84 at terminals 22 / 23) or P490.02=1 (KTY84 at terminals 204 / 205):</u> The fault message is activated if the motor temperature reaches or exceeds the value set in parameter P492. <u>When parameter P490.01=2, 3, 4 or 5 (PTC thermistor at terminals 22 / 23) or P490.02=2, 3, 4 or 5 (PTC thermistor at terminals 204 / 205):</u> 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

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 causes of fault •Control loop interrupted •Incorrect tachometer polarity •Controller is not optimized •P590 or P591 is not correctly parameterized
F033	Fault message from free function block FB4 (active in all operating states) The binector connected via U102 is in the log. "1" state
F034	Fault message from free function block FB5 (active in all operating states) The binector connected via U103 is in the log. "1" state
F035	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 current limit reached •Stator current is greater than 1% of converter rated DC current •The actual speed value is less than 0.4% of maximum speed Possible causes of fault •Drive blocked

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)
F036	No stator current can flow (active in operating states of – –, I, II) This monitoring function responds if the firing angle is at 0° for more than 500 ms and the stator current is less than 1% of the converter rated DC current. Possible causes of fault • Break in motor cable	
F037	I²t motor monitor has responded (active in operating states of – –, I, II) This monitoring function responds when an I ² t value is reached which corresponds to the final temperature at 110% of the rated motor current. Possible causes of fault • Parameter P114 is incorrectly set • Drive has been operating for too long at >110% of rated motor current	
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 causes of fault • 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	I²t power section monitor has responded (active in operating states of – –, I, II) This monitoring function responds if the calculated I ² t value of the power section reaches the permissible value for the power section concerned (see also P075). Possible causes of fault • 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 causes of fault • 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) • 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 causes of fault • 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: 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)
F046	Analog select input for main setpoint (terminals 4 and 5) faulty (active in operating states of ≤ 06) 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 causes of fault •Open circuit in supply cable •P700 is incorrectly set	
F047	Analog select input 1 (terminals 6 and 7) faulty (active in operating states of ≤ 06) 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 causes of fault •Open circuit in supply cable •P710 is incorrectly set	

10.1.2.6 Start-up faults

F056	Important parameter is not set (active in operating states of ≤ 06) 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 current in P100 is still set to 0.0
F058	Parameter settings are not consistent (active in operating states of ≤ 06) Inconsistent values have been set in mutually dependent parameters. Fault value:	
	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
	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)
	10	P090 (stabilization time for supply voltage) $\geq$ P086 (time for automatic restart)
	11	P090 (stabilization time for supply voltage) $\geq$ 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 shutdown button (P444=0)

10.1.2.7 Hardware 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 (e.g. due to unprotected contactors, unscreened cables, loose screen connections)	

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:	r047 Index 002 to 016:
	1 Connection to EEPROM is faulty Possible causes of fault •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 causes of fault •"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 causes of fault •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 causes of fault •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 Calculated checksum i003 Checksum found in EEPROM
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 output. Possible causes of fault •A7001 electronics board is defective •Excessive EMC-related interference (e.g. due to unprotected contactors, unscreened cables, loose screen connections)	

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)
F065	Illegal microprocessor status (active in all operating states) An internal microprocessor hardware function monitors the microprocessor for illegal operating states. Possible causes of fault •A7001 electronics board is defective •Excessive EMC-related interference (e.g. due to unprotected contactors, unscreened cables, loose screen connections)	
F067	Converter cooling faulty (active in operating states of ≤ 013) The heatsink temperature monitoring function is activated 6s after connection of the electronics supply. Fault value: r047 Index 002 to 016:	
	1 Heatsink temperature > 95°C	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 causes of fault •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)	
F069	MLFB data are faulty (active in all operating states) Possible causes of fault •Excessive EMC-related interference (e.g. due to unprotected contactors, unscreened cables, loose screen 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	-

10.1.2.8 Communication errors with supplementary boards

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 correctly inserted •CB/TB board is taking too long to run up (e.g. due to very complex TB board configuration) Fault value: 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 1 st CB 2 2 nd CB
	2 The product version of the installed CT/TB board is not compatible with the SIMOTRAS HD 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 30 and 31)	i015 Code number of board: 1 TB or 1 st CB 2 2. 2 nd 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 1 st CB 2 2. 2 nd 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 inserted	i015 Code number of board: 1 TB or 1 st CB 2 2. 2 nd 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: r047 Index 002 to 016:	
	1 Fault in alarm channel from CB to basic unit	i015 Code number of board: 1 TB or 1 st CB 2 2. 2 nd 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 1 st CB 2 2. 2 nd CB
	6 Fault in parameter response channel from basic unit to CB	i015 Code number of board: 1 1. TB or 1 st CB 2 2. 2 nd 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 1 st CB 2 2. 2 nd 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 1 st CB 2 2. 2 nd CB
	16 Fault in actual value channel from basic unit to CB/TB	i015 Code number of board: 1 TB or 1 st CB 2 2. 2 nd CB

10.1.2.9 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 bottom line of 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 alarm messages can only occur in certain operating states.

(see list of alarm messages)

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) The board has been initialized, it cannot yet exchange telegrams (parameters have not yet been correctly configured on all nodes or the boards are not connected correctly)
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).
A021	External alarm 1 (active in all operating states) Bit 28 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 connected via parameter U104 is in the log. "1" state
A024	Alarm message from free function block FB7 (active in all operating states) The binector connected via parameter U105 is in the log. "1" state
A025	External fault 5 (active in all operating states $\leq$ o3 if P495=1) A log. "0" signal has been on terminal 211 for more than 10s.
A026	External fault 6 (active in all operating states $\leq$ o6 if P496=1) A log. "1" signal has been on terminal 212 for more than 2s.
A027	External fault 7 (active in all operating states $<$ o6 if P497=1) A log. "0" signal has been on terminal 213 for more than 40s.
A028	External fault 8 (active in all operating states $\leq$ o6 if P498=1) A log. "0" signal has been on terminal 214 for more than 10s.

Alarm No.	Description
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) <u>When parameter P490.01=1 (KTY84 at terminals 22 / 23) or P490.02=1 (KTY84 at terminals 204 / 205):</u> The alarm is activated if the motor temperature reaches or exceeds the values set in parameter P492. <u>When parameter P490.01=2, 3, 4 or 5 (PTC thermistor at terminals 22 / 23) or P490.02=2, 3, 4 or 5 (PTC thermistor at terminals 204 / 205):</u> 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 of fault •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 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 is in the log. "1" state
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 current limit reached •Stator current is greater than 1% of converter rated DC current •The actual speed value is less than 0.4% of maximum speed
A036	No stator current can flow (active in operating states of —, I, II) This monitoring function responds if the firing angle is at 0° for more than 500 ms and the stator current is less than 1% of the converter rated DC current.
A037	I²t motor monitor has responded (active in operating states of —, I, II) This monitoring function responds when an I²t value is reached which corresponds to the final temperature at 100% of the rated motor current.
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	I²t value of power section too high (active in all operating states) This alarm is activated if the permissible I²t value for the relevant power section is reached. At the same time, the current limit is set to P077 * 100% of the converter rated current. This limit is not cancelled again until the setpoint drops below 100% of the converter rated current. See also Fault F039 and Parameter P075.
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.

Alarm No.	Description
A047	Analog select input 1 (terminals 6 and 7) faulty (active in operating states of ≤ 06) This alarm is activated when P710=2 (current input 4 to 20 mA) and the input current is less than 3mA.
A067	Converter cooling faulty (active in all operating states) The heatsink temperature is $> 90\text{ }^{\circ}\text{C}$. The monitoring function is activated 6s after the electronics supply is connected.
A081	CB alarm from 1st CB (active in operating states ≤ 011) For PROFIBUS board (CB1 or CBP): The combinations of identifier bytes sent in the configuration message by the DP Master do not conform to the permitted identifier byte combinations (configuring error in DP Master) Effect: No link is set up with the DP Master; re-configuration necessary.
A082	CB alarm from 1st CB (active in operating states ≤ 011) For PROFIBUS board (CB1 or CBP): No valid PPO type can be identified from the configuration message sent by the DP Master. Effect: No link is set up with the DP Master; re-configuration necessary.
A083	CB alarm from 1st CB (active in operating states ≤ 011) For PROFIBUS board (CB1 or CBP): No useful data or invalid useful data have been received from the DP Master. Effect: The process data are not transferred to the basic unit. When the message timeout monitor is active (U722 set to value other than 0), fault message F082 with fault value 10 is output.
A084	CB alarm from 1st CB (active in operating states ≤ 011) For PROFIBUS board (CB1 or CBP): The data exchange between the communications board and DP Master has been interrupted. Effect: When the message timeout monitor is active (U722 set to value other than 0), fault message F082 with fault value 10 is output.
A085	CB alarm from 1st CB (active in operating states ≤ 011) For PROFIBUS board (CB1 or CBP): Error in DPS software of communications board. Effect: Fault message F081 is output.
A086 to A088	CB alarm from 1st CB (active in operating states ≤ 011)
A089	CB alarm from 2nd CB (active in operating states ≤ 011) Meaning as for A081, but from 2 nd CB.
A090	CB alarm from 2nd CB (active in operating states ≤ 011) Meaning as for A082, but from 2 nd CB.
A091	CB alarm from 2nd CB (active in operating states ≤ 011) Meaning as for A083, but from 2 nd CB.
A092	CB alarm from 2nd CB (active in operating states ≤ 011) Meaning as for A084, but from 2 nd CB.
A093	CB alarm from 2nd CB (active in operating states ≤ 011) Meaning as for A085, but from 2 nd CB.

Alarm No.	Description
A094 to A096	CB alarm from 2nd CB (active in operating states $\leq$ o11)
A097 to A128	TB alarms (active in operating states $\leq$ 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 status display
r001 - P050	General visualization parameters
P051- r059	Access authorization levels and parameter output
r060 - r065	Definition of SIMOTRAS converter
r068 - P078	Definition of SIMOTRAS power section
P080 - P096	Setting values for converter control
P100 - P114	Definition of motor
P140 - P148	Definition of pulse encoder, speed sensing using pulse encoder
P152 - P168	Closed-loop current control, auto-reversing stage, gating unit
P171 - P184	Current limitation, torque limitation
P200 - P234	Speed controller
P300 - P318	Ramp-function generator
P320 - P323	Setpoint processing
P351 - P360	Setting values for monitoring functions and limits
P370 - P390	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 - P451	Position sensing with pulse encoder
P460 - P473	Motorized potentiometer
P480 - P485	Oscillation/square wave generator
P490 - P494	Temperature sensor inputs
P495 - P498	Binary inputs
P500 - P502	Configuring of torque shell input
P509 - P515	Speed limiting controller
P520 - P530	Friction compensation
P540 - P563	Compensation of moment of inertia (dv/dt injection)
P590 - P595	Input quantities for signals
P600 - P646	Configuring of closed-loop control
P648 - P691	Control word, status word
P694 - 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
P831 - P899	Parameters for SIMOVIS and OP1S
P918 - P927	Profile parameters
r947 - r952	Fault memory, alarm parameters
r953 - r968	Visualization parameters: Alarms, control and status word
P970 - r999	Resetting and storing parameters, list of existing and modified P and r parameters
n600 - U629	Control inputs, control outputs
U630 - n649	Rotor stage stepping
U651 - U657	Start pulse, speed controller
U660 - U668	Evaluation of a four-stage master switch
U710 - n739	Configuration of supplementary boards in board locations 2 and 3
U740 - U753	Configuring the SIMOLINK board
U755 - n770	Configuring the EB1 expansion board
U773 - n788	Configuring the EB2 expansion board
U790 - n795	Configuring the SBP pulse encoder board
n980 - n999	List of existing and modified U and n parameters

Parameters for technology software, S00 option ("freely assignable function blocks")

Range of parameter numbers	Function
n010 - n023	Displays
U100 - U107	Triggering of faults and alarms
U110 - U118	Connector/binector converters, binector/connector converters
U120 - U171	Mathematical functions
U175 - U218	Limiters, limit-value monitors
U220 - U259	Processing of analog signals
U260 - U299	Integrators, DT1 elements, characteristics, dead zones, setpoint branching
U300 - U303	Simple ramp-function generator
U318 - U411	Logic functions
U415 - U474	Storage elements, timers and binary signal selector switches
U480 - U512	Technology controller
U515 - U520	Velocity/speed calculator
U900 - U969	Altering the processing sequence of function blocks

Overview of abbreviations

Example:

PNU *	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
FDS				
P520 * 1) FDS ²⁾ 8) 9)	Friction at 0% speed Setting as % of converter rated DC current or 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 S00 technology software

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.

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

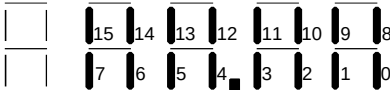
11.1 Operating status display

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) II 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 Reserved o1.5 Reserved o1.6 Waiting for operating enable via checkback signal "Line contactor closed". o2 Reserved o2.0 Reserved o3 Test phase o3.0 Reserved o3.1 Waiting for completion of line symmetry check. o3.2 Waiting for a contactor in the motor circuit to pick up 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) NOTE The system dwells in state o4 for no more than a time set in parameter P089. The appropriate fault message is output if the corresponding conditions are still not fulfilled at the end of this period. o5 Reserved 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 internal shutdown to be cancelled through input of an external shutdown command o7.3 Waiting for completion of "Restore factory settings" operation. o7.4 Reserved o7.5 Wait for completion of "Read in parameter set" operation. o7.6 Wait for completion of "Load MLFB" operation. (performed at factory)		Ind: None Type: O2	P052 = 3

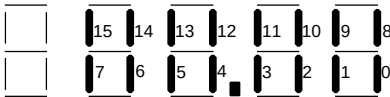
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
	o8 Waiting for acknowledgement of starting lockout o8.0 Waiting for acknowledgement of starting lockout through input of SHUTDOWN command (OFF1). o9 Fast stop (OFF3) o9.0 Fast stop has been input via 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 Reserved o10.4 Wait for receipt of a valid telegram on G-SST1 (only if telegram failure time monitoring is set with P787 ≠ 0) o10.5 Waiting for receipt of a valid telegram on G-SST2 (only if telegram failure time monitoring is set with P797 ≠ 0) o10.6 Waiting for receipt of a valid telegram on G-SST3 (only if telegram failure time monitoring is set with P807 ≠ 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 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 <u>failed</u> (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).			

11.2 General visualization parameters

r001	Display of terminals 4 and 5 (main setpoint)	-200.0 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r002	Analog input, terminals 103 and 104 (main actual value)	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r003	Analog input, terminals 6 and 7 (selectable input 1)	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r004	Analog input, terminals 8 and 9 (selectable input 2)	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r005	Analog input, terminals 10 and 11 (selectable input 3)	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r006	Analog output, terminals 14 and 15 Display of output value <u>before</u> normalization and offset	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r007	Analog output, terminals 16 and 17 Display of output value <u>before</u> normalization and offset	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r008	Analog output, terminals 18 and 19 Display of output value <u>before</u> normalization and offset	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r009	Analog output, terminals 20 and 21 Display of output value <u>before</u> normalization and offset	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r010	Display of status of binary inputs Representation on operator panel (PMU):  Segment alight: Corresponding terminal is activated (HIGH level is applied) Segment dark: 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 (not used) 13 (not used) 14 (not used) 15 (not used)		Ind: None Type: V2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r011	Display of status of binary outputs Representation on operator panel (PMU): Segment alight: Corresponding terminal is activated (HIGH level is applied) or overloaded or short-circuited Segment dark: 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 11/12 (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 13 Terminal 34, 44 or 210		Ind: None Type: V2	P052 = 3
r012	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 (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] 0.0V	Ind: None Type: O2	P052 = 3
r017	Display of line frequency	0.00 to 100.00 [Hz] 0.01Hz	Ind: None Type: O2	P052 = 3
r018	Display of firing angle	0.00 to 180.00 [degrees] 0.01 degrees	Ind: None Type: O2	P052 = 3
r019	Display of actual motor current value The internal actual motor current value is displayed (arithmetic average between 6 current peaks)	-400.0 to 400.0 [% of P100] 0.1% of P100	Ind: None Type: I2	P052 = 3
r020	Display of motor current setpoint	-300.0 to 300.0 [% of P100] 0.1% of P100	Ind: None Type: I2	P052 = 3
r021	Display of torque setpoint after torque limitation Steps: 1 $\triangleq$ 0.1% of rated motor torque	-400.0 to 400.0 [%] 0.1% (see column on left)	Ind: None Type: I2	P052 = 3
r022	Display of torque setpoint before torque limitation Steps: 1 $\triangleq$ 0.1% of rated motor torque	-400.0 to 400.0 [%] 0.1%	Ind: None Type: I2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r023	Display of speed controller setpoint/actual value deviation	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r024	Display of actual speed value from pulse encoder	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r025	Display of actual speed controller value	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r026	Display of speed controller setpoint	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r027	Display of ramp-function generator output	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r028	Display of ramp-function generator input	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r029	Display of main setpoint before limitation	-200.00 to 199.99 [%] 0.01%	Ind: None Type: I2	P052 = 3
r040	Display of limitations: Representation on operator panel (PMU):  Segment alight: Corresponding limitation is reached Segment dark: Corresponding limitation is not reached Segment or bit 0 Reserved 1 Reserved 2 α_W limit reached 3 Negative current limit 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 Reserved 9 Reserved 10 α_G limit reached 11 Positive current limit 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)		Ind: None Type: V2	P052 = 3

Connector and binector displays

r041	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 12)	-200.00 to 199.99 [%] 0.01%	Ind: 2 Type: I2	P052 = 3
P042 *	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 12)	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r043	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 *	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	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
P046 *	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
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	Hours run Display of time (hours) in which drive has been operating in states I, II or - -. All times of $\geq$ approx. 0.1 s are included in the count.	0 to 65535 [hours] 1 hour	Ind: None Type: O2	P052 = 3
r049	Fault time Display of time at which the current fault, and the last 7 acknowledged faults, were activated. i001: Current fault hours i002: 1. 7 th acknowledged fault hours i003: 2. 7 th acknowledged fault hours i004: 3. 7 th acknowledged fault hours i005: 4. 7 th acknowledged fault hours i006: 5. 7 th acknowledged fault hours i007: 6. 7 th acknowledged fault hours i008: 7. 7 th 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 SIMOVIS PC service routine 0: German 1: English	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 ### 0 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.3 Access authorization levels and parameter output

P051 *	Key parameters 0 No access authorization 6 Do not set (for use by SIMOVIS) Download active 7 Do not set (for use by SIMOVIS) Upread active 21 Restore factory settings All parameters are reset to their defaults (factory settings). Parameter P051 is then automatically reset to factory setting "40". 40 Access authorization to parameter values for authorized service personnel	see Column 2	Ind: None FS=40 Type: O2	P052 = 3 P051 ≥ 0 Online
P052 *	Selection of display parameters 0 Display only parameters that are not set to original factory settings 3 Display all parameters used	0, 3	Ind: None FS=3 Type: O2	P052 = 3 P051 ≥ 0 Online
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 *	Copy function data set This parameter allows parameter set 1, 2, 3 or 4 to be <u>copied</u> 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 32). 0xy <u>Do nothing</u> , 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 <u>copied</u> 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.	012 to 143 1	Ind: None FS=012 Type: L2	P052 = 3 P051 = 40 Offline
r056	Display of active function data set	1 to 4 1	Ind: None Type: O2	P052 = 3
P057 *	Copy Bico data set This parameter allows parameter set 1 or 2 to be <u>copied</u> 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 32). 0xy <u>Do nothing</u> , 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 <u>copied</u> 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.	012 to 121 1	Ind: None FS=012 Type: L2	P052 = 3 P051 = 40 Offline
r058	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.4 Definition of SIMOTRAS converter

r060	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	Creation date of software i001: Year i002: Month i003: Day i004: Hour i005: Minute		Ind: 5 Type: O2	P052 = 3
r062	Checksum i001: Converter firmware checksum i002: Boot sector checksum		Ind: 2 Type: L2	P052 = 3
r063	Board code Identification code of boards mounted in locations 1 to 3 of electronics box. 1 3 2 CUDx F D G E Designation of locations 1 to 3 and slots D to G in electronics box i001: Board in location 1 75: CUD1 76: CUD1 + CUD2 i002: Board in slot D (upper slot of location 2) 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) 110 to 119: Tachometer board 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) 151,152, 161: Special board (EB1, EB2, SLB) 141 to 149: Communications board i005: Board in slot G (lower slot of location 3) 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	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	Software identifiers Additional software version identifiers of boards in locations 1, 2 and 3 of electronics box for internal purposes. Indices: i001: Software identifier of board in location 1 i002: Software identifier of board in slot D i003: Software identifier of board in slot E i004: Software identifier of board in slot F i005: Software identifier of board in slot G		Ind: 5 Type: O2	P052 = 3

11.5 Definition of SIMOTRAS power section

r068	Options according to rating plate 0 No option 1 Option L04 (low voltage) 2 Option K01 (terminal expansion) 3 L04 and K01 4 H78 (65°Celsius) 5 H78 + L04 6 H78 + K01 7 H78 + L04 + K01		Ind: None Type: O2	P052 = 3
r069	SIMOTRAS serial number i001: 1. 1 st and 2 nd places of serial number i002: 3. 3 rd and 4 th places of serial number i003: 5. 5 th and 6 th places of serial number i004: 7. 7 th and 8 th places of serial number i005: 9. 9 th and 10 th places of serial number i006: 11. 11 th and 12 th places of serial number i007: 13. 13 th and 14 th 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	MLFB (order number) for SIMOTRAS The corresponding MLFB is displayed in encoded form in this parameter. The MLFB is displayed in plaintext on the OP1S panel.	0 to 73 1	Ind: None Type: O2	P052 = 3
r071	Converter rated supply voltage Converter rated supply voltage as specified on rating plate	0 to 1000 [V] 1V	Ind: None Type: O2	P052 = 3
r072	Converter rated current i001: Converter rated current as specified on rating plate i002: Actual converter rated current as set in parameter P076.001	1.0 to 6553.5 [A] 0.1A	Ind: 2 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P075 *	Control word for power section Selection of operating characteristics of thermal monitor (I ² t monitoring) of power section 0 The I ² t monitoring function for the power section is deactivated. The motor current is limited to <u>P077 * converter rated current</u> . 1 The motor current is limited to <u>P077 * 2 * converter rated current</u> provided that the calculated thyristor temperature rise does not exceed the permissible value. When the permissible value is violated, <u>alarm A039</u> is activated and the limit for the motor current setpoint <u>reduced</u> automatically to <u>P077 * converter rated current</u> until the absolute value of the motor current setpoint before limitation has dropped to below converter rated current and the calculated temperature rise is within the permissible tolerance again. The motor current setpoint limit is then raised again to equal P077 * 2 * converter rated current and alarm A039 is deactivated again. 2 The motor current is limited to <u>P077 * 2 * converter rated current</u> provided that the calculated thyristor temperature rise does not exceed the permissible value. <u>Fault message F039</u> is activated in response to violation of the permissible limit.	0 to 2 1	Ind: None FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P076 *	Reduction of converter rated current i001: For the purpose of achieving a close match between the converter and motor, the converter rated current is reduced to the value entered here. 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% *) for use by works engineers only i002: irrelevant	see Column 2	Ind: 2 FS=100.0 Type: O2	P052 = 3 P051 = 40 Offline
P077	Total thermal reduction factor The factor set in this parameter effects a <u>reduction in the motor current limit</u> (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 40°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 $k_{temp} = (100 - a) / 100$ – 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 $k_{altitude} = b1 / 100$ P077 must be set as follows: P077 = k_{temp} * $k_{altitude}$ Note: A general reduction in the converter rated 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	Reduction of converter rated supply voltage i001: Rated input voltage i002: Irrelevant 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	10 to r071 [V] 1V	Ind: 2 FS=r071 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.6 Setting values for converter control

P080 *	Control word for brake control 1 The brake is a <u>holding brake</u> (When the "Operating enable" command is cancelled and the "Voltage disconnection" command is input, the "Close brake" command is not input until $n < n_{min}$ (P370, P371) is reached.) 2 The brake is an <u>operating brake</u> (When the "Operating enable" command is cancelled and the "Voltage disconnection" is input, the "Close brake" command is input immediately, i.e. while the motor is still rotating.)	1 to 2	Ind: None FS=2 Type: O2	P052 = 3 P051 = 40 Offline
P083 * FDS	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 Do not set! 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 *	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. 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 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 U1, V1, W1, 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), 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 waits in operating state o4 or is in o13. Setting this parameter to 0.0s deactivates the "Automatic restart" function.	0.00 to 2.00 [s] 0.1s	Ind: None FS=0.20 Type: O2	P052 = 3 P051 = 40 Online
P087	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
P088	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.	0.0 to 100.0 [s] 0.1s	Ind: None FS=10.0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
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 dwells in operating state o4 until voltage appears at the power section. The corresponding fault message is activated if no power section voltage is detected within the period specified by this parameter (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 "Switch-on" or "Inching" or "Crawling" command is applied, or after a phase failure has been detected in the mains supply with active "Automatic restart" function (P086>0), the converter dwells in operating state o4 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. 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 The converter can be switched on only if a setpoint $ K0193 \leq P091$ 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 $\leq P091$.	0.00 to 199.99 [%] 0.01%	Ind: None FS=199.99 Type: O2	P052 = 3 P051 = 40 Online
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 120.0 [s] 0.1s	Ind: None FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
P095	Pick-up time for a contactor in the motor circuit If the output (terminals U2, V2, W2) is switched through to the motor via a contactor, and if this contactor is controlled by the relay output terminals 110 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 o4. 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.	0.00 to 1.00 [s] 0.01s	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P096	Run-on time for the converter fan After the drive has stopped (an operating state ≥ 7.0 is reached), the fan continues to run until the power section has cooled down. This parameter can be used to set the minimum run-on time.	0.0 to 60.0 [min] 0.1min	Ind: None FS=4.0 Type: O2	P052 = 3 P051 = 40 Online

11.7 Definition of motor

P100 *	Rated motor 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
P114 FDS	Thermal time constant of motor (see Section 9.10) 0.0 I ² t monitoring deactivated	0.0 to 80.0 [min] 0.1min	Ind: 4 FS=10.0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

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)

Track 1
X173 28, 29

Track 2
X173 30, 31

Zero marker
X173 32, 33

Heidenhain ROD
Teldix Rotaswitch Series 26

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.

Track 1
X173 28, 29

Track 2
X173 30, 31

Zero marker
X173 32, 33

Internal zero marker

Hübner OG9DN, POG9DN
Teldix Rotaswitch Series 25
Honeywell HDM Series

3. Pulse encoder type 2
Encoder with one pulse track per direction of rotation (with/without zero marker).

Clockwise

Anti-clockwise

Track 1
X173 28, 29

Track 2
X173 30, 31

Zero marker
X173 32, 33

4. Pulse encoder type 3
Encoder with one pulse track and one output for direction of rotation (with/without zero marker).

Clockwise

Anti-clockwise

Track 1
X173 28, 29

Track 2
X173 30, 31

Zero marker
X173 32, 33

11-16

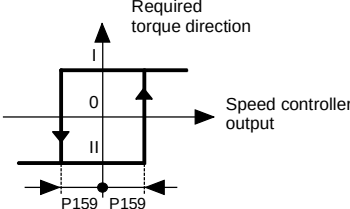
SIEMENS AG 6SG7000-0BA76
SIMOTRAS HD Operating Instructions

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
<u>Notes on selecting a pulse encoder (number of pulses):</u> The lowest speed which can be measured by a pulse encoder is calculated with the following equation: $n_{min} [U / min] = 21973 * \frac{1}{X * P141}$ 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: $n_{max} [U / min] = \frac{18000000}{P141}$ When selecting a pulse encoder, therefore, it is important to ensure that the lowest possible speed $\neq 0$ is significantly higher than n_{min} and the highest possible speed does not exceed n_{max}. $IM \gg \frac{21973}{X * n_{min} [U / min]}$ $IM \leq \frac{18000000}{n_{max} [U / min]}$ 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				
P140	Selection of pulse encoder type See beginning of this Section 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=1 Type: O2	P052 = 3 P051 = 40 Offline
P141	Number of pulses of pulse encoder	1 to 32767 [pulses/rev] 1 pulse/rev	Ind: None FS=250 Type: O2	P052 = 3 P051 = 40 Offline
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. CAUTION Resetting parameter P142 to the alternative setting <u>does not</u> switch over the supply voltage for the pulse encoder (terminals X173.26 and 27). Terminal X173.26 always supplies +15V. An external voltage supply 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	Setting the maximum speed for pulse encoder operation The speed set in this parameter corresponds to an actual speed (K0040) of 100% = rated motor speed.	1.0 to 6500.0 [rev/min] 0.1rev/min	Ind: 4 FS=1450.0 Type: O2	P052 = 3 P051 = 40 Online
Control parameters for speed sensing with pulse encoder P144 to P147: <u>P144 and P147</u> determine the <u>basic setting</u> 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). <u>P145 and P146</u> 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	Multiple evaluation of encoder signals 0 <u>1x</u> evaluation of pulse encoder signals 1 <u>2x</u> evaluation of pulse encoder signals (for encoder types 1, 1a, 2) 2 <u>4x</u> evaluation of pulse encoder signals (for encoder types 1, 1a) <u>Note:</u> 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=0 Type: O2	P052 = 3 P051 = 40 Online
P145 FDS	Automatic measuring range switchover for measurement of low speeds - switchover of multiple evaluation 0 <u>Automatic switchover of multiple evaluation</u> of pulse encoder signals OFF (i.e. P144 is always active) 1 <u>Automatic switchover of multiple evaluation</u> of pulse encoder signals ON (i.e. when P144 = 0, 2x evaluation is selected for low speeds and 4x evaluation for very low speeds. When P144 = 1, 4x evaluation is selected for low speeds) As opposed to P145 = 0, this setting reduces the minimum measurable speed by up to a factor of 4. <u>Caution:</u> Switching over the multiple evaluation method for encoder pulses also affects the <u>position sensing function</u> in the measuring channel. For this reason, this setting may not be used in conjunction with positioning operations. Connectors K0042 to K0044 are inoperative when P145 = 1.	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Online
P146 FDS	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) <u>Caution:</u> When P146=1, the minimum measurable speed can be reduced by up to a factor of 4 as opposed to a 0 setting. However, this setting results in a longer <u>actual speed sensing delay</u> in the extended minimum speed range.	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P147 FDS	Nominal measuring time of pulse encoder signal evaluation 0 Nominal measuring time = 1 ms 1 Nominal measuring time = 2 ms (produces "steadier" actual speed value than with 0) 2 Nominal measuring time = 4 ms (for drives with high moment of inertia, produces "steadier" actual speed value than with 0) <u>Caution:</u> When P147 = 1 or 2, the minimum measurable speed can be reduced by a factor of 2 or 4 respectively as opposed to 0. However, these settings increase the <u>actual speed sensing delay</u> . For this reason, P200 should be parameterized to at least 5ms <u>before</u> optimizing the speed controller.	0 to 2 1	Ind: 4 FS=2 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P148 *	Pulse encoder monitoring function	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
FDS	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)			

11.9 Closed-loop current control, auto-reversing stage, gating unit

P152 *	Line frequency correction	1 to 20	Ind: 4 FS=20 Type: O2	P052 = 3 P051 = 40 Offline
FDS	The internal line synchronization for the 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.			
P153 *	Control word for precontrol	0 to 2 1	Ind: 4 FS=2 Type: O2	P052 = 3 P051 = 40 Offline
FDS	0 Precontrol disabled, precontrol output=165° 1 Precontrol active 2 Precontrol active			
P154 *	Set current controller I component to zero	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
FDS	0 Set controller I component to zero (i.e. to obtain pure P controller) 1 Controller I component is active			
P155	Current controller P gain	0.01 to 200.00 0.01	Ind: 4 FS=0.20 Type: O2	P052 = 3 P051 = 40 Online
FDS	Proportional gain of current controller			
P156	Current controller reset time	0.001 to 10.000 [s] 0.001s	Ind: 4 FS=0.020 Type: O2	P052 = 3 P051 = 40 Online
FDS				
P157 *	Control word for current setpoint integrator	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
FDS	0 Reduced gearbox stressing The integrator is active only after a change in torque direction (acts as ramp-function generator for current setpoint only until the output reaches the setpoint at the integrator input for the 1 st time after a change in torque direction). 1 Current setpoint integrator The integrator is always active (acts as ramp-function generator for the current setpoint)			
P158	Ramp-up time for current setpoint integrator (reduced gearbox stressing)	0.000 to 1.000 [s] 0.001s	Ind: 4 FS=0.000 Type: O2	P052 = 3 P051 = 40 Online
FDS	Period of an acceleration ramp with a setpoint step change from 0% to 100% at r072.002.			
P159	Switchover threshold for auto-reversing stage	0.00 to 100.00 [%] 0.01% of n controller output	Ind: 4 FS=5.00 Type: O2	P052 = 3 P051 = 40 Online
FDS				
P160	Additional torque-free interval	0.000 to 2.000 [s] 0.001s	Ind: 4 FS=0.000 Type: O2	P052 = 3 P051 = 40 Online
FDS	Additional torque-free interval for torque direction change in 4Q operation.			
P164 *	Set current controller P component to zero	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
FDS	0 Set controller P component to zero (i.e. to obtain pure I controller) 1 Controller P component is active			

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P166 FDS	Filter time for precontrol The precontrol input signal is applied via a filtering element	0 to 10000 [ms]	Ind: 4 FS=40 Type: O2	P052 = 3 P051 = 40 Online
P167 FDS	Maximum firing angle With P153 = 2 and if no "zero delay-angle setting", the output of the precontrol is limited to P167.	0 to 165 [°]	Ind: 4 FS=45 Type: O2	P052 = 3 P051 = 40 Online
P168 FDS	Maximum change to firing angle The change of the firing angle from one firing instant to the next is limited.	1 to 179 [°]	Ind: 4 FS=15 Type: O2	P052 = 3 P051 = 40 Online

11.10 Current limitation, torque limitation

P171 FDS	System current limit in torque direction I	0.0 to 300.0 [% of P100] 0.1% of P100	Ind: 4 FS=200.0 Type: O2	P052 = 3 P051 = 40 Online
P172 FDS	System current limit in torque direction II	-300.0 to 0.0 [% of P100] 0.1% of P100	Ind: 4 FS=-200.0 Type: I2	P052 = 3 P051 = 40 Online
P180 FDS	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	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	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	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	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

11.11 Speed controller

Setting values for speed controller - actual value/setpoint processing				
P200 FDS	Filter time for actual speed controller value Filtering of the actual speed value by means of a PT1 element.	0 to 10000 [ms] 1ms	Ind: 4 FS=10 Type: O2	P052 = 3 P051 = 40 Online
P201 FDS	Band-stop 1: Resonant frequency	1 to 140 [Hz] 1Hz	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Online
P202 FDS	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	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P205 FDS	D element: Derivative-action time	0 to 1000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
P206 FDS	D element: Filter time	0 to 100 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online

r219	Display of effective P gain of speed controller	0.10 to 200.00 0.01	Ind: None Type: O2	P052 = 3
P222 FDS	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 + 2% n_{max} . 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	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 zero (i.e. to obtain 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 $\pm 199.99\%$ is reached	0 to 3 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P225 FDS	Speed controller P gain See also setting values for "Speed controller adaptation" function (P550 to P559). See also U645 to U649 for factors relating to the speed controller P gain.	0.10 to 200.00 0.01	Ind: 4 FS=3.00 Type: O2	P052 = 3 P051 = 40 Online
P226 FDS	Speed controller reset time	0.010 to 10.000 [s] 0.001s	Ind: 4 FS=0.200 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	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 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

P228 FDS	Filter time for speed setpoint Filtering of setpoint by means of a PT1 element. 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	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 $M(\text{set}, n_{\text{contr.}}) = M(\text{set}, \text{limit})$, 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P234 *	Set speed controller P component to zero	0 to 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
FDS	0 Set controller P component to zero (i.e. to obtain pure I controller) 1 Controller P component is active	1		

11.12 Ramp-function generator

(see also Section 8, Sheet G20 and Section 9)

See P639 and P640 for ramp-function generator setting parameters

Limitation at ramp-function generator output (setpoint limitation)

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	Positive limitation at ramp-function generator output	-200.00 to 199.99 [%] 0.01%	Ind: 4 FS=105.00 Type: I2	P052 = 3 P051 = 40 Offline
P301 FDS	Negative limitation at ramp-function generator output	-200.00 to 199.99 [%] 0.01%	Ind: 4 FS=-105.00 Type: I2	P052 = 3 P051 = 40 Offline
P302 *	Select ramp-function generator / ramp-up integrator mode	0 to 3	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
FDS	0 Normal <u>ramp-function generator</u> 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 <u>Ramp-up integrator</u> 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 <u>Ramp-up integrator</u> 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 <u>Ramp-up integrator</u> 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)	1		

Ramp-function generator parameter set 1

P303 FDS	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	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	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	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	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	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	Lower transition rounding 2	0.00 to 100.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

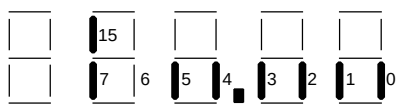
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P310 FDS	Upper transition rounding 2	0.00 to 100.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

Ramp-function generator parameter set 3

Ramp-function generator parameter set 3 is selected via the binector parameterized in P638.

P311 FDS	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	Ramp-down time 3	0.00 to 650.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online
P313 FDS	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	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	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	Display of ramp-function generator status 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	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	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 <u>not set</u> at the commencement of a "Shutdown" process" 1 At the commencement of "Shutdown", the output is set to the <u>actual speed value K0167</u> (actual speed value K0167 is "unfiltered") 2 At the commencement of "Shutdown", the output is set to the <u>actual speed value K0179</u> (value is filtered by PT1 in P200, other filters may also be active) (setting may not be used in conjunction with P205 > 0) 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	Delay time for enabling ramp-function generator	0.00 to 10.00 [s] 0.01s	Ind: 4 FS=0.50 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.13 Setpoint processing

P320 FDS	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	Multiplier for additional setpoint	-300.00 to 300.00 [%] 0.01%	Ind: 4 FS=100.00 Type: I2	P052 = 3 P051 = 40 Online
P322 * FDS	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	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

11.14 Setting values for monitoring functions and limits

Setting values for monitoring functions				
P351 FDS	Threshold for undervoltage 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 F006 is activated. The drive dwells in operating state o4 while the line undervoltage persists.	0 to 65535 [%] 1% of P078.001	Ind: 4 FS=-80 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 1% of P078.001	Ind: 4 FS=30 Type: O2	P052 = 3 P051 = 40 Online
P353 FDS	Response threshold for phase failure monitoring If the line voltage drops below the permissible value <u>in operating states of $\leq$ o4</u> and does not return to an "acceptable" value within the "Restart time" set in P086, fault message F004 is activated. The drive dwells in operating state o4 for the period that the line voltage remains below the threshold and during the subsequent voltage stabilization period set in P090. <u>When a switch-on command is entered</u> , the converter dwells in operating state o4 for a maximum delay period set in P089 until the voltages in all phases exceed the threshold set in this parameter before fault message F004 is activated.	10 to 100 1% of P078.001	Ind: 4 FS=20 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
P360	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 G37 and G38). 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.15 Setting values for limit-value monitors

(see also Section 8, Sheet G43)

n < n_{min} signal				
P370	Speed threshold n_{min}	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=5.00 Type: O2	P052 = 3 P051 = 40 Online
FDS	Speed threshold for n < n _{min} limit-value monitor. Note: This threshold also affects the sequence of control operations at "shutdown", "fast stop", cancellation of "Inch" or "Crawl" command (see section 9).			
P371	Hysteresis for n < n_{min} signal	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=0.50 Type: O2	P052 = 3 P051 = 40 Online
FDS	This value is added to the response threshold if n < n _{min} is active.			

n < n_{comp.} signal				
P373	Speed threshold n_{comp.}	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=100.00 Type: O2	P052 = 3 P051 = 40 Online
FDS	Speed threshold for n < n _{comp.} signal			
P374	Hysteresis for < n_{comp.} signal (n < n_{comp.} signal)	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=3.00 Type: O2	P052 = 3 P051 = 40 Online
FDS	This value is added to the response threshold if n < n _{comp.} is active.			
P375	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
FDS				

Overspeed				
P380	Maximum speed in positive direction of rotation	0.0 to 199.9 [%] 0.1% of rated speed	Ind: 4 FS=120.0 Type: O2	P052 = 3 P051 = 40 Online
FDS				
P381	Maximum speed in negative direction of rotation	-199.9 to 0.0 [%] 0.1% of rated speed	Ind: 4 FS=-120.0 Type: I2	P052 = 3 P051 = 40 Online
FDS				

Setpoint/actual value deviation				
P387	OFF delay	0.0 to 100.0 [s] 0.1s	Ind: 4 FS=2.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	If the system leaves the state "Setpoint in the controlled range", the system waits for the time set here until the setpoint/actual value comparison for the "setpoint/actual deviation" signal (status word 1 bit 8) becomes active again.			
P388	Permissible deviation between setpoint and actual value	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=5.00 Type: O2	P052 = 3 P051 = 40 Online
FDS				
P389	Hysteresis for setpoint/actual value deviation signal	0.00 to 199.99 [%] 0.01% of maximum speed	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 Online
FDS	This value is added to the response threshold if a setpoint/actual value deviation signal is active			
P390	Response delay for setpoint/actual value deviation signal	0.0 to 100.0 [s] 0.1s	Ind: 4 FS=1.0 Type: O2	P052 = 3 P051 = 40 Online
FDS				

11.16 Settable fixed values

(see also Section 8, Sheet G12)

Function: The value set in the parameter is applied to the specified connector				
P401	K401 fixed value	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=60.00 Type: I2	P052 = 3 P051 = 40 Online
FDS	is applied to connector K0401			
P402	K402 fixed value	-199.99 to 199.99 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
FDS	is applied to connector K0402			

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P403 FDS	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	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	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	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	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	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	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	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	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	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	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	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	K415 fixed value is applied to connector K0415	-32768 to 32767 1	Ind: 4 FS=0 Type: I2	P052 = 3 P051 = 40 Online
P416 FDS	K416 fixed value is applied to connector K0416	-32768 to 32767 1	Ind: 4 FS=0 Type: I2	P052 = 3 P051 = 40 Online

11.17 Fixed control bits

(see also Section 8, Sheet G12)

Function: The value set in the parameter is applied to the specified binector				
P421 FDS	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	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	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	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	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	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	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	B428 fixed bit is applied to binector B0428	0 to 1 1	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)

11.18 Digital setpoint input (fixed setpoint, inching and crawling setpoints)

(see also Section 8, Sheets G15, G17 and G18)

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 *	Source for fixed-setpoint injection Selection of binector to control injection of the fixed 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
P431 *	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 *	Bypassing the ramp-function generator when the fixed setpoint is injected 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.	0 to 1 1	Ind: 8 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P433 * FDS	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=9215 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.				
P435 *	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 *	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 *	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.	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)
P438 * FDS	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 ("level" when P445=0) or in response to a 0 → 1 transition ("edge" 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.

Note: The level/edge selection performed using P445 also applies to the switch-on command of terminal 37 or the crane control.

If crawling setpoint injection is not selected, the connector set in P443 is applied to K0206.

P440 *	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 *	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
P442 *	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.	0 to 1 1	Ind: 8 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P443 * FDS	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	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 *	Selection of level/edge for switch-on/crawling Selection to define whether ON command must be input via terminal 37 or the crane control 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.19 Position sensing with pulse encoder

See parameters P140 to P148 for pulse encoder definition and monitoring				
P450 *	Resetting of position counter	0 to 3 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
FDS	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			
P451 *	Position counter hysteresis	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
FDS	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)			

11.20 Motorized potentiometer

(see also Section 8, Sheet G14)

P460 *	Control word for motorized potentiometer ramp-function generator	0 to 1 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
FDS	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			
P461 *	Source for setpoint in Automatic mode	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
FDS	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.			
P462	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
FDS				
P463	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
FDS				
P464	Time difference for dy/dt	0.01 to 300.00 [s] 0.01s	Ind: 4 FS=10.00 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting of dt 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. - $\Rightarrow$ A dy/dt of 40% appears at connector K0241 since the dy within the set dt of 2 s equals $(2s/5s)*100\%$..			
P465 *	Factor of expansion for motorized potentiometer	0 to 1 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
FDS	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>			

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P466 * FDS	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	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	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	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	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	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	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	Storage of output value 0 <u>No storage of output value:</u> The output is set to 0 in all operating states of >0.5. 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

11.21 Oscillation/square wave generator

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. Selected in P485. The free-running rectangular signal is switched through to the output K0208.

P480 FDS	Oscillation setpoint 1	-199.9 to 199.9 [%] 0.1% of maximum speed	Ind: 4 FS=5.0 Type: I2	P052 = 3 P051 = 40 Online
P481 FDS	Oscillation time 1	0.1 to 300.0 [s] 0.1s	Ind: 4 FS=2.0 Type: O2	P052 = 3 P051 = 40 Online
P482 FDS	Oscillation setpoint 2	-199.9 to 199.9 [%] 0.1% of maximum speed	Ind: 4 FS=-0.0 Type: I2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P483 FDS	Oscillation time 2	0.1 to 300.0 [s] 0.1s	Ind: 4 FS=2.0 Type: O2	P052 = 3 P051 = 40 Online
P484 * FDS	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	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

11.22 Temperature sensor inputs

(see also Section 8, Sheet G41)

CAUTION! The encoders for measuring and monitoring the motor temperature must be safely isolated from the power circuit.				
P490	Selection of temperature sensor for 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) 2) 3 PTC thermistor with R=1200Ω 1) 2) 4 PTC thermistor with R=1330Ω 1) 2) 5 PTC thermistor with R=2660Ω 1) 2) 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). 2) R_n = resistance at switching point when $R < R_n$: B0184 or B0185 = 0 when $R > R_n$: B0184 or B0185 = 1	0 to 5 1	Ind: 2 FS=1 Type: O2	P052 = 3 P051 = 40 Online
P491 FDS	Monitoring of motor temperature: Alarm temperature Operative only when P490.x=1.	0 to 200 [°C] 1°C	Ind: 4 FS=20 Type: O2	P052 = 3 P051 = 40 Online
P492 FDS	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P493 *	Motor temperature 1 (temperature sensor at terminals 22 / 23): Tripping of alarm or fault message	0 to 3 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
FDS	Motor temperature grasped with PTC thermistor KTY64: 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			
P494 *	Motor temperature 2 (temperature sensor at terminals 204 / 205): Tripping of alarm or fault message	0 to 3 1	Ind: 4 FS=1 Type: O2	P052 = 3 P051 = 40 Offline
FDS	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			

11.23 Binary inputs

(see also Section 8, Sheet G42)

P495 *	Alarm A025 / Fault F025 from terminal 211	0 to 2 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
FDS	0 Terminal 211 is not scanned: no tripping of alarm or fault message 1 Terminal 211 is scanned: alarm (A025) if 0 signal 2 Terminal 211 is scanned: fault message (F025) if 0 signal			
P496 *	Alarm A025 / Fault F026 from terminal 212	0 to 2 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
FDS	0 Terminal 212 is not scanned: no tripping of alarm or fault message 1 Terminal 212 is scanned: alarm (A026) if 1 signal 2 Terminal 212 is scanned: fault message (F026) if 1 signal			
P497 *	Alarm A027 / Fault F027 from terminal 213	0 to 2 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
FDS	0 Terminal 213 is not scanned: no tripping of alarm or fault message 1 Terminal 213 is scanned: alarm (A027) if 0 signal 2 Terminal 213 is scanned: fault message (F027) if 0 signal			
P498 *	Alarm A028 / Fault F028 from terminal 214	0 to 2 1	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Offline
FDS	0 Terminal 214 is not scanned: no tripping of alarm or fault message 1 Terminal 214 is scanned: alarm (A028) if 0 signal 2 Terminal 214 is scanned: fault message (F028) if 0 signal			

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.24 Configuring of torque shell input

P500 *	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=203 Type: L2	P052 = 3 P051 = 40 Offline
P501 *	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 *	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

11.25 Speed limiting controller

(see also Section 8, Sheet G26)

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 *	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 *	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 *	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	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	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
P515 FDS	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.26 Friction compensation

(see also Section 8, Sheet G25)

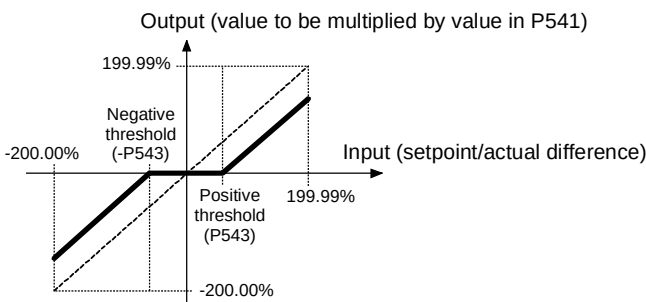
Parameters P520 to P530 are the armature current and torque setpoints required to obtain a steady-state speed of 0%, 10% to 100% of maximum speed (in steps of 10%).
 These parameters represent interpolation points in the friction characteristic. Depending on P170 (0 or 1), they are either a current or torque setpoint.
 Depending on the actual speed controller value (K0179), the values between the interpolation points are calculated by linear interpolation, the output of the friction compensation assuming the sign of the actual speed controller value.
 P530 is specified by the friction compensation function when the actual speed control value equals >100% of maximum speed.
 For operation in both directions of rotation, it is advisable to leave P520 set at 0.0% in order to avoid current oscillations at 0% speed.

P520	Friction at 0% speed	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			
P521	Friction at 10% speed	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			
P522	Friction at 20% speed	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			
P523	Friction at 30% speed	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			
P524	Friction at 40% speed	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			
P525	Friction at 50% speed	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			
P526	Friction at 60% speed	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			
P527	Friction at 70% speed	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			
P528	Friction at 80% speed	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			
P529	Friction at 90% speed	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			
P530	Friction at 100% speed and higher	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=0.0 Type: O2	P052 = 3 P051 = 40 Online
FDS	Setting as % of converter rated current or rated torque			

11.27 Compensation of moment of inertia (dv/dt injection)

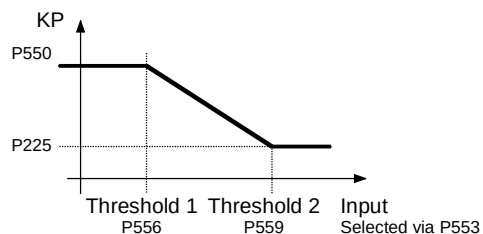
(see also Section 8, Sheet G25)

P540	Acceleration time	0.00 to 650.00 [s] 0.01s	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
FDS	The acceleration time is the time which would be necessary to accelerate the drive with 100% converter rated current from 0% to 100% of maximum speed (where no friction is present). It is a measure of the moment of inertia on the motor shaft.			
P541	P gain of acceleration	0.00 to 650.00 0.01	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
FDS	Proportional gain for "SAD-dependent acceleration" function (see also parameter P543)			

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P542 FDS	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. - $\Rightarrow$ 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	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	Filter time for compensation of moment of inertia	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online

Speed controller - P gain adaptation

Function:



P550 FDS	P gain in adaptation range Maximum value of KP if influencing quantity $\leq$ threshold 1	0.10 to 200.00 0.01	Ind: 4 FS=3.00 Type: O2	P052 = 3 P051 = 40 Online
P553 * FDS	Source for influencing quantity for adaptation Selection of the connector to be injected as the influencing quantity for adaptation of the n controller P gain 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P556 FDS	Adaptation of n controller P gain: Threshold 1	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
P559 FDS	Adaptation of n controller P gain: Threshold 2	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

Speed controller - speed droop limitation

P562 FDS	Positive speed droop limitation	0.00 to 199.99 [%] 0.01%	Ind: 4 FS=100.00 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P563 FDS	Negative speed droop limitation	-199.99 to 0.00 [%] 0.01%	Ind: 4 FS=-100.00 Type: I2	P052 = 3 P051 = 40 Online

11.28 Input quantities for signals

(see also Section 8, Sheet G43)

P590 *	Source for setpoint of "nset = nact signal" 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 *	Source for actual value of "n-set = n-act signal" 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
P592 *	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 *	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 *	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 *	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

11.29 Configuring of closed-loop control

Setting values for configuring of torque shell				
P600 *	Source for gating unit input Selection of connector to be injected as the gating unit input 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=102 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P601 *	Source for 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 current controller setpoint (before current limitation). Both values are added. Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS= i001: 141 i002: 0 i003: 134 i005: 0 Type: L2	P052 = 3 P051 = 40 Offline
P602 *	Source for actual current controller value Selection of connector to be injected as 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 *	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 i005 Selection of connector to be injected as current limit in torque direction I with <u>Fast Stop or Shutdown</u> Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 5 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P604 *	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 i005 Selection of connector to be injected as current limit in torque direction II with <u>Fast Stop or Shutdown</u> 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: 5 FS=9 Type: L2	P052 = 3 P051 = 40 Offline
P605 *	Source for variable positive torque limit Torque limitation: Selection of connectors to be injected as the variable positive torque limit (100% of connector value corresponds to positive system torque limit obtained with settings $I_a=P171$) 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=2 Type: L2	P052 = 3 P051 = 40 Offline
P606 *	Source for variable negative torque limit Torque limitation: Selection of connectors to be injected as the variable negative torque limit (100% of connector value corresponds to negative system torque limit obtained with settings $I_a=P172$) 0 = connector K0000 ... 8 = connector K0008 9 = value as set in parameter P605 * (-1) 10 = connector K0010 etc.	All connector numbers 1	Ind: 4 FS=9 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P607 *	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

Speed controller

P609 *	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

Configuring of injection of acceleration value

P619 *	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 *	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 *	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 *	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 *	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 *	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 *	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

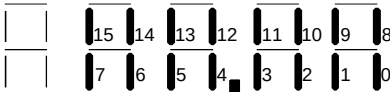
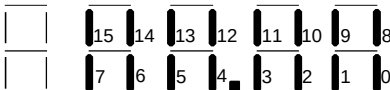
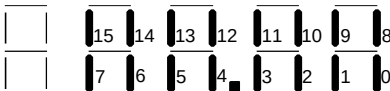
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P626 *	Source for actual speed controller value Selection of connector to be injected as the input signal for actual speed value filtering 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 4 FS=167 Type: L2	P052 = 3 P051 = 40 Offline
P627 *	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 *	Source for 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 *	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 *	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 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 *	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=454 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 G20) 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 *	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=6 Type: L2	P052 = 3 P051 = 40 Offline

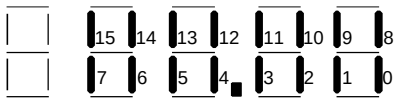
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P633 *	Source for variable negative limitation at ramp-function generator output Selection of connectors to be injected at the variable negative limitation at the ramp-function generator output (setpoint 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 *	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	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 *	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) 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P637 * BDS	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=9175 Type: L2	P052 = 3 P051 = 40 Offline
P638 * BDS	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
P639 *	Source for ramp-function generator setting values Selection of connectors to be injected as the ramp-function generator setting values . i001 Setting value for the ramp-function generator output when the binector selected via P640 has the log. "1" signal i002 Setting value for the ramp-function generator output when the drive is not in the "Run" state (B0104=0) <u>and</u> the binector selected via P640 has the log. "0" signal 0 = connector K0000 1 = connector K0001 etc.	All connector 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)
P640 * BDS	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	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 *	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 *	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	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	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
P646 * BDS	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.30 Control word, status word

Selection of sources of control words 1 and 2				
P648 *	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 *	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	Display of control word 1 Representation on operator panel (PMU):  Segments 0 to 15 correspond to bits 0 to 15 of the status word Segment alight: Corresponding bit is in log. "1" state Segment dark: Corresponding bit is in log. "0" state		Ind: None Type: V2	P052 = 3
r651	Display of control word 2 Representation on operator panel (PMU):  Segments 0 to 15 correspond to bits 16 to 31 of the status word Segment alight: Corresponding bit is in log. "1" state Segment dark: Corresponding bit is in log. "0" state		Ind: None Type: V2	P052 = 3
Display of status words 1 and 2				
r652	Display of status word 1 Representation on operator panel (PMU):  Segments 0 to 15 correspond to bits 0 to 15 of the status word Segment alight: Corresponding bit is in log. "1" state Segment dark: 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)
r653	Display of status word 2 Representation on operator panel (PMU):  Segments 0 to 15 correspond to bits 16 to 31 of the status word Segment alight: Corresponding bit is in log. "1" state Segment dark: 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 G37 and 38 in Section 8.

Control word 1

P654 *	Source for control word 1, bit0 (0=OFF1, 1=ON; ANDed with terminal 37)	All binector numbers 1	Ind: 2 FS=9358 Type: L2	P052 = 3 P051 = 40 Offline
P655 *	1. 3rd source for control word 1, bit1 (0=OFF2; ANDed with 2 nd and 3 rd sources for bit1)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P656 *	2. 3rd source for control word 1, bit1 (0=OFF2; ANDed with 1 st and 3 rd sources for bit1)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P657 *	3. 3rd source for control word 1, bit1 (0=OFF2; ANDed with 1 st and 2 nd sources for bit1)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P658 *	1. 3rd source for control word 1, bit2 (0=OFF3=Fast stop; ANDed with 2 nd and 3 rd sources for bit2)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P659 *	2. 3rd source for control word 1, bit2 (0=OFF3=Fast stop; ANDed with 1 st and 3 rd sources for bit2)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P660 *	3. 3rd source for control word 1, bit2 (0=OFF3=Fast stop; ANDed with 1 st and 2 nd sources for bit2)	All binector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
P661 *	Source for control word 1, bit3 (0=pulse disable, 1=enable; ANDed with terminal 38)	All binector numbers 1	Ind: 2 FS=9350 Type: L2	P052 = 3 P051 = 40 Offline
P662 *	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=9381 Type: L2	P052 = 3 P051 = 40 Offline
P663 *	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 *	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 *	1. 3rd source for control word 1, bit7 (0→1 transition=acknowledge; ORed with 2 nd and 3 rd sources for bit7)	All binector numbers 1	Ind: 2 FS=9367 Type: L2	P052 = 3 P051 = 40 Offline
P666 *	2. 3rd source for control word 1, bit7 (0→1 transition=acknowledge; ORed with 1 st and 3 rd sources for bit7)	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P667 *	3. 3rd source for control word 1, bit7 (0→1 transition=acknowledge; ORed with 1 st and 2 nd sources for bit7)	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)
P668 * BDS	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	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	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	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	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	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	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	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	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	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	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
P684 * BDS	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	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	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	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	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	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 * BDS	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	Source for control word 2, bit31 (main contactor checkback signal)	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)

11.31 Further configuring measures

P694 *	Source for selection of enabling command for "Torque limit switchover" BDS Selection of binector which is to control enabling of the "Torque limit switchover" function (1=enable, see also 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 *	Source for selection of "Set speed controller I component" function BDS 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= i001: 9361 i002: 0 Type: L2	P052 = 3 P051 = 40 Offline
P696 *	Source for selection of "Stop speed controller I component" function BDS 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 *	Source for selection of enabling of dv/dt injection BDS 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 *	Source for selection of enabling command for speed controller PI / P function switchover BDS 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

11.32 Analog inputs (main actual value, main setpoint, selectable inputs)

(see also Section 8, Sheets G5 and G6)

Analog input terminals 4 / 5 (main setpoint)				
P700 *	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	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 general rule applies: With a voltage input: $P701 [\%] = 10 V * \frac{Y}{X}$ X .. Input voltage in volts Y .. % value which is generated for input current X With a 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	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 *	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 *	Source for selection of sign reversal at "Main setpoint" analog input Selected binector in “1” state = sign reversal 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline																				
P705	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 *	Source for enabling of "Main setpoint" analog input Selected binector in “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																				
P707 *	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. <table><tr><td>Param. value</td><td>Resolution better than</td><td>Quantization</td><td>Delay period</td></tr><tr><td>11</td><td>± 11 bits</td><td>4.4 mV</td><td>0.53 ms</td></tr><tr><td>12</td><td>± 12 bits</td><td>2.2 mV</td><td>0.95 ms</td></tr><tr><td>13</td><td>± 13 bits</td><td>1.1 mV</td><td>1.81 ms</td></tr><tr><td>14</td><td>± 14 bits</td><td>0.56 mV</td><td>3.51 ms</td></tr></table> If the analog input is operating as a current input (0 to 20 mA or 4 to 20 mA), the above applies analogously.	Param. value	Resolution better than	Quantization	Delay period	11	± 11 bits	4.4 mV	0.53 ms	12	± 12 bits	2.2 mV	0.95 ms	13	± 13 bits	1.1 mV	1.81 ms	14	± 14 bits	0.56 mV	3.51 ms	11 to 14 [Bit] 1 bit	Ind: None FS=12 Type: O2	P052 = 3 P051 = 40 Offline
Param. value	Resolution better than	Quantization	Delay period																					
11	± 11 bits	4.4 mV	0.53 ms																					
12	± 12 bits	2.2 mV	0.95 ms																					
13	± 13 bits	1.1 mV	1.81 ms																					
14	± 14 bits	0.56 mV	3.51 ms																					

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Analog input terminals 6 / 7 (analog selectable input 1)				
P710 *	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	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 general rule applies: With a voltage input: $P711 [\%] = 10 V * \frac{Y}{X}$ X .. Input voltage in volts Y .. % value which is generated for input current X With a 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	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 *	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 *	Source for selection of sign reversal at "Analog selectable input 1" Selected binector in "1" state = sign reversal 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P715	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 *	Source for enabling of "Analog selectable input 1" Selected binector in "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 *	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	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 general rule applies: With a voltage input: $P721 [\%] = 10 V * \frac{Y}{X}$ X .. Input voltage in volts Y .. % value which is generated for input current X With a 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	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P723 *	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 *	Source for selection of sign reversal at "Analog selectable input 2" Selected binector in "1" state = sign reversal 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P725	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 *	Source for enabling of "Analog selectable input 2" Selected binector in "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

Analog input terminals 10 / 11 (analog selectable input 3)

P731 FDS	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 general rule applies: With a voltage input: $P731 [\%] = 10 V * \frac{Y}{X}$ X .. Input voltage in volts Y .. % value which is generated for input current X With a 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	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 *	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 *	Source for selection of sign reversal at "Analog selectable input 3" Selected binector in "1" state = sign reversal 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P735	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 *	Source for enabling of "Analog selectable input 3" Selected binector in "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

Analog input terminals 103 / 104 (main actual value)

P741 FDS	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P742	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 *	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 *	Source for selection of sign reversal at "Main actual value" analog input Selected binector in "1" state = sign reversal 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
P745	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
P746 *	Source for enabling of "Main actual value" analog input Selected binector in "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

11.33 Analog outputs

(see also Section 8, Sheets G7 and G8)

Analog output terminals 12 / 13 (actual current display)				
P749 *	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

Analog output, terminal 14 / 15				
P750 *	Source for output value at analog output 1 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=170 Type: L2	P052 = 3 P051 = 40 Online
P751 *	Mode of signal injection at analog output 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 Online
P752	Filtering time for analog output 1	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P753	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 an offset of 0)	-200.00 to 199.99 [V] 0.01V	Ind: None FS=10.00 Type: I2	P052 = 3 P051 = 40 Online
P754	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, terminal 16 / 17				
P755 *	Source for output value at analog output 2 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=167 Type: L2	P052 = 3 P051 = 40 Online
P756 *	Mode of signal injection at analog output 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 Online
P757	Filtering time for analog output 2	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P758	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 an offset of 0)	-200.00 to 199.99 [V] 0.01V	Ind: None FS=10.00 Type: I2	P052 = 3 P051 = 40 Online
P759	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, terminal 18 / 19				
P760 *	Source for output value at analog output 3 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Online
P761 *	Mode of signal injection at analog output 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 Online
P762	Filtering time for analog output 3	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P763	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 an offset of 0)	-200.00 to 199.99 [V] 0.01V	Ind: None FS=10.00 Type: I2	P052 = 3 P051 = 40 Online
P764	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, terminal 20 / 21				
P765 *	Source for output value at analog output 4 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Online
P766 *	Mode of signal injection at analog output 4 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 Online
P767	Filtering time for analog output 4	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)
P768	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 an offset of 0)	-200.00 to 199.99 [V] 0.01V	Ind: None FS=10.00 Type: I2	P052 = 3 P051 = 40 Online
P769	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

11.34 Binary outputs

(see also Section 8, Sheet G4)

P770 *	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 *	Source for output value at binary output terminal 46 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=252 Type: L2	P052 = 3 P051 = 40 Online
P772 *	Source for output value at binary 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 *	Source for output value at binary 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 *	Source for output value at binary 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	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	Delay for output value at binary output 2 as P775	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P777	Delay for output value at binary output 3 as P775	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
P778	Delay for output value at binary output 4 as P775	0 to 10000 [ms] 1ms	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online

11.35 Configuration of serial interfaces on basic converter

G-SST 1 (RS485 / RS232 on X300) (see also Section 8, Sheet G29 and Section 9)				
P780 *	Selection of protocol for G-SST1 basic converter interface 0 Setting has no function 2 USS protocol 9 Diagnostic monitor (for factory test purposes)	0, 2, 9 1	Ind: None FS=2 Type: O2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P781 *	Number of process data for G-SST1 <u>When P790 = 0 or 9 is selected:</u> Parameter is irrelevant <u>When USS protocol (P780=2) is selected:</u> 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 *	Length of parameter jobs for G-SST1 This parameter is functional 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 *	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 *	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	Bus terminator for G-SST1 0 = bus terminator OFF 1 = bus terminator ON	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P786 *	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P787	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 *	Source for triggering of message F011 Selection of binector which must trigger message F011 when it switches to log. 2030 = binector B2030 2031 = binector B2031	2030, 2031	Ind: None FS=2030 Type: L2	P052 = 3 P051 = 40 Offline
r789	Diagnostic information for G-SST1 Free-running counter, overflow at 65535 i001: Number of <u>error-free</u> telegrams i002: Number of <u>errored</u> 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 G30 and G32 and Section 9)				
P790 *	Selection of protocol for G-SST2 basic converter interface 0 Setting has no function 2 USS protocol 5 "Peer-to-peer" communication 9 Diagnostic monitor (4-wire operation) (for 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 *	Number of process data for G-SST2 <u>When P790 = 0 or 9 is selected:</u> Parameter is irrelevant <u>When USS protocol (P790=2) is selected:</u> 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. <u>When peer-to-peer (P790= 5) is selected:</u> 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 *	Length of parameter jobs for G-SST2 This parameter is functional only when P790=2 (USS protocol). 0 <u>No PKW data</u> are expected or sent in the USS protocol. 3, 4 <u>3 or 4 PKW data words</u> are expected in the USS protocol and 3 or 4 PKW data words are also sent (for transmission of parameter values). 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 *	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 *	Source for transmit data for G-SST2 Selection of connectors to be transferred as <u>transmit data</u> via basic converter interface 3 <u>When USS protocol (P790=2) is selected:</u> i001: Selection for word 1 i002: Selection for word 2 ... i016: Selection for word 16 <u>When peer-to-peer (P790=5) is selected:</u> i001: Selection for word 1 i002: Selection for word 2 ... i005: Selection for word 5 i006: Not in use ... i016: Not in use 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
P795	Bus terminator for G-SST2 0 = bus terminator OFF 1 = bus terminator ON	0 to 1 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)
P796 *	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	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 *	Source for triggering of message F012 Selection of binector which must trigger message F012 when it switches to log. 6030 = binector B6030 6031 = binector B6031	6030, 6031	Ind: None FS=6030 Type: L2	P052 = 3 P051 = 40 Offline
r799	Diagnostic information for G-SST2 Free-running counter, overflow at 65535 i001: Number of <u>error-free</u> telegrams i002: Number of <u>errored</u> 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
G-SST 3 (RS485 on X162) (see also Section 8, Sheets G31 and G33 and Section 9)				
P800 *	Selection of protocol for G-SST3 basic converter interface 0 Setting has no function 2 USS protocol 5 "Peer-to-peer" communication 9 Diagnostic monitor (4-wire operation) (for factory test purposes)	0, 2, 5, 9 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P801 *	Number of process data for G-SST3 <u>When P800 = 0 or 9 is selected:</u> Parameter is irrelevant <u>When USS protocol (P800=2) is selected:</u> 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. <u>When peer-to-peer (P800=5) is selected:</u> 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 *	Length of parameter jobs for G-SST3 This parameter is functional only when P800=2 (USS protocol). 0 <u>No PKW data</u> are expected or sent in the USS protocol. 3, 4 <u>3 or 4 PKW data words</u> are expected in the USS protocol and 3 or 4 PKW data words are also sent (for transmission of parameter values). 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
P803 *	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P804 *	Source for transmit data for G-SST3 Selection of connectors to be transferred as <u>transmit data</u> via basic converter interface 3 <u>When USS protocol (P800=2) is selected:</u> i001: Selection for word 1 i002: Selection for word 2 ... i016: Selection for word 16 <u>When peer-to-peer (P800=5) is selected:</u> i001: Selection for word 1 i002: Selection for word 2 ... i005: Selection for word 5 i006: Not in use ... i016: Not in use 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	Bus terminator for G-SST3 0 = bus terminator OFF 1 = bus terminator ON	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline
P806 *	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
P807	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P808 *	Source for triggering of message F013 Selection of binector which must trigger message F013 when it switches to log. 9030 = binector B9030 9031 = binector B9031	9030, 9031	Ind: None FS=9030 Type: L2	P052 = 3 P051 = 40 Offline
r809	Diagnostic information for G-SST3 Free-running counter, overflow at 65535 i001: Number of <u>error-free</u> telegrams i002: Number of <u>errored</u> 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. $\neq 02$ 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 $\neq P801 + P802$ (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
r810	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	0000 to FFFF H 1	Ind: 20 Type: L2	P052 = 3
r811	Transmit data on G-SST1 Display of data 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	0000 to FFFF H 1	Ind: 20 Type: L2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r812	Receive data on G-SST2 <u>When USS protocol (P790=2) is selected:</u> 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 <u>When peer-to-peer (P790=5) is selected:</u> Display of data received via peer-to-peer interface 3 i001: Receive data word 1 ... i005 Receive data word 5 i006: Not in use ... i020 Not in use	0000 to FFFF H 1	Ind: 20 Type: L2	P052 = 3
r813	Transmit data on G-SST2 <u>When USS protocol (P790=2) is selected:</u> Display of data 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 data transmitted via peer-to-peer interface 2 i001: Transmit data word 1 ... i005 Transmit data word 5 i006: Not in use ... i020 Not in use	0000 to FFFF H 1	Ind: 20 Type: L2	P052 = 3
r814	Receive data on G-SST3 <u>When USS protocol (P800=2) is selected:</u> 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 <u>When peer-to-peer (P800=5) is selected:</u> Display of data received via peer-to-peer interface 3 i001: Receive data word 1 ... i005 Receive data word 5 i006: Not in use ... i020 Not in use	0000 to FFFF H 1	Ind: 20 Type: L2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
r815	Transmit data on G-SST3 <u>When USS protocol (P800=2) is selected:</u> Display of data 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 <u>When peer-to-peer (P800=5) is selected:</u> Display of data transmitted via peer-to-peer interface 3 i001: Transmit data word 1 ... i005: Transmit data word 5 i006: Not in use ... i020: Not in use	0000 to FFFF H 1	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 *	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 *	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 *	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 *	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

11.36 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!

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 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.37 Compensation values

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
P826	Correction of natural commutation timing If there is a variation in the 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 current peak in the appropriate line phase. Caution: Even an asymmetrical system causes variations in the magnitude of 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
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

11.38 Parameters for SIMOVIS and OP1S

P831 to r849	Parameters for the Trace function of SIMOVIS These parameters are settings for the data exchange between SIMOVIS and the SIMOTRAS converter. They must <u>not</u> be changed!			P052 = 3
r850 to P899	Parameters for the OP1S These parameters are settings for the data exchange between OP1S and the SIMOTRAS converter. They must <u>not</u> be changed!			P052 = 3

11.39 Profile parameters

P918	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
P927 *	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)

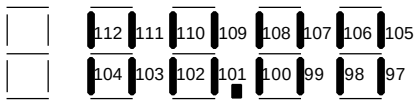
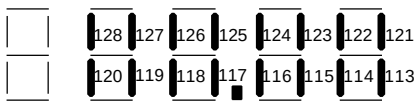
11.40 Fault memory, alarm parameters

r947	Fault memory Display of fault messages generated in response to recent faults. A <u>fault value</u> and <u>fault time</u> is assigned to each <u>fault number</u> (see Section 10 for details of fault numbers and fault values). The interrelationship between the associated parameters is shown in the diagram below. The <u>fault numbers</u> of the last (maximum 8) fault events are stored under the indices of parameter P947. r947.001 displays the fault number of the current (still not acknowledged) fault, index 9 displays the number of the most recent acknowledged fault, index 17 the fault number of the second most recent acknowledged fault, etc. An entry of "0" means that no "earlier" fault has occurred. Since only one fault message can be stored with respect to any fault event on the SIMOTRAS 6SG70, only indices 1, 9, 17, 25, 33, 41, 49 and 57 are relevant. A <u>fault value</u> is assigned to each fault number in the corresponding index of parameter r949. This provides further information about the nature of the fault. In addition, the <u>fault time</u> (the current reading of the hours run counter as the fault occurred (r048)), is stored for each fault in r049. The data for the current (not yet acknowledged) fault are stored as the "Hours run counter reading" in index 1. The data for earlier, already acknowledged faults are stored under the following indices. Plaintext information about the fault numbers is available under the corresponding index of parameter r951. When the electronics power supply fails, only fault numbers and fault values are stored, but fault times are lost (all indices are set to "0" on recovery of the power supply).		Ind: 64 Type: O2	P052 = 3
r949	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
r952	Number of faults	0 to 65535 1	Ind: None Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.41 Visualization parameters: Alarms, control and status word

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 7.2 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 7.2 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
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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
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
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

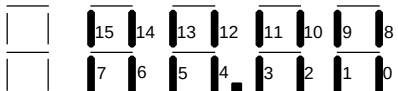
11.42 Resetting and storing parameters, list of existing and modified P and r parameters

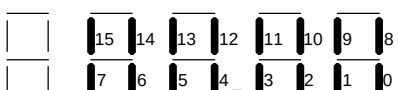
P970 *	Restore factory setting Reset parameters to factory setting (default) 0: Parameter reset: All parameters are reset to their original values (factory setting). The parameter is then set automatically to 1. 1: No parameter reset Note: Function can also be selected by setting P051=21.	0 to 1 1	Ind: None FS=1 Type: O2	P052 = 3 P051 = 40 Offline
P971 *	EEPROM transfer Transfer of parameter values from RAM to EEPROM 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 parameters are arranged 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
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 parameters are arranged 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
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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.43 Display parameters for technology functions with S00

Connector/binector converters				
n010 (2010) S00	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 alight: Bit (binector) = log. "1" state Segment dark: Bit (binector) = log. "0" state		Ind: None Type: V2	P052 = 3
n011 (2011) S00	Connector/binector converter 2 (bit field 2) FB 11 As for n010		Ind: None Type: V2	P052 = 3
n012 (2012) S00	Connector/binector converter 3 (bit field 3) FB 12 As for n010		Ind: None Type: V2	P052 = 3

Binector/connector converters				
n013 (2013) S00	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 alight: Bit = log. "1" state Segment dark: Bit = log. "0" state		Ind: None Type: V2	P052 = 3
n014 (2014) S00	Binector/connector converter 2 (bit field 5) FB 14 As for n013		Ind: None Type: V2	P052 = 3
n015 (2015) S00	Binector/connector converter 3 (bit field 6) FB 15 As for n013		Ind: None Type: V2	P052 = 3

Technology controller				
n016 (2016) S00	Actual value display FB 260	-200.0 to 199.9 [%] 0.1	Ind: None Type: I2	P052 = 3
n017 (2017) S00	Setpoint display FB 260	-200.0 to 199.9 [%] 0.1	Ind: None Type: I2	P052 = 3
n018 (2018) S00	Display of effective Kp factor FB 260	0.00 to 30.00 0.01	Ind: None Type: O2	P052 = 3
n019 (2019) S00	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	Display of actual speed FB 261	-200.0 to 199.9 [%] 0.1	Ind: None Type: I2	P052 = 3
n021 (2021) S00	Display of actual velocity FB 261	-32768 to 32767 [m/s] 0.001	Ind: None Type: I2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n022 (2022) S00	Display of setpoint velocity FB 261	-32768 to 32767 [m/s] 0.001	Ind: None Type: I2	P052 = 3
n023 (2023) S00	Display of setpoint speed FB 261	-200.0 to 199.9 [%] 0.1	Ind: None Type: I2	P052 = 3

11.44 Triggering of faults and alarms

U100 (2100) * S00	Source for triggering of message F023 FB 2 Selection of binector which must trigger message F023 when it switches to log. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=9580 Type: L2	P052 = 3 P051 = 40 Offline
U101 (2101) * S00	Source for triggering of message F024 FB 3 Selection of binector which must trigger message F024 when it switches to log. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=9582 Type: L2	P052 = 3 P051 = 40 Offline
U102 (2102) * S00	Source for triggering of message F033 FB 4 Selection of binector which must trigger message F033 when it switches to log. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U103 (2103) * S00	Source for triggering of message F034 FB 5 Selection of binector which must trigger message F033 when it switches to log. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U104 (2104) * S00	Source for triggering of message A023 FB 6 Selection of binector which must trigger alarm A023 on transition to log. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=9552 Type: L2	P052 = 3 P051 = 40 Offline
U105 (2105) * S00	Source for triggering of message A024 FB 7 Selection of binector which must trigger alarm A024 on transition to log. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U106 (2106) * S00	Source for triggering of message A033 FB 8 Selection of binector which must trigger alarm A033 on transition to log. 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U107 (2107) * S00	Source for triggering of message A034 FB 9 Selection of binector which must trigger alarm A034 on transition to log. 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)

11.45 Connector/binector converters, binector/connector converters

U110 (2110) * S00	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=9210 Type: L2	P052 = 3 P051 = 40 Offline
U111 (2111) * S00	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=9211 Type: L2	P052 = 3 P051 = 40 Offline
U112 (2112) * S00	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	Source for binector/connector converter 1 FB 13 Binectors which must be converted to connector K9113 i001: 1. 16 th binector (bit 0) i002: 2. 16 th binector (bit 1) ... i016: 16. 16 th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS= i001: 0 i002: 0 i003: 14 i004: 0 i005: 0 i006: 12 i007: 0 i008: 514 i009: 0 i010: 0 i011: 0 i012: 500 i013: 502 i014: 510 i015: 512 i016: 0 Type: L2	P052 = 3 P051 = 40 Offline
U114 (2114) * S00	Source for binector/connector converter 2 FB 14 Binectors which must be converted to connector K9114 i001: 1. 16 th binector (bit 0) i002: 2. 16 th binector (bit 1) ... i016: 16. 16 th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS= i001: 0 i002: 0 i003: 0 i004: 0 i005: 0 i006: 0 i007: 506 i008: 508 i009: 0 i010: 0 i011: 0 i012: 0 i013: 16 i014: 10 i015: 0 i016: 504 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U115 (2115) * S00	Source for binector/connector converter 3 FB 15 Binectors which must be converted to connector K9115 i001: 1. 16 th binector (bit 0) i002: 2. 16 th binector (bit 1) ... i016: 16. 16 th binector (bit 15) Settings: 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 16 FS= i001: 9170 i002: 9173 i003: 136 i004: 139 i005: 141 i006: 143 i007: 145 i008: 147 i009: 149 i010: 151 i011: 153 i012: 9361 i013: 157 i014: 0 i015: 9381 i016: 211 Type: L2	P052 = 3 P051 = 40 Offline
U116 (2116) *	Source for binector/connector converter for GSST1 Binectors which must be converted to connector K2020 i001: 1. 16 th binector (bit 0) i002: 2. 16 th binector (bit 1) ... i016: 16. 16 th 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) *	Source for binector/connector converter for GSST2 Binectors which must be converted to connector K6020 i001: 1. 16 th binector (bit 0) i002: 2. 16 th binector (bit 1) ... i016: 16. 16 th 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) *	Source for binector/connector converter for GSST3 Binectors which must be converted to connector K9020 i001: 1. 16 th binector (bit 0) i002: 2. 16 th binector (bit 1) ... i016: 16. 16 th 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 SIMOVIS This parameter is a setting for the exchange of process data between SIMOVIS and the SIMOREG converter. It must <u>not</u> be changed!			

11.46 Mathematical functions

Adders / Subtracters

The 3 operands of a function block are selected via the 3 indices of a parameter. The connectors selected in indices i001 and i002 are added, and the connector selected in index i003 is subtracted.
The result is limited to -200.00 to +199.99% and applied to the specified connector.

U120 (2120) * S00	Operands for 1st adder / subtracter (result = K9120) FB 20 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)
U121 (2121) * S00	Operands for 2nd adder / subtracter (result = K9121) 0 = connector K0000 1 = connector K0001 etc.	FB 21	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U122 (2122) * S00	Operands for 3rd adder / subtracter (result = K9122) 0 = connector K0000 1 = connector K0001 etc.	FB 22	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U123 (2123) * S00	Operands for 4th adder / subtracter (result = K9123) 0 = connector K0000 1 = connector K0001 etc.	FB 23	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U124 (2124) * S00	Operands for 5th adder / subtracter (result = K9124) 0 = connector K0000 1 = connector K0001 etc.	FB 24	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U125 (2125) * S00	Operands for 6th adder / subtracter (result = K9125) 0 = connector K0000 1 = connector K0001 etc.	FB 25	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U126 (2126) * S00	Operands for 7th adder / subtracter (result = K9126) 0 = connector K0000 1 = connector K0001 etc.	FB 26	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U127 (2127) * S00	Operands for 8th adder / subtracter (result = K9127) 0 = connector K0000 1 = connector K0001 etc.	FB 27	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U128 (2128) * S00	Operands for 9th adder / subtracter (result = K9128) 0 = connector K0000 1 = connector K0001 etc.	FB 28	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U129 (2129) * S00	Operands for 10th adder / subtracter (result = K9129) 0 = connector K0000 1 = connector K0001 etc.	FB 29	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U130 (2130) * S00	Operands for 11th adder / subtracter (result = K9130) 0 = connector K0000 1 = connector K0001 etc.	FB 30	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U131 (2131) * S00	Operands for 12th adder / subtracter (result = K9131) 0 = connector K0000 1 = connector K0001 etc.	FB 31	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Sign inverters

The contents of the connector selected in the parameter are negated (two's complement). The result is applied to the specified connector.

U135 (2135) * S00	Source for 1st sign inverter (result = K9135) 0 = connector K0000 1 = connector K0001 etc.	FB 35	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U136 (2136) * S00	Source for 2nd sign inverter (result = K9136) 0 = connector K0000 1 = connector K0001 etc.	FB 36	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U137 (2137) * S00	Source for 3rd sign inverter (result = K9137) 0 = connector K0000 1 = connector K0001 etc.	FB 37	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)
U138 (2138) * S00	Source for 4th sign inverter (result = K9138) 0 = connector K0000 1 = connector K0001 etc.	FB 38 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.

U140 (2140) * S00	Source for 1st switchable sign inverter Result = K9140 0 = connector K0000 1 = connector K0001 etc.	FB 40 All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U141 (2141) * S00	Control bit for 1st switchable sign inverter 0 = binector B0000 1 = binector B0001 etc.	FB 40 All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U142 (2142) * S00	Source for 2nd switchable sign inverter Result = K9141 0 = connector K0000 1 = connector K0001 etc.	FB 41 All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U143 (2143) * S00	Control bit for 2nd switchable sign inverter 0 = binector B0000 1 = binector B0001 etc.	FB 41 All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Dividers

The two operands are selected via the two indices of the parameter, i.e. index i001 = x1, index i002 = x2

$$\text{Equation: } y = \frac{x1 * 100\%}{x2}$$

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.

U145 (2145) * S00	Operands for 1st divider (result = K9145) 0 = connector K0000 1 = connector K0001 etc.	FB 45 All connector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U146 (2146) * S00	Operands for 2nd divider (result = K9146) 0 = connector K0000 1 = connector K0001 etc.	FB 46 All connector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U147 (2147) * S00	Operands for 3rd divider (result = K9147) 0 = connector K0000 1 = connector K0001 etc.	FB 47 All connector numbers 1	Ind: 2 FS=1 Type: L2	P052 = 3 P051 = 40 Offline

Multipliers

The two operands are selected via the two indices of the parameter, i.e. index i001 = x1, index i002 = x2

$$\text{Equation: } y = \frac{x1 * x2}{100\%}$$

y is limited to -200.00 to +199.99% and applied to the specified connector.

U150 (2150) * S00	Operands for 1st multiplier (result = K9150) 0 = connector K0000 1 = connector K0001 etc.	FB 50 All connector numbers 1	Ind: 2 FS= i001: 9229 i002: 401 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U151 (2151) * S00	Operands for 2nd multiplier (result = K9151) FB 51 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U152 (2152) * S00	Operands for 3rd multiplier (result = K9152) FB 52 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U153 (2153) * S00	Operands for 4th multiplier (result = K9153) FB 53 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

High-resolution multipliers/dividers

The three operands are selected via the three indices of the parameter, i.e. index i001 = x1, index i002 = x2, index i003 = x3

$$\text{Equations: } x4(32\text{bit}) = x1 * x2, \quad y = \frac{x4}{x3} = \frac{x1 * x2}{x3}$$

Applicable for division by 0 (x2=0):

When x1 > 0: y = +199.99%

When x1 = 0: y = 0.00%

When x1 < 0: y = -200.00%

y is limited to -200.00 to +199.99% and applied to the specified connector.

U155 (2155) * S00	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	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	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 generator with filter

U160 (2160) * S00	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	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	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	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	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	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U166 (2166) * S00	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
U167 (2167) * S00	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	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	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	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	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

11.47 Limiters, limit-value monitors

Limiters The input quantity selected via index i001 of the 1 st parameter is limited to the limit values selected via indices i002 and i003 and applied to the specified connector. Violation of the limit values is signalled by means of two binectors.				
U175 (2175) * S00	Source for input signal and limits for limiter 1 FB 65 Output = connector K9167 i001: Input signal i002: Positive limiting value (L+) i003: Negative limiting value (L-) Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS= i001: 0 i002: 9165 i003: 9166 Type: L2	P052 = 3 P051 = 40 Offline
U176 (2176) S00	Limit value for limiter FB 65 Applied to connector K9165	-199.99 to 199.99 [%] 0.01%	Ind: None FS=100.00 Type: I2	P052 = 3 P051 = 40 Offline
U177 (2177) * S00	Source for input signal and limits for limiter 2 FB 66 Output = connector K9170 i001: Input signal i002: Positive limiting value (L+) i003: Negative limiting value (L-) Settings: 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 3 FS= i001: 0 i002: 9168 i003: 9169 Type: L2	P052 = 3 P051 = 40 Offline
U178 (2178) S00	Limit value for limiter FB 66 Applied to connector K9168	-199.99 to 199.99 [%] 0.01%	Ind: None 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	Source for input signal and limits for limiter 3 Output = connector K9173 i001: Input signal i002: Positive limiting value (L+) i003: Negative limiting value (L-) Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 67	All connector numbers 1	Ind: 3 FS= i001: 0 i002: 9171 i003: 9172 Type: L2	P052 = 3 P051 = 40 Offline
U180 (2180) S00	Limit value for limiter Applied to connector K9171	FB 67	-199.99 to 199.99 [%] 0.01%	Ind: None FS=100.00 Type: I2	P052 = 3 P051 = 40 Offline

Limit-value monitor with filter					
U185 (2185) * S00	Source for input signal (A) and operating point (B) for 1. Limit-value monitor with filter i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 70	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9181 Type: L2	P052 = 3 P051 = 40 Offline
U186 (2186) S00	Settable operating point for limit-value monitor Applied to connector K9181	FB 70	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U187 (2187) S00	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	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

U189 (2189) * S00	Source for input signal (A) and operating point (B) for 2. Limit-value monitor with filter i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 71	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9183 Type: L2	P052 = 3 P051 = 40 Offline
U190 (2190) S00	Settable operating point for limit-value monitor Applied to connector K9183	FB 71	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U191 (2191) S00	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	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	Source for input signal (A) and operating point (B) for 3. Limit-value monitor with filter i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 72	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9185 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description		Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U194 (2194) S00	Settable operating point for limit-value monitor Applied to connector K9185	FB 72	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U195 (2195) S00	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	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 monitor without filter					
U197 (2197) * S00	Source for input signal (A) and operating point (B) for 1. Limit-value monitor without filter i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 73	All connector numbers 1	Ind: 2 FS= i001: 167 i002: 9186 Type: L2	P052 = 3 P051 = 40 Offline
U198 (2198) S00	Settable operating point for limit-value monitor Applied to connector K9186	FB 73	-200.00 to 199.99 [%] 0.01%	Ind: None FS=75.00 Type: I2	P052 = 3 P051 = 40 Offline
U199 (2199) S00	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

U200 (2200) * S00	Source for input signal (A) and operating point (B) for 2. Limit-value monitor without filter i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 74	All connector numbers 1	Ind: 2 FS= i001: 9187 i002: 167 Type: L2	P052 = 3 P051 = 40 Offline
U201 (2201) S00	Settable operating point for limit-value monitor Applied to connector K9187	FB 74	-200.00 to 199.99 [%] 0.01%	Ind: None FS=-75.00 Type: I2	P052 = 3 P051 = 40 Offline
U202 (2202) S00	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

U203 (2203) * S00	Source for input signal (A) and operating point (B) for 3. Limit-value monitor without filter i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 75	All connector numbers 1	Ind: 2 FS= i001: 401 i002: 166 Type: L2	P052 = 3 P051 = 40 Offline
U204 (2204) S00	Settable operating point for limit-value monitor Applied to connector K9188	FB 75	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U205 (2205) S00	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	Source for input signal (A) and operating point (B) for 4. Limit-value monitor without filter i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 76	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9189 Type: L2	P052 = 3 P051 = 40 Offline
U207 (2207) S00	Settable operating point for limit-value monitor Applied to connector K9189	FB 76	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U208 (2208) S00	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
U210 (2210) * S00	Source for input signal (A) and operating point (B) for 5. Limit-value monitor without filter i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 77	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9190 Type: L2	P052 = 3 P051 = 40 Offline
U211 (2211) S00	Settable operating point for limit-value monitor Applied to connector K9190	FB 77	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U212 (2212) S00	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
U213 (2213) * S00	Source for input signal (A) and operating point (B) for 6. Limit-value monitor without filter i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 78	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9191 Type: L2	P052 = 3 P051 = 40 Offline
U214 (2214) S00	Settable operating point for limit-value monitor Applied to connector K9191	FB 78	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U215 (2215) S00	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
U216 (2216) * S00	Source for input signal (A) and operating point (B) for 7. Limit-value monitor without filter i001: Input signal i002: Operating point Settings: 0 = connector K0000 1 = connector K0001 etc.	FB 79	All connector numbers 1	Ind: 2 FS= i001: 0 i002: 9192 Type: L2	P052 = 3 P051 = 40 Offline
U217 (2217) S00	Settable operating point for limit-value monitor Applied to connector K9192	FB 79	-200.00 to 199.99 [%] 0.01%	Ind: None FS=0.00 Type: I2	P052 = 3 P051 = 40 Offline
U218 (2218) S00	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.48 Processing of analog signals

Maximum selection

The highest of the input values selected via the 3 parameter indices is applied to the output (K9193).

U220 (2220) * S00	Source for maximum selection 0 = connector K0000 1 = connector K0001 etc.	FB 80	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Minimum selection

The lowest of the input values selected via the 3 parameter indices is applied to the output (K9194).

U221 (2221) * S00	Source for minimum selection 0 = connector K0000 1 = connector K0001 etc.	FB 81	All connector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Tracking/storage elements

The tracking/storage elements are storage elements for the parameterized input quantity. While the SET input is in the log.

Transfer of the input quantity is controlled via the RESET, TRACK and STORE functions:

RESET: When the controlling binector reaches log. "1", the output is set to 0.00% (y=0)

TRACK: When the controlling binector reaches log. "1", the output is set to the input value and then tracks it continuously (y=x). If the TRACK signal switches from "1" to "0", the last value applied to the y output is "frozen"

STORE: With a "0" to "1" transition of the controlling binector signal, the output is permanently set to the current input value (y=x). This value then remains stored

Priority 1. RESET, 2. TRACK, 3. STORE

Tracking/storage element 1

U222 (2222) * S00	Source for input quantity (x) 0 = connector K0000 1 = connector K0001 etc.	FB 82	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U223 (2223) * S00	Source for control signals RESET, TRACK and STORE i001: TRACK i002: STORE i003: RESET Settings: 0 = binector B0000 1 = binector B0001 etc.	FB 82	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U224 (2224) * S00	Control word for Power On Mode 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	FB 82	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Tracking/storage element 2

U225 (2225) * S00	Source for input quantity (x) 0 = connector K0000 1 = connector K0001 etc.	FB 83	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	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	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

Analog signal memory

The analog signal memories are storage elements for input quantities selected in 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.

Analog signal memory 1

U228 (2228) * S00	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	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

Analog signal memory 2

U230 (2230) * S00	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	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 selector 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 selector switch 1 (output = K9210)

U240 (2240) * S00	Source for input quantities FB 90 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 9113 i002: 3001 Type: L2	P052 = 3 P051 = 40 Offline
U241 (2241) * S00	Source for control signal FB 90 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=3110 Type: L2	P052 = 3 P051 = 40 Offline

Connector selector switch 2 (output = K9211)

U242 (2242) * S00	Source for input quantities FB 91 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: 2 FS= i001: 9114 i002: 3003 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description		Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U243 (2243) * S00	Source for control signal 0 = binector B0000 1 = binector B0001 etc.	FB 91	All binector numbers 1	Ind: None FS=3110 Type: L2	P052 = 3 P051 = 40 Offline

Connector selector switch 3 (output = K9212)

U244 (2244) * S00	Source for input quantities 0 = connector K0000 1 = connector K0001 etc.	FB 92	All connector numbers 1	Ind: 2 FS= i001: 11 i002: 3002 Type: L2	P052 = 3 P051 = 40 Offline
U245 (2245) * S00	Source for control signal 0 = binector B0000 1 = binector B0001 etc.	FB 92	All binector numbers 1	Ind: None FS=3110 Type: L2	P052 = 3 P051 = 40 Offline

Connector selector switch 4 (output = K9213)

U246 (2246) * S00	Source for input quantities 0 = connector K0000 1 = connector K0001 etc.	FB 93	All connector numbers 1	Ind: 2 FS= i001: 1 i002: 3 Type: L2	P052 = 3 P051 = 40 Offline
U247 (2247) * S00	Source for control signal 0 = binector B0000 1 = binector B0001 etc.	FB 93	All binector numbers 1	Ind: None FS=9064 Type: L2	P052 = 3 P051 = 40 Offline

Connector selector switch 5 (output = K9214)

U248 (2248) * S00	Source for input quantities 0 = connector K0000 1 = connector K0001 etc.	FB 94	All connector numbers 1	Ind: 2 FS= i001: 9150 i002: 9213 Type: L2	P052 = 3 P051 = 40 Offline
U249 (2249) * S00	Source for control signal 0 = binector B0000 1 = binector B0001 etc.	FB 94	All binector numbers 1	Ind: None FS=9083 Type: L2	P052 = 3 P051 = 40 Offline

Connector selector switch 6 (output = K9215)

U250 (2250) * S00	Source for input quantities 0 = connector K0000 1 = connector K0001 etc.	FB 95	All connector numbers 1	Ind: 2 FS= i001: 9214 i002: 510 Type: L2	P052 = 3 P051 = 40 Offline
U251 (2251) * S00	Source for control signal 0 = binector B0000 1 = binector B0001 etc.	FB 95	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Connector selector switch 7 (output = K9216)

U252 (2252) * S00	Source for input quantities 0 = connector K0000 1 = connector K0001 etc.	FB 96	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U253 (2253) * S00	Source for control signal 0 = binector B0000 1 = binector B0001 etc.	FB 96	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 selector switch 8 (output = K9217)					
U254 (2254) * S00	Source for input quantities 0 = connector K0000 1 = connector K0001 etc.	FB 97	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U255 (2255) * S00	Source for control signal 0 = binector B0000 1 = binector B0001 etc.	FB 97	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Connector selector switch 9 (output = K9218)					
U256 (2256) * S00	Source for input quantities 0 = connector K0000 1 = connector K0001 etc.	FB 98	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U257 (2257) * S00	Source for control signal 0 = binector B0000 1 = binector B0001 etc.	FB 98	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Connector selector switch 10 (output = K9219)					
U258 (2258) * S00	Source for input quantities 0 = connector K0000 1 = connector K0001 etc.	FB 99	All connector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U259 (2259) * S00	Source for control signal 0 = binector B0000 1 = binector B0001 etc.	FB 99	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

11.49 Integrators, DT1 elements, characteristics, dead zones, setpoint branching

Integrator 1 (output = K9220)					
U260 (2260) * S00	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 100	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U261 (2261) S00	Integral-action time	FB 100	10 to 65000 [ms] 1	Ind: None FS=10 Type: O2	P052 = 3 P051 = 40 Online
U262 (2262) * S00	Source for control signals 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.	FB 100	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U263 (2263) * S00	Source for setting value 0 = connector K0000 1 = connector K0001 etc.	FB 100	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)
Integrator 2 (output = K9221)					
U264 (2264) * S00	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 101	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U265 (2265) S00	Integral-action time	FB 101	10 to 65000 [ms] 1	Ind: None FS=10 Type: O2	P052 = 3 P051 = 40 Online
U266 (2266) * S00	Source for control signals 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.	FB 101	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U267 (2267) * S00	Source for setting value 0 = connector K0000 1 = connector K0001 etc.	FB 101	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Integrator 3 (output = K9222)					
U268 (2268) * S00	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 102	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U269 (2269) S00	Integral-action time	FB 102	10 to 65000 [ms] 1	Ind: None FS=10 Type: O2	P052 = 3 P051 = 40 Online
U270 (2270) * S00	Source for control signals 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.	FB 102	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U271 (2271) * S00	Source for setting value 0 = connector K0000 1 = connector K0001 etc.	FB 102	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	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 103	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U273 (2273) S00	Derivative-action time	FB 103	0 to 1000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
U274 (2274) S00	Filter time	FB 103	0 to 1000 [ms] 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)
DT1 element 2 (output = K9225, inverted: K9226)					
U275 (2275) * S00	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 104	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U276 (2276) S00	Derivative-action time	FB 104	0 to 1000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
U277 (2277) S00	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	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 105	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U279 (2279) S00	Derivative-action time	FB 105	0 to 1000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
U280 (2280) S00	Filter time	FB 105	0 to 1000 [ms] 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online

Characteristic blocks

The shape of the characteristics can be defined in 10 points:

x values: Index i001 to i10 of parameter for x values
Associated y values: Index i001 to i10 of parameter for y values

Applicable for x = -200.00% up to x value as set in i001 of "x value" parameter: y = value as set in index i001 of parameter for y values

Applicable for x = x value as set in index i10 of "x value" parameter up to x = 200.00%: y = value as set in index i10 of parameter for y values

The space between any two adjacent x or y values must not exceed 199.99%. The characteristic will otherwise deviate from the desired shape.

Characteristic block 1 (output = K9229)

U281 (2281) * S00	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 106	All connector numbers 1	Ind: None FS=9212 Type: L2	P052 = 3 P051 = 40 Offline
U282 (2282) S00	x values i001 1. 10 th characteristic point i002 2. 10 th characteristic point ... i010 10. 10 th characteristic point	FB 106	-200.00 to 199.99 [%] 0.01	Ind: 10 FS= i001: -100.00 i002: -70.00 i003: -60.00 i004: -40.00 i005: -20.00 i006: 20.00 i007: 40.00 i008: 60.00 i009: 70.00 i010: 100.00 Type: I2	P052 = 3 P051 = 40 Online
U283 (2283) S00	y values i001 1. 10 th characteristic point i002 2. 10 th characteristic point ... i010 10. 10 th characteristic point	FB 106	-200.00 to 199.99 [%] 0.01	Ind: 10 FS= i001: -100.00 i002: -50.00 i003: -35.00 i004: -20.00 i005: -6.00 i006: 6.00 i007: 20.00 i008: 35.00 i009: 50.00 i010: 100.00 Type: I2	P052 = 3 P051 = 40 Online

PNU	Description		Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
Characteristic block 2 (output = K9230)					
U284 (2284) * S00	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 107	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U285 (2285) S00	x values i001 1. 10 th characteristic point i002 2. 10 th characteristic point ... i010 10. 10 th characteristic point	FB 107	-200.00 to 199.99 [%] 0.01	Ind: 10 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
U286 (2286) S00	y values i001 1. 10 th characteristic point i002 2. 10 th characteristic point ... i010 10. 10 th characteristic point	FB 107	-200.00 to 199.99 [%] 0.01	Ind: 10 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
Characteristic block 3 (output = K9231)					
U287 (2287) * S00	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 108	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U288 (2288) S00	x values i001 1. 10 th characteristic point i002 2. 10 th characteristic point ... i010 10. 10 th characteristic point	FB 108	-200.00 to 199.99 [%] 0.01	Ind: 10 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
U289 (2289) S00	y values i001 1. 10 th characteristic point i002 2. 10 th characteristic point ... i010 10. 10 th characteristic point	FB 108	-200.00 to 199.99 [%] 0.01	Ind: 10 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
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	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 109	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U291 (2291) S00	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	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 110	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U293 (2293) S00	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	Source for input quantity 0 = connector K0000 1 = connector K0001 etc.	FB 111	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)
U295 (2295) S00	Dead zone FB 111	0.00 to 100.00 [%] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

Setpoint branching (output = K9235)

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	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	Minimum speed FB 112	0.00 to 199.99 [%] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online
U298 (2298) S00	Maximum speed FB 112	0.00 to 199.99 [%] 0.01	Ind: None FS=100.00 Type: O2	P052 = 3 P051 = 40 Online
U299 (2299) S00	Hysteresis FB 112	0.00 to 100.00 [%] 0.01	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Online

11.50 Simple ramp-function generator

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	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	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	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	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)

11.51 Logic functions

Decoders / demultiplexers, binary to 1 of 8					
U318 (2318) * S00	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	
U319 (2319) * S00	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	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= i001: 14 i002: 9054 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline	
U321 (2321) * S00	Source for input signals, AND element 2 (output = B9351) FB 121 As for U320	All binector numbers 1	Ind: 3 FS= i001: 9081 i002: 250 i003: 9456 Type: L2	P052 = 3 P051 = 40 Offline	
U322 (2322) * S00	Source for input signals, AND element 3 (output = B9352) FB 122 As for U320	All binector numbers 1	Ind: 3 FS= i001: 9063 i002: 9065 i003: 9551 Type: L2	P052 = 3 P051 = 40 Offline	
U323 (2323) * S00	Source for input signals, AND element 4 (output = B9353) FB 123 As for U320	All binector numbers 1	Ind: 3 FS= i001: 9064 i002: 9066 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline	
U324 (2324) * S00	Source for input signals, AND element 5 (output = B9354) FB 124 As for U320	All binector numbers 1	Ind: 3 FS= i001: 9057 i002: 151 i003: 145 Type: L2	P052 = 3 P051 = 40 Offline	
U325 (2325) * S00	Source for input signals, AND element 6 (output = B9355) FB 125 As for U320	All binector numbers 1	Ind: 3 FS= i001: 149 i002: 9451 i003: 9452 Type: L2	P052 = 3 P051 = 40 Offline	

PNU	Description		Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U326 (2326) * S00	Source for input signals, AND element 7 (output = B9356) As for U320	FB 126	All binector numbers 1	Ind: 3 FS= i001: 9354 i002: 9355 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline
U327 (2327) * S00	Source for input signals, AND element 8 (output = B9357) As for U320	FB 127	All binector numbers 1	Ind: 3 FS= i001: 9356 i002: 9367 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline
U328 (2328) * S00	Source for input signals, AND element 9 (output = B9358) As for U320	FB 128	All binector numbers 1	Ind: 3 FS= i001: 9380 i002: 9553 i003: 170 Type: L2	P052 = 3 P051 = 40 Offline
U329 (2329) * S00	Source for input signals, AND element 10 (output = B9359) As for U320	FB 129	All binector numbers 1	Ind: 3 FS= i001: 9470 i002: 9456 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline
U330 (2330) * S00	Source for input signals, AND element 11 (output = B9360) As for U320	FB 130	All binector numbers 1	Ind: 3 FS= i001: 9065 i002: 9066 i003: 9551 Type: L2	P052 = 3 P051 = 40 Offline
U331 (2331) * S00	Source for input signals, AND element 12 (output = B9361) As for U320	FB 131	All binector numbers 1	Ind: 3 FS= i001: 255 i002: 9381 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline
U332 (2332) * S00	Source for input signals, AND element 13 (output = B9362) As for U320	FB 132	All binector numbers 1	Ind: 3 FS= i001: 9063 i002: 9074 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline
U333 (2333) * S00	Source for input signals, AND element 14 (output = B9363) As for U320	FB 133	All binector numbers 1	Ind: 3 FS= i001: 9064 i002: 9075 i003: 9551 Type: L2	P052 = 3 P051 = 40 Offline
U334 (2334) * S00	Source for input signals, AND element 15 (output = B9364) As for U320	FB 134	All binector numbers 1	Ind: 3 FS= i001: 9454 i002: 9361 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline
U335 (2335) * S00	Source for input signals, AND element 16 (output = B9365) As for U320	FB 135	All binector numbers 1	Ind: 3 FS= i001: 250 i002: 9455 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline
U336 (2336) * S00	Source for input signals, AND element 17 (output = B9366) As for U320	FB 136	All binector numbers 1	Ind: 3 FS= i001: 9361 i002: 9080 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline
U337 (2337) * S00	Source for input signals, AND element 18 (output = B9367) As for U320	FB 137	All binector numbers 1	Ind: 3 FS= i001: 9456 i002: 105 i003: 9059 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description		Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U338 (2338) * S00	Source for input signals, AND element 19 (output = B9368) As for U320	FB 138	All binector numbers 1	Ind: 3 FS= i001: 9382 i002: 9083 i003: 1 Type: L2	P052 = 3 P051 = 40 Offline
U339 (2339) * S00	Source for input signals, AND element 20 (output = B9369) As for U320	FB 139	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U340 (2340) * S00	Source for input signals, AND element 21 (output = B9370) As for U320	FB 140	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U341 (2341) * S00	Source for input signals, AND element 22 (output = B9371) As for U320	FB 141	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U342 (2342) * S00	Source for input signals, AND element 23 (output = B9372) As for U320	FB 142	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U343 (2343) * S00	Source for input signals, AND element 24 (output = B9373) As for U320	FB 143	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U344 (2344) * S00	Source for input signals, AND element 25 (output = B9374) As for U320	FB 144	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U345 (2345) * S00	Source for input signals, AND element 26 (output = B9375) As for U320	FB 145	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U346 (2346) * S00	Source for input signals, AND element 27 (output = B9376) As for U320	FB 146	All binector numbers 1	Ind: 3 FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U347 (2347) * S00	Source for input signals, AND element 28 (output = B9377) As for U320	FB 147	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	Source for input signals, OR element 1 (output = B9380) i001 Source for input 1 i002 Source for input 2 i003 Source for input 3 Settings: 0 = binector B0000 1 = binector B0001 etc.	FB 150	All binector numbers 1	Ind: 3 FS= i001: 9352 i002: 9353 i003: 0 Type: L2	P052 = 3 P051 = 40 Offline
U351 (2351) * S00	Source for input signals, OR element 2 (output = B9381) As for U350	FB 151	All binector numbers 1	Ind: 3 FS= i001: 9554 i002: 9360 i003: 0 Type: L2	P052 = 3 P051 = 40 Offline
U352 (2352) * S00	Source for input signals, OR element 3 (output = B9382) As for U350	FB 152	All binector numbers 1	Ind: 3 FS= i001: 9362 i002: 9363 i003: 0 Type: L2	P052 = 3 P051 = 40 Offline
U353 (2353) * S00	Source for input signals, OR element 4 (output = B9383) As for U350	FB 153	All binector numbers 1	Ind: 3 FS= i001: 9365 i002: 9366 i003: 0 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U354 (2354) * S00	Source for input signals, OR element 5 (output = B9384) As for U350	FB 154 All binector numbers 1	Ind: 3 FS= i001: 9063 i002: 9064 i003: 0 Type: L2	P052 = 3 P051 = 40 Offline
U355 (2355) * S00	Source for input signals, OR element 6 (output = B9385) As for U350	FB 155 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U356 (2356) * S00	Source for input signals, OR element 7 (output = B9386) As for U350	FB 156 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U357 (2357) * S00	Source for input signals, OR element 8 (output = B9387) As for U350	FB 157 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U358 (2358) * S00	Source for input signals, OR element 9 (output = B9388) As for U350	FB 158 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U359 (2359) * S00	Source for input signals, OR element 10 (output = B9389) As for U350	FB 159 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U360 (2360) * S00	Source for input signals, OR element 11 (output = B9390) As for U350	FB 160 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U361 (2361) * S00	Source for input signals, OR element 12 (output = B9391) As for U350	FB 161 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U362 (2362) * S00	Source for input signals, OR element 13 (output = B9392) As for U350	FB 162 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U363 (2363) * S00	Source for input signals, OR element 14 (output = B9393) As for U350	FB 163 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U364 (2364) * S00	Source for input signals, OR element 15 (output = B9394) As for U350	FB 164 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U365 (2365) * S00	Source for input signals, OR element 16 (output = B9395) As for U350	FB 165 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U366 (2366) * S00	Source for input signals, OR element 17 (output = B9396) As for U350	FB 166 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U367 (2367) * S00	Source for input signals, OR element 18 (output = B9397) As for U350	FB 167 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U368 (2368) * S00	Source for input signals, OR element 19 (output = B9398) As for U350	FB 168 All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U369 (2369) * S00	Source for input signals, OR element 20 (output = B9399) As for U350	FB 169 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)
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.					
U370 (2370) * S00	Source for input signals, XOR element 1 (output = B9195) i001 Source for input 1 i002 Source for input 2 Settings: 0 = binector B0000 1 = binector B0001 etc.	FB 170	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U371 (2371) * S00	Source for input signals, XOR element 2 (output = B9196) As for U370	FB 171	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U372 (2372) * S00	Source for input signals, XOR element 3 (output = B9197) As for U370	FB 172	All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U373 (2373) * S00	Source for input signals, XOR element 4 (output = B9198) As for U370	FB 173	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.					
U380 (2380) * S00	Source for input signal, inverter 1 (output = B9450) 0 = binector B0000 1 = binector B0001 etc.	FB 180	All binector numbers 1	Ind: None FS=9081 Type: L2	P052 = 3 P051 = 40 Offline
U381 (2381) * S00	Source for input signal, inverter 2 (output = B9451) As for U380	FB 181	All binector numbers 1	Ind: None FS=186 Type: L2	P052 = 3 P051 = 40 Offline
U382 (2382) * S00	Source for input signal, inverter 3 (output = B9452) As for U380	FB 182	All binector numbers 1	Ind: None FS=189 Type: L2	P052 = 3 P051 = 40 Offline
U383 (2383) * S00	Source for input signal, inverter 4 (output = B9453) As for U380	FB 183	All binector numbers 1	Ind: None FS=9356 Type: L2	P052 = 3 P051 = 40 Offline
U384 (2384) * S00	Source for input signal, inverter 5 (output = B9454) As for U380	FB 184	All binector numbers 1	Ind: None FS=9358 Type: L2	P052 = 3 P051 = 40 Offline
U385 (2385) * S00	Source for input signal, inverter 6 (output = B9455) As for U380	FB 185	All binector numbers 1	Ind: None FS=9080 Type: L2	P052 = 3 P051 = 40 Offline
U386 (2386) * S00	Source for input signal, inverter 7 (output = B9456) As for U380	FB 186	All binector numbers 1	Ind: None FS=9384 Type: L2	P052 = 3 P051 = 40 Offline
U387 (2387) * S00	Source for input signal, inverter 8 (output = B9457) As for U380	FB 187	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U388 (2388) * S00	Source for input signal, inverter 9 (output = B9458) As for U380	FB 188	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U389 (2389) * S00	Source for input signal, inverter 10 (output = B9459) As for U380	FB 189	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U390 (2390) * S00	Source for input signal, inverter 11 (output = B9460) As for U380	FB 190	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)
U391 (2391) * S00	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	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	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	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	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	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= i001: 9065 i002: 9066 i003: 9551 Type: L2	P052 = 3 P051 = 40 Offline
U401 (2401) * S00	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	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	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	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	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
U406 (2406) * S00	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	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	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	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U410 (2410) * S00	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	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

11.52 Storage elements, timers and binary signal selector switches

RS flipflops				
RS flipflops with SET (Q=1) and RESET (Q=0) (priority: 1. 1 st RESET, 2 nd SET). RESET setting is enabled on POWER ON.				
U415 (2415) * S00	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= i001: 9450 i002: 9351 Type: L2	P052 = 3 P051 = 40 Offline
U416 (2416) * S00	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= i001: 9453 i002: 9357 Type: L2	P052 = 3 P051 = 40 Offline
U417 (2417) * S00	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= i001: 9359 i002: 9360 Type: L2	P052 = 3 P051 = 40 Offline
U418 (2418) * S00	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	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	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
U421 (2421) * S00	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	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	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	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	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	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U427 (2427) * S00	Source for SET and RESET for RS flipflop 13 (outputs: Q = B9574, /Q = B9575) As for U415	FB 227 All binector numbers 1	Ind: 2 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U428 (2428) * S00	Source for SET and RESET for RS flipflop 14 (outputs: Q = B9576, /Q = B9577) As for U415	FB 228 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.

U430 (2430) * S00	Source for SET, D, STORE and RESET for D flipflop 1 (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.	FB 230 All binector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U431 (2431) * S00	Source for SET, D, STORE and RESET for D flipflop 2 (outputs: Q = B9492, /Q = B9493) As for U430	FB 231 All binector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U432 (2432) * S00	Source for SET, D, STORE and RESET for D flipflop 3 (outputs: Q = B9494, /Q = B9495) As for U430	FB 232 All binector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U433 (2433) * S00	Source for SET, D, STORE and RESET for D flipflop 4 (outputs: Q = B9496, /Q = B9497) As for U430	FB 233 All binector numbers 1	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Timer 1 (0.000 to 60.000s) (output = B9580, inverted: B9581)

U440 (2440) * S00	Source for input signal for timer 1 0 = binector B0000 1 = binector B0001 etc.	FB 240 All binector numbers 1	Ind: None FS=9364 Type: L2	P052 = 3 P051 = 40 Offline
U441 (2441) S00	Time for timer 1	FB 240 0.000 to 60.000 [s] 1	Ind: None FS=10.500 Type: O2	P052 = 3 P051 = 40 Offline
U442 (2442) * S00	Mode for timer 1 0 ON delay 1 OFF delay 2 ON / OFF delay 3 Pulse generator with positive edge triggering	FB 240 0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Timer 2 (0.000 to 60.000s) (output = B9582, inverted: B9583)

U443 (2443) * S00	Source for input signal for timer 2 As for U440	FB 241 All binector numbers 1	Ind: None FS=9383 Type: L2	P052 = 3 P051 = 40 Offline
U444 (2444) S00	Time for timer 2	FB 241 0.000 to 60.000 [s] 1	Ind: None FS=0.500 Type: O2	P052 = 3 P051 = 40 Offline
U445 (2445) * S00	Mode for timer 2 As for U442	FB 241 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)					
U446 (2446) * S00	Source for input signal for timer 3 As for U440	FB 242	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U447 (2447) S00	Time for timer 3	FB 242	0.000 to 60.000 [s] 1	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
U448 (2448) * S00	Mode for timer 3 As for U442	FB 242	0 to 3 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

Timer 4 (0.000 to 60.000s) (output = B9586, inverted: B9587)					
U449 (2449) * S00	Source for input signal for timer 4 As for U440	FB 243	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U450 (2450) S00	Time for timer 4	FB 243	0.000 to 60.000 [s] 1	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
U451 (2451) * S00	Mode for timer 4 As for U442	FB 243	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	Source for input signal for timer 5 As for U440	FB 244	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U453 (2453) S00	Time for timer 5	FB 244	0.000 to 60.000 [s] 1	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
U454 (2454) * S00	Mode for timer 5 As for U442	FB 244	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	Source for input signal for timer 6 As for U440	FB 245	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U456 (2456) S00	Time for timer 6	FB 245	0.000 to 60.000 [s] 1	Ind: None FS=0.000 Type: O2	P052 = 3 P051 = 40 Offline
U457 (2457) * S00	Mode for timer 6 As for U442	FB 245	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	Source for input signal for timer 7 As for U440	FB 246	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U459 (2459) S00	Time for timer 7	FB 246	0.00 to 600.00 [s] 1	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline
U460 (2460) * S00	Mode for timer 7 As for U442	FB 246	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 8 (0.00 to 600.00s) (output = B9594, inverted: B9595)					
U461 (2461) * S00	Source for input signal for timer 8 As for U440	FB 247	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U462 (2462) S00	Time for timer 8	FB 247	0.00 to 600.00 [s] 1	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline
U463 (2463) * S00	Mode for timer 8 As for U442	FB 247	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	Source for input signal for timer 9 As for U440	FB 248	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U465 (2465) S00	Time for timer 9	FB 248	0.00 to 600.00 [s] 1	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline
U466 (2466) * S00	Mode for timer 9 As for U442	FB 248	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	Source for input signal for timer 10 As for U440	FB 249	All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U468 (2468) S00	Time for timer 10	FB 249	0.00 to 600.00 [s] 1	Ind: None FS=0.00 Type: O2	P052 = 3 P051 = 40 Offline
U469 (2469) * S00	Mode for timer 10 As for U442	FB 249	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	Source for input signals for binary signal selector switch 1 (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.	FB 250	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U471 (2471) * S00	Source for input signals for binary signal selector switch 2 (output = B9483) As for U470	FB 251	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U472 (2472) * S00	Source for input signals for binary signal selector switch 3 (output = B9484) As for U470	FB 252	All binector numbers 1	Ind: 3 FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U473 (2473) * S00	Source for input signals for binary signal selector switch 4 (output = B9485) As for U470	FB 253	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	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

11.53 Technology controller

Technology controller: Actual value				
U480 (2480) * S00	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	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	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	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	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	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	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	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	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	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
U490 (2490) S00 FDS	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

PNU	Description		Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U491 (2491) S00 FDS	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	Characteristic for Kp adaptation: Minimum value (y1) FB 114 Minimum value of Kp factor (y) when $x \leq x1$		0.10 to 30.00 0.01	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 Online
U493 (2493) S00 FDS	Characteristic for Kp adaptation: Maximum value (y2) FB 114 Maximum value of Kp factor (y) when $x \geq x2$		0.10 to 30.00 0.01	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 Online
U494 (2494) S00 FDS	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	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).

U496 (2496) * S00	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	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	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	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

U500 (2500) * S00	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	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
U503 (2503) * S00 FDS	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	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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
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	Source for setting value for I component 0 = connector K0000 1 = connector K0001 etc.	FB 114 All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U506 (2506) * S00	Source for control bit "Set I component" 0 = binector B0000 1 = binector B0001 etc.	FB 114 All binector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Technology controller: Output, limitation				
U507 (2507) * S00	Source for variable positive limit 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. <u>Note:</u> If the selected connector contains a negative value, a negative maximum value is applied to the output of this limiter stage.	FB 114 All connector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U508 (2508) S00 FDS	Positive limit for technology controller output See also U507	FB 114 0.0 to 199.9 [%] 0.1	Ind: 4 FS=100.0 Type: O2	P052 = 3 P051 = 40 Online
U509 (2509) * S00	Source for variable negative limit 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. <u>Note:</u> If the selected connector contains a positive value, a positive minimum value is applied to the output of this limiter stage. <u>Note:</u> 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.	FB 114 All connector numbers 1	Ind: None FS=9252 Type: L2	P052 = 3 P051 = 40 Offline
U510 (2510) S00 FDS	Negative limit for technology controller output See also U509	FB 114 0.0 to 199.9 [%] 0.1	Ind: 4 FS=100.0 Type: O2	P052 = 3 P051 = 40 Online
U511 (2511) * S00	Source for variable weighting factor for output 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.	FB 114 All connector numbers 1	Ind: None FS=1 Type: L2	P052 = 3 P051 = 40 Offline
U512 (2512) S00 FDS	Weighting factor for output See also U511	FB 114 -100.0 to 100.0 [%] 0.01	Ind: 4 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)

11.54 Velocity/speed calculator

Speed/velocity calculator

Function:
$$v\_ist = \frac{D * \pi * n\_nenn}{i} * \frac{n\_ist}{100\%}$$

v_act	Actual velocity	n021, K9256
D	Diameter	U517, U518
n Rated	Rated speed	U520
i	Gear ratio	U519
n_act	Actual speed	U515

U515 (2515) * S00	Source for actual speed 0 = connector K0000 1 = connector K0001 etc.	FB 115	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

Velocity/speed calculator

Function:
$$n\_soll = \frac{v\_soll * i}{D * \pi * n\_nenn} * 100\%$$

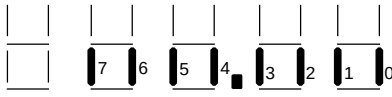
n_set	Speed setpoint	n023, K9257
D	Diameter	U517, U518
n Rated	Rated speed	U520
i	Gear ratio	U519
v_set	Setpoint velocity	U516

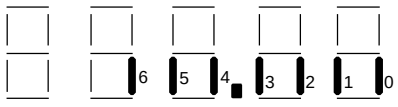
U516 (2516) * S00	Source for setpoint velocity 0 = connector K0000 1 = connector K0001 etc.	FB 115	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline

U517 (2517) * S00	Source for diameter The contents of the selected connector are included in the calculation as a diameter with a normalization of 1 equals 0.1mm (lower limit 518). 0 = connector K0000 1 = connector K0001 etc.	FB 115	All connector numbers 1	Ind: None FS=0 Type: L2	P052 = 3 P051 = 40 Offline
U518 (2518) S00 FDS	Minimum diameter Lower limit for diameter set in U517	FB 115	10.0 to 6553.5 [mm] 0.1	Ind: 4 FS=6500.0 Type: O2	P052 = 3 P051 = 40 Online
U519 (2519) S00 FDS	Gear ratio (i)	FB 115	1.00 to 300.00 0.01	Ind: 4 FS=1.00 Type: O2	P052 = 3 P051 = 40 Online
U520 (2520) S00 FDS	Rated speed (n Rated)	FB 115	600 to 4000 [rev/m] 1	Ind: 4 FS=1450 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.55 Control inputs, control outputs

n600 (2600)	Display of status of control inputs Representation on operator panel (PMU):  Segment alight: corresponding terminal is activated Segment dark: corresponding terminal is not activated Segment or bit 0 Terminal 72 1 Terminal 73 2 Terminal 74 3 Terminal 75 4 Terminal 76 5 Terminal 77 6 Terminal 78 7 Terminal 79		Ind: None Type: V2	P052 = 3
U605 (2605) *	Source for zero delay-angle command 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=9368 Type: L2	P052 = 3 P051 = 40 Offline
U607 (2607) * BDS	Source for activation of setpoint reduction 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=9382 Type: L2	P052 = 3 P051 = 40 Offline
U608 (2608) FDS	Multiplier for speed setpoint when setpoint reduction is activated	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=15.00 Type: O2	P052 = 3 P051 = 40 Online
U614 (2614)	Ramp-up time for setpoint with zero delay-angle	0 to 1000 [ms] 1ms	Ind: None FS=100 Type: O2	P052 = 3 P051 = 40 Online
U617 (2617)	Enable terminal 37 0 terminal 37 inactive 1 terminal 37 active	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
U618 (2618)	Enable terminal 38 0 terminal 38 inactive 1 terminal 38 active	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Online
U619 (2619) * BDS	Source for "No fault" signal (terminals 109/110) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=107 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n620 (2620)	Display of status of control outputs Representation on operator panel (PMU):  Segment alight: corresponding terminal is activated (relay contact closed) Segment dark: corresponding terminal is not activated (relay contact open) Segment or bit 0 "No fault" signal (terminal 81/82) 1 Acknowledgement signal (terminal 83/84) 2 Brake contactor (terminal 85/86) 3 Rotor contactor stage 1 (terminal 87/88) 4..... Rotor contactor stage 2 (terminal 89/90) 5..... Rotor contactor stage 3 (terminal 91/92) 6..... Rotor contactor stage 4 (terminal 93/94)		Ind: None Type: V2	P052 = 3
U621 (2621) * BDS	Source for "No fault" signal (terminals 81/82) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=170 Type: L2	P052 = 3 P051 = 40 Offline
U622 (2622) * BDS	Source for acknowledgement signal (terminals 83/84) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=9367 Type: L2	P052 = 3 P051 = 40 Offline
U623 (2623) * BDS	Source for brake contactor (terminals 85/86) 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=9361 Type: L2	P052 = 3 P051 = 40 Offline
U627 (2627) FDS	Filter time for actual speed value for switch over of rotor stages	0 to 10000 [ms] 1ms	Ind: 4 FS=0 Type: O2	P052 = 3 P051 = 40 Online
U628 (2628) FDS	Threshold for "Setpoint in the controlled range" signal	10.0 to 199.9 [%] 0.1%	Ind: 4 FS=-55.0 Type: O2	P052 = 3 P051 = 40 Online
U629 (2629) FDS	Hysteresis for "Setpoint in the controlled range" signal	0.1 to 10.0 [%] 0.1%	Ind: 4 FS=5.0 Type: O2	P052 = 3 P051 = 40 Online

11.56 Rotor stage stepping

U630 (2630) FDS	Setpoint for premature switch over to controlled torque characteristic – MI	0.0 to -100.0 [%] 0.1%	Ind: 4 FS=-1.0 Type: I2	P052 = 3 P051 = 40 Online
U631 (2631) FDS	Hysteresis for premature switch over to controlled torque characteristic – MI	0.1 to 10.0 [%] 0.1%	Ind: 4 FS=5.0 Type: O2	P052 = 3 P051 = 40 Online
U632 (2632) FDS	Setpoint for premature switch over to controlled torque characteristic – MII	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=1.0 Type: O2	P052 = 3 P051 = 40 Online
U633 (2633) FDS	Hysteresis for premature switch over to controlled torque characteristic – MII	0.1 to 10.0 [%] 0.1%	Ind: 4 FS=5.0 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U634 (2634) FDS	Threshold for switch over to rotor contactor stage 2 Switching of rotor contactor 2 when specified actual speed value reaches the controlled range	10.0 to 100.0 [%] 0.1%	Ind: 4 FS=50.0 Type: O2	P052 = 3 P051 = 40 Online
U635 (2635) FDS	Hysteresis for switch over to rotor contactor stage 2	0.1 to 50.0 [%] 0.1%	Ind: 4 FS=5.0 Type: O2	P052 = 3 P051 = 40 Online
U636 (2636) FDS	Threshold for switch over to rotor contactor stage 3 Switching of rotor contactor 3 when specified actual speed value reaches the controlled range	10.0 to 100.0 [%] 0.1%	Ind: 4 FS=75.0 Type: O2	P052 = 3 P051 = 40 Online
U637 (2637) FDS	Hysteresis for switch over to rotor contactor stage 3	0.1 to 50.0 [%] 0.1%	Ind: 4 FS=5.0 Type: O2	P052 = 3 P051 = 40 Online
U638 (2638) FDS	Threshold for switch over to rotor contactor stage 4 Switching of rotor contactor 4 when specified actual speed value reaches the controlled range	10.0 to 100.0 [%] 0.1%	Ind: 4 FS=90.0 Type: O2	P052 = 3 P051 = 40 Online
U639 (2639) FDS	Hysteresis for switch over to rotor contactor stage 4	0.1 to 50.0 [%] 0.1%	Ind: 4 FS=5.0 Type: O2	P052 = 3 P051 = 40 Online

U640 (2640)	Wait period when switching rotor contactors i 001: Pick-up time of rotor contactors i 002: Drop-out time of rotor contactors i 003: Pick-up time of rotor contactors (see header for parameter U641 ff.) Off-load switching is recommended to increase the service life of the rotor contactors. A disadvantage of off-load switching of rotor contactors: there is a torque-free interval, and this may lead to a deviation in the speed. Whenever a rotor contactor is <u>switched in</u> , the firing pulses are disabled for the time set at <u>index 001</u> (zero current interval). Whenever a rotor contactor is <u>switched out</u> , the firing pulses are disabled for the time set at <u>index 002</u> (zero current interval).	0 to 2000 [ms] 1ms	Ind: 3 FS= i001: 0 i002: 50 i003: 50 Type: O2	P052 = 3 P051 = 40 Online

Preventing current peaks during rotor stage stepping:

To prevent excessive stator current values occurring when switching in the next rotor contactor, it is desirable, at the same time as the contactor is switched in (delayed by the time set at U640 index 003), to reduce the I component of the speed controller by roughly the same proportion by which the rotor resistance is also reduced.

U641 (2641) FDS	Factor for I component n controller with rotor stage 1 R (stage 1) / R (counter-torque stage)	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=50.0 Type: O2	P052 = 3 P051 = 40 Online
U642 (2642) FDS	Factor for I component n controller with rotor stage 2 R (stage 2) / R (stage 1)	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=50.0 Type: O2	P052 = 3 P051 = 40 Online
U643 (2643) FDS	Factor for I component n controller with rotor stage 3 R (stage 3) / R (stage 2)	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=50.0 Type: O2	P052 = 3 P051 = 40 Online
U644 (2644) FDS	Factor for I component n controller with rotor stage 4 R (stage 4) / R (stage 4)	0.0 to 100.0 [%] 0.1%	Ind: 4 FS=50.0 Type: O2	P052 = 3 P051 = 40 Online
U645 (2645) FDS	Factor for P component n controller with counter-torque operation effective P gain for speed controller with counter-torque operation = P225 * U645	1 to 1000 [%] 1%	Ind: 4 FS=100 Type: O2	P052 = 3 P051 = 40 Online
U646 (2646) FDS	Factor for P component n controller with rotor stage 1 effective P gain for speed controller with rotor stage 1 = P225 * U646	1 to 1000 [%] 1%	Ind: 4 FS=100 Type: O2	P052 = 3 P051 = 40 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U647 (2647) FDS	Factor for P component n controller with rotor stage 2 effective P gain for speed controller with rotor stage 2 = P225 * U647	1 to 1000 [%] 1%	Ind: 4 FS=100 Type: O2	P052 = 3 P051 = 40 Online
U648 (2648) FDS	Factor for P component n controller with rotor stage 3 effective P gain for speed controller with rotor stage 3 = P225 * U648	1 to 1000 [%] 1%	Ind: 4 FS=100 Type: O2	P052 = 3 P051 = 40 Online
U649 (2649) FDS	Factor for P component n controller with rotor stage 4 effective P gain for speed controller with rotor stage 4 = P225 * U649	1 to 1000 [%] 1%	Ind: 4 FS=100 Type: O2	P052 = 3 P051 = 40 Online

11.57 Start pulse, speed controller

(see also Section 8, Sheet G23)

U651 (2651) FDS	Start pulse (integrator setting value for the speed controller)	-100.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
U652 (2652) FDS	Multiplier for start pulse when lowering when start pulse as in U651 is also used for a positive setpoint (lowering)	0.00 to 100.00 [%] 0.01%	Ind: 4 FS=50.00 Type: O2	P052 = 3 P051 = 40 Online
U653 (2653) FDS	Start pulse lowering	-100.00 to 100.00 [%] 0.01%	Ind: 4 FS=0.00 Type: I2	P052 = 3 P051 = 40 Online
U655 (2655) *	Source for start pulse 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=451 Type: L2	P052 = 3 P051 = 40 Offline
U656 (2656) *	Source for start pulse lowering 0 = connector K0000 1 = connector K0001 etc.	All connector numbers 1	Ind: None FS=452 Type: L2	P052 = 3 P051 = 40 Offline
U657 (2657) * BDS	Source for switch over of start pulse lifting/lowering 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: 2 FS=502 Type: L2	P052 = 3 P051 = 40 Offline

11.58 Evaluation of a four-stage master switch

(see also Section 8, Sheet G13)

U660 (2660) *	Source for travel command 1 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=9063 Type: L2	P052 = 3 P051 = 40 Offline
U661 (2661) *	Source for travel command 2 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=9064 Type: L2	P052 = 3 P051 = 40 Offline
U662 (2662) *	Source for switch over to setpoint stage S2 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=18 Type: L2	P052 = 3 P051 = 40 Offline
U663 (2663) *	Source for switch over to setpoint stage S3 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=20 Type: L2	P052 = 3 P051 = 40 Offline
U664 (2664) *	Source for switch over to setpoint stage S4 0 = binector B0000 1 = binector B0001 etc.	All binector numbers 1	Ind: None FS=9083 Type: L2	P052 = 3 P051 = 40 Offline

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U665 (2665)	Setpoint for setpoint stage S1	0.00 to 110.00 [%] 0.01%	Ind: None FS=10.00 Type: O2	P052 = 3 P051 = 40 Online
U666 (2666)	Setpoint for setpoint stage S2	0.00 to 110.00 [%] 0.01%	Ind: None FS=25.00 Type: O2	P052 = 3 P051 = 40 Online
U667 (2667)	Setpoint for setpoint stage S3	0.00 to 110.00 [%] 0.01%	Ind: None FS=40.00 Type: O2	P052 = 3 P051 = 40 Online
U668 (2668)	Setpoint for setpoint stage S4	0.00 to 110.00 [%] 0.01%	Ind: None FS=100.00 Type: O2	P052 = 3 P051 = 40 Online

11.59 Configuration of supplementary boards in board locations 2 and 3

U710 (2710) *	Initialize link to supplementary boards i001 Initialization of 1 st communications board (in slot with lower ID letter) i002 Initialization of 2 nd 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
U711 (2711) *	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 1 st CB (including CB behind TB) and index 2 to parameterize the 2 nd CB.	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U712 (2712) *	Communications board parameter 2 (CB parameter 2) See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U713 (2713) *	Communications board parameter 3 (CB parameter 3) See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U714 (2714) *	Communications board parameter 4 (CB parameter 4) See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U715 (2715) *	Communications board parameter 5 (CB parameter 5) See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U716 (2716) *	Communications board parameter 6 (CB parameter 6) See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U717 (2717) *	Communications board parameter 7 (CB parameter 7) See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U718 (2718) *	Communications board parameter 8 (CB parameter 8) See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U719 (2719) *	Communications board parameter 9 (CB parameter 9) See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U720 (2720) *	Communications board parameter 10 (CB parameter 10) See U711	0 to 65535 1	Ind: 2 FS=0 Type: O2	P052 = 3 Online
U721 (2721) *	Communications board parameter 11 (CB parameter 11) See U711	0 to 65535 1	Ind: 10 FS=0 Type: O2	P052 = 3 Online
U722 (2722) *	Telegram failure time for CB and TB i001: Telegram failure time for board location 2 i002: Telegram failure time for board location 3 Settings: 0 No time monitoring, must be parameterized for sporadic (acyclic) telegrams 1...65000 Permissible time interval between two data exchange operations before a fault message is output. Fault message F082 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. 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 6500 [ms] 1ms	Ind: 2 FS=100 Type: O2	P052 = 3 Online
n732 (2732)	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: L2	P052 = 3
n733 (2733)	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: 1 st process data word from 1 st CB/TB ... i016: 16 th process data word from 1 st CB/TB i017: 1 st process data word from 2 nd CB/TB ... i032: 16 th process data word from 2 nd CB/TB	0000 to FFFF H 1	Ind: 32 Type: L2	P052 = 3
U734 (2734) *	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 PZD section of telegram i002: Word 2 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= i001: 32 i002: 167 i003: 9115 i004: 0 to i016: 0 Type: L2	P052 = 3 Online

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n735 (2735)	Display of transmit data to CB/TB i001: 1 st process data word to 1 st CB or TB ... i016: 16 th process data word to 1 st CB or TB i017: 1 st process data word to 2 nd CB ... i032: 16 th process data word to 2 nd CB	0000 to FFFF H 1	Ind: 32 Type: L2	P052 = 3
U736 (2736) *	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 PZD section of telegram i002: Word 2 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
n738 (2738)	Display of PKW job from supplementary boards in locations 2 and 3 i001: 1. 4 th word of PKW job from 1 st CB ... i004: 4. 4 th word of PKW job from 1 st CB i005: 1. 4 th word of PKW job from 2 nd CB ... i008: 4. 4 th word of PKW job from 2 nd CB i009: 1. 4 th word of PKW job from TB ... i012: 4. 4 th word of PKW job from TB Details refer to "Function diagrams", Section 8 Sheets G34 and G35.	0000 to FFFF H 1	Ind: 12 Type: L2	P052 = 3
n739 (2739)	Display of PKW response to supplementary boards in locations 2 and 3 i001: 1. 4 th word of PKW job from 1 st CB ... i004: 4. 4 th word of PKW job from 1 st CB i005: 1. 4 th word of PKW job from 2 nd CB ... i008: 4. 4 th word of PKW job from 2 nd CB i009: 1. 4 th word of PKW job from TB ... i012: 4. 4 th word of PKW job from TB Details refer to "Function diagrams", Section 8 Sheets G34 and G35.	0000 to FFFF H 1	Ind: 12 Type: L2	P052 = 3

11.60 Configuring the SIMOLINK board

U740 (2740) *	SLB Node address Node address of SIMOLINK board (SLB) on bus. The node address defines which telegrams the relevant converter may write to. 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U741 (2741) *	SLB Telegram failure time 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
U742 (2742) *	SLB Transmitter power 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) *	SLB Selection of active SLB board 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) *	SLB No. of channels 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) *	SLB Cycle time 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	1.00 to 6.50 [ms] 0.01	Ind:2 FS=1.20 Type: O2	P052 = 3 P051 = 40 Offline
U747 (2747) *	SLB Application flags Selection of binectors to be sent as application flags by an SLB (see also Section 7 "Starting up SIMOLINK boards" and Section 8 "SIMOLINK board: Receiving, transmitting"). 0 = binector B0000 1 = binector B0001 etc. In addition to the binectors themselves, their place in the application section of the transmit telegram is also defined. i001: Flag 0 application section of transmit telegram i004: Flag 3 in application section of transmit telegram	All binector numbers	Ind: 4 FS=0 Type: L2	P052 = 3 P051 = 40 Offline

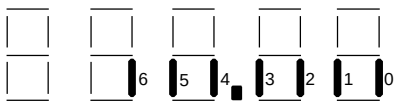
PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n748 (2748)	SLB Diagnosis Visualization parameter which displays diagnostic information for an installed SIMOLINK board (SLB) i001: Number of error-free synchronizing telegrams i002: Number of CRC errors 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
U749 (2749) *	SLB Read address 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 1 Changes to the receive data parameters have no effect until the electronics supply voltage of the drive is switched on again.	0.0 to 200.7 0.1	Ind: 8 FS=0.0 Type: O2	P052 = 3 P051 = 40 Offline
n750 (2750)	SLB Receive data 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 PZD section of telegram ... i016: Word 16 in PZD section of telegram	0000 to FFFF H 1	Ind: 16 Type: L2	P052 = 3
U751 (2751) *	SLB Transmit data selection 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. This parameter not only defines the transmit data, but also their position in the transmit telegram. 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)	SLB Display of transmit data 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) *	SLB Fault delay 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.61 Configuring the EB1 expansion board

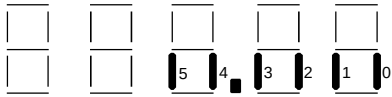
U755 (2755) *	Signal type of analog inputs on EB1 0 = voltage input 0 to ± 10 V 1 = current input 0 to ± 20 mA i001: AI1 of the first EB2 i002: AI1 of the second EB2	0 to 1 1	Ind: 2 FS=0 Type: O2	P052 = 3 P051 = 40 Online
U756 (2756)	Normalization of analog inputs on EB1 This parameter specifies the 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: $U756[\%] = 10\text{ V} \cdot \frac{Y}{X}$ X .. Input voltage in volts Y .. % value which is generated for input current X With a current input: $U756[\%] = 20\text{ mA} \cdot \frac{Y}{X}$ X .. Input current in mA Y .. % value which is generated for input current X i001: AI1 of the first EB2 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB2 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)	Offset for analog inputs on EB1 i001: AI1 of the first EB2 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB2 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) *	Mode of signal injection at analog inputs on EB1 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 EB2 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB2 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) *	Source for selecting sign reversal of analog inputs on EB1 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 EB2 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB2 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U760 (2760) *	Filtering time for analog inputs on EB1 Note: Hardware filtering of approximately 0.2 ms is applied as standard i001: AI1 of the first EB2 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB2 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
U761 (2761) *	Source for enabling of analog inputs on EB1 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 EB2 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB2 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)	Display of analog inputs on EB1 i001: AI1 of the first EB2 i002: AI2 of the first EB1 i003: AI3 of the first EB1 i004: AI1 of the second EB2 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) *	Source for output value at analog outputs on EB1 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) *	Mode of signal injection at analog outputs on EB1 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) *	Filtering time for analog outputs on EB1 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U766 (2766)	Normalization of analog outputs on EB1 $y[V] = x * \frac{U_{766}}{100\%}$ 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)	Offset for analog outputs on EB1 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
n768 (2768)	Display of analog outputs on EB1 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 [%] 0.01%	Ind: 4 Type: I2	P052 = 3
U769 (2769) *	Source for output values at binary outputs on EB1 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)	Display of status of binary inputs and outputs on EB1 Representation on operator panel (PMU):  Segment alight: Corresponding terminal is activated (HIGH level is applied) Segment dark: 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)

11.62 Configuring the EB2 expansion board

n773 (2773)	Display of status of binary inputs and outputs on EB2 Representation on operator panel (PMU):  Segment alight: Corresponding terminal is activated (HIGH level is applied) Segment dark: 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) *	Source for output values at binary outputs on EB2 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) *	Signal type of analog input on EB2 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)	Normalization of analog input on EB2 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: $U_{776} [\%] = 10 V * \frac{Y}{X}$ X .. Input voltage in volts Y .. % value which is generated for input current X With a current input: $U_{776} [\%] = 20 mA * \frac{Y}{X}$ 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
U777 (2777)	Offset for analog input on EB2 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U778 (2778) *	Mode of signal injection at analog input on EB2 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) *	Source for selection of sign reversal at 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)	Filtering time for analog input on EB2 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) *	Source for enabling of analog inputs on EB2 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)	Display of analog input on EB2 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) *	Source for output value at analog output on EB2 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) *	Mode of signal injection at analog output on EB2 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)	Filtering time for analog outputs on EB1 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
U786 (2786)	Normalization of analog outputs on EB2 $y[V] = x * \frac{U786}{100\%}$ 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

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
U787 (2787)	Offset for analog output on EB2 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)	Display of analog outputs on EB2 i001: AO of the first EB2 i002: AO of the second EB2	-200.0 to 199.99 [%] 0.01%	Ind: 2 Type: I2	P052 = 3

11.63 Configuring the SBP pulse encoder board

U790 (2790) *	Configuration of input level of A/B and CRTL tracks 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) *	Configuration of encoder supply voltage 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) *	Number of pulses per revolution 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) *	Encoder type 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)	Reference speed 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]	Ind: None FS=500.0 Type: O2	P052 = 3 P051 = 40 Online
n795 (2795)	Display of actual speed in % of reference speed	-200.00 to 199.99 [%]	Ind: None Type: I2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)

11.64 Technology software S00: Altering the processing sequence of function blocks

The function blocks of the S00 technology software are processed within the computational cycle in the sequence defined in parameters U960 to U962:

1. Function block with number set in U960 index.001
- ...
100. Function block with number set in U960 index.100
101. Function block with number set in U961 index.001
- ...
200. Function block with number set in U961 index.100
201. Function block with number set in U962 index.001
- etc.

The numbers are parameterized in ascending sequence (1, 2, 3, ...) in the factory setting (standard sequence).

Altering the processing sequence:

If a new function block number is entered (i.e. moved from another location) in a certain index of parameter U960, U961 or U962, then the new processing sequence is defined such that the function block previously entered in this index will be processed after the newly entered block. The gap which may be left at the old location of the moved (newly entered) function block is closed by shifting the function block numbers behind the space forward by one position.

Example 1:

Starting with the standard sequence setting, the processing sequence must be altered such that function block 90 (analog signal selector switch) will be processed immediately after function block 83 (tracking/storage element):

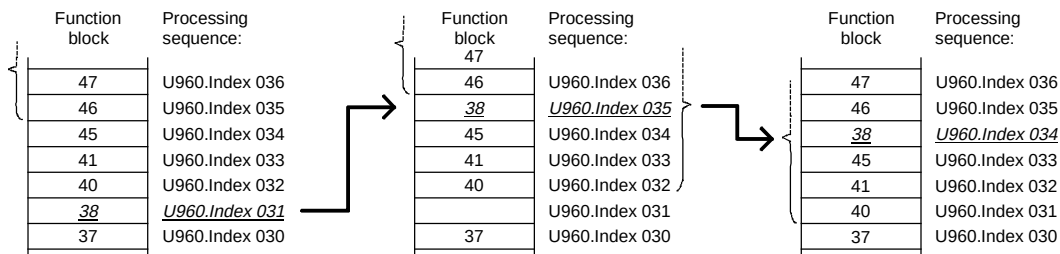
Function block no. 90 must be entered in the index in which the number of the function block previously processed after block 83 (84 in U960.9065) is currently stored. Function block numbers (84 and 85) in the following indices of U960 will be shifted up to the next index automatically.



Example 2:

Starting with the standard sequence setting, the processing sequence must be altered such that function block 38 (sign inverter) will be processed immediately after function block 45 (divider):

Function block number 38 must be entered in the index in which the number of the function block previously processed after function block 45 (46 in U960.i035) is currently stored. The function block numbers stored in the indices immediately above this position shift up by one index, then all numbers immediately above the gap left shift down automatically by one index.



n900 (2900)	Parameter for SIMOVIS	0 to 65535	Ind: 100 Type: O2	P052 = 3
n901 (2901)	Parameter for SIMOVIS	0 to 65535	Ind: 100 Type: O2	P052 = 3
U905 (2905)	Parameter for SIMOVIS This parameter is a setting for the exchange of process data between SIMOVIS and the SIMOREG converter. It must <u>not</u> be changed!	0 to 65535	Ind: 5 FS=0 Type: O2	P052 = 3 P051 = 40 Online
n940 (2940)	Parameter for SIMOVIS	0 to 9990	Ind: 100 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
n941 (2941)	Parameter for SIMOVIS	0 to 9990	Ind: 100 Type: O2	P052 = 3
n942 (2942)	Parameter for SIMOVIS	0 to 9990	Ind: 100 Type: O2	P052 = 3
n943 (2943)	Parameter for SIMOVIS	0 to 9990	Ind: 100 Type: O2	P052 = 3
n948 (2948)	Parameter for SIMOVIS	0 to 9990	Ind: 100 Type: O2	P052 = 3
n949 (2949)	Parameter for SIMOVIS	0 to 9990	Ind: 100 Type: O2	P052 = 3
n950 (2950)	Parameter for SIMOVIS	0 to 1	Ind: 100 Type: O2	P052 = 3
n951 (2951)	Parameter for SIMOVIS	0 to 1	Ind: 100 Type: O2	P052 = 3
n952 (2952)	Parameter for SIMOVIS	0 to 1	Ind: 100 Type: O2	P052 = 3
n953 (2953)	Parameter for SIMOVIS	0 to 1	Ind: 100 Type: O2	P052 = 3
n958 (2958)	Parameter for SIMOVIS	0 to 1	Ind: 100 Type: O2	P052 = 3
n959 (2959)	Parameter for SIMOVIS	0 to 1	Ind: 100 Type: O2	P052 = 3

U960 (2960) * S00	Processing sequence of function blocks of S00 technology software (1) i001: Number of function block for 1 st place in processing sequence i002: Number of function block for 2 nd 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 101 st place in processing sequence i002: Number of function block for 102 nd 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 201 st place in processing sequence i002: Number of function block for 202 nd 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	Restoration of standard processing sequence 0 Return 1 Restore standard processing sequence: The numbers of the function blocks are entered in ascending sequence in parameters U960 and U961. The parameter is then reset automatically to 0.	0 to 1 1	Ind: None FS=0 Type: O2	P052 = 3 P051 = 40 Offline

11.65 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 at the parameter whose number is displayed under index 101. For example: 2981 = n981 The first 0 to be displayed signals that no further parameter numbers are stored.		Ind: 101 Type: O2	P052 = 3

PNU	Description	Value range [Unit] Steps	No. indices Factory setting Type	See Change (Access / Status)
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 at the parameter whose number is displayed under index 101. 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
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

Display:

The values of connectors can be displayed via parameters r041, r042, r043 and P044.

Normalization: The following applies unless stated otherwise:

100% corresponds

for currents, to the converter rated current (r072.i002),

for voltages, to the converter rated voltage (P078.i001)

or, for speeds, to the parameterized maximum speed (P741 or P143).

Numeric representation:

100% corresponds to the figure of 4000 hex = 16384 dec

The displayable value range is -200.00% to +199.99%, corresponding to 8000 hex ... 7FFF hex.

The connectors are transferred in this numerical format via the serial interfaces.

Connector	Description	Normalization	Function diag., Sheet
Fixed values			
K0000	Fixed value 0		G12
K0001	Fixed value 100.00%	16384 $\triangle$ 100%	G12
K0002	Fixed value 200.00%	16384 $\triangle$ 100%	G12
K0003	Fixed value -100.00%	16384 $\triangle$ 100%	G12
K0004	Fixed value -200.00%	16384 $\triangle$ 100%	G12
K0005	Fixed value 50.00%	16384 $\triangle$ 100%	G12
K0006	Fixed value 150.00%	16384 $\triangle$ 100%	G12
K0007	Fixed value -50.00%	16384 $\triangle$ 100%	G12
K0008	Fixed value -150.00%	16384 $\triangle$ 100%	G12
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 $\triangle$ 100%	G5
K0011	Analog input, terminal 4 / 5 (main setpoint) After normalization, offset injection, filtering	16384 $\triangle$ 100%	G5
K0012	Analog input, terminal 103 / 104 (main actual value) Raw value after A/D conversion (unfiltered, not normalized)	16384 $\triangle$ 100%	G5
K0013	Analog input, terminal 103 / 104 (main actual value) After normalization, offset injection, filtering	16384 $\triangle$ 100%	G5
K0014	Analog input, terminal 6 / 7 (analog selectable input 1) Raw value after A/D conversion (unfiltered, not normalized)	16384 $\triangle$ 100%	G5
K0015	Analog input, terminal 6 / 7 (analog selectable input 1) After normalization, offset injection, filtering	16384 $\triangle$ 100%	G5
K0016	Analog input, terminal 8 / 9 (analog selectable input 2) Raw value after A/D conversion (unfiltered, not normalized)	16384 $\triangle$ 100%	G6
K0017	Analog input, terminal 8 / 9 (analog selectable input 2) After normalization, offset injection, filtering	16384 $\triangle$ 100%	G6
K0018	Analog input, terminal 10 / 11 (analog selectable input 3) Raw value after A/D conversion (unfiltered, not normalized)	16384 $\triangle$ 100%	G6
K0019	Analog input, terminal 10 / 11 (analog selectable input 3) After normalization, offset injection, filtering	16384 $\triangle$ 100%	G6

Connector	Description	Normalization	Function diag., Sheet
Binary inputs, binary outputs			
K0020	Binary inputs, terminals 36 to 43 and 211 to 214 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	$1 \triangleq 1$	G2
K0021	Binary outputs, terminals 46 to 52 Bit0 = Status of terminal 46 Bit1 = Status of terminal 48 Bit2 = Status of terminal 50 Bit3 = Status of terminal 52	$1 \triangleq 1$	G4

Analog outputs			
K0026	Analog output, terminal 14 / 15	$16384 \triangleq 100\%$	G7
K0027	Analog output, terminal 16 / 17	$16384 \triangleq 100\%$	G7
K0028	Analog output, terminal 18 / 19	$16384 \triangleq 100\%$	G8
K0029	Analog output, terminal 20 / 21	$16384 \triangleq 100\%$	G8

Control word, status word			
K0030	Control word 1	$1 \triangleq 1$	G37
K0031	Control word 2	$1 \triangleq 1$	G38
K0032	Status word 1	$1 \triangleq 1$	G39
K0033	Status word 2	$1 \triangleq 1$	G40

Evaluating the SBP pulse encoder board			
K0039	Actual speed value from SBP pulse encoder board	$16384 \triangleq 100\%$	Z9

Pulse encoder evaluation			
K0040	Actual speed value from pulse encoder	$16384 \triangleq 100\%$	G22
K0041	Absolute actual speed value from pulse encoder	$16384 \triangleq 100\%$	G22
K0042	Actual position value, LOW word	$1 \triangleq 1$	G22
K0043	Actual position value, HIGH word	$1 \triangleq 1$	G22
K0044	Actual position value, number of zero markers	$1 \triangleq 1$	G22

Heatsink temperature			
K0050	Heatsink temperature	$16384 \triangleq 100^\circ\text{C}$	

Motor interface			
K0051 or K0052 is always set to 0 when a PTC thermistor or no temperature sensor is connected (P490.x $\neq$ 1).			
K0051	Motor temperature 1 (from sensor to terminal 22 / 23)	$16384 \triangleq 100^\circ\text{C}$	G41
K0052	Motor temperature 2 (from sensor to terminal 204 / 205)	$16384 \triangleq 100^\circ\text{C}$	G41

Closed-loop current control, auto-reversing stage, gating unit			
K0100	Firing angle	$16384 \triangleq 0^\circ$ $0 \triangleq 90^\circ$ $-16384 \triangleq 180^\circ$	G28

Connector	Description	Normalization	Function diag., Sheet
K0101	Firing angle before limitation	16384 $\triangle$ 0° 0 $\triangle$ 90° -16384 $\triangle$ 180°	G28
K0102	Precontrol value + current controller output (gating unit input)	16384 $\triangle$ 0° 0 $\triangle$ 90° -16384 $\triangle$ 180°	G28
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 $\triangle$ 1	
K0106	Requested torque direction 0 no torque direction 1 torque direction I 2 torque direction II	1 $\triangle$ 1	G28
K0108	RMS value of stator current, averaged over one line period	16384 $\triangle$ 100%	
K0109	Internal signed actual current value, averaged over one line period	16384 $\triangle$ 100%	G28
K0110	Current controller output	16384 $\triangle$ 100%	G28
K0111	Current controller output, P component	16384 $\triangle$ 100%	G28
K0112	Current controller output, I component	16384 $\triangle$ 100%	G28
K0113	Current controller, setpoint/actual value deviation	16384 $\triangle$ 100%	G28
K0114	Internal signed actual current value, averaged over one firing cycle	16384 $\triangle$ 100%	G28
K0115	Current controller actual value	16384 $\triangle$ 100%	G28
K0116	Absolute value of internal actual current	16384 $\triangle$ 100%	G28
K0117	Internal signed actual current value	16384 $\triangle$ 100%	G28
K0118	Current controller setpoint	16384 $\triangle$ 100%	G28
K0119	Current controller setpoint before absolute-value generation	16384 $\triangle$ 100%	G28
K0120	Current setpoint before reduced gear stressing	16384 $\triangle$ 100%	G27
K0121	Precontrol output	16384 $\triangle$ 0° 0 $\triangle$ 90° -16384 $\triangle$ 180°	G28

Current limitation, torque limitation, speed limiting controller			
K0131	Lowest positive current limit	16384 $\triangle$ 100%	G27
K0132	Highest negative current limit	16384 $\triangle$ 100%	G27
K0133	Current setpoint before limitation (incl. additional setpoint)	16384 $\triangle$ 100%	G27
K0134	Torque setpoint (after speed limiting controller) (= K0140)	16384 $\triangle$ 100%	G26
K0136	Speed limiting controller: Active torque limit 1	16384 $\triangle$ 100%	G26
K0137	Speed limiting controller: Active torque limit 2	16384 $\triangle$ 100%	G26
K0140	Torque setpoint (after speed limiting controller) (= K0134)	16384 $\triangle$ 100%	G26
K0141	Torque setpoint (after torque limitation)	16384 $\triangle$ 100%	G26
K0143	Upper torque limit	16384 $\triangle$ 100%	G26
K0144	Lower torque limit	16384 $\triangle$ 100%	G26
K0145	Torque setpoint before limitation (incl. additional setpoint)	16384 $\triangle$ 100%	G26
K0147	Torque setpoint before limitation (without additional setpoint)	16384 $\triangle$ 100%	G26
K0148	Torque setpoint (from speed controller)	16384 $\triangle$ 100%	G24

Connector	Description	Normalization	Function diag., Sheet
Compensation of moment of inertia (dv/dt injection)			
K0150	Component of precontrol for speed controller calculated from $d(K0168)/dt * P540$	$16384 \triangleq 100\%$	G25
K0152	Component of precontrol for speed controller calculated from $f(K0164) * P541$ (= function of speed actual value/setpoint deviation in K0164)	$16384 \triangleq 100\%$	G25

Speed controller			
Setpoint processing, ramp-function generator, friction and moment of inertia compensation			
K0160	Speed controller output	$16384 \triangleq 100\%$	G24
K0161	P component	$16384 \triangleq 100\%$	G24
K0162	I component	$16384 \triangleq 100\%$	G24
K0164	Setpoint/actual value deviation	$16384 \triangleq 100\%$	G24
K0165	Generation of setpoint/actual value deviation output	$16384 \triangleq 100\%$	G24
K0166	Selected actual speed value (absolute value)	$16384 \triangleq 100\%$	G24
K0167	Selected actual speed value (signed)	$16384 \triangleq 100\%$	G24
K0168	D component output * (-1)	$16384 \triangleq 100\%$	G24
K0169	D component output	$16384 \triangleq 100\%$	G24
K0170	Speed setpoint from ramp-function generator after limitation	$16384 \triangleq 100\%$	G20
K0171	Precontrol for speed controller (friction and moment of inertia compensation)	$16384 \triangleq 100\%$	G22
K0172	Component of precontrol determined by friction for speed controller	$16384 \triangleq 100\%$	G22
K0173	Filtered component of precontrol determined by moment of inertia for speed controller	$16384 \triangleq 100\%$	G22
K0174	Filtering element output for nset filtering	$16384 \triangleq 100\%$	G24
K0176	Speed droop	$16384 \triangleq 100\%$	G24
K0177	Band-stop output 1	$16384 \triangleq 100\%$	G24
K0178	Band-stop output 2	$16384 \triangleq 100\%$	G24
K0179	Filtering element output for nact filtering	$16384 \triangleq 100\%$	G24
K0181	Lowest positive setpoint limit	$16384 \triangleq 100\%$	G20
K0182	Highest negative setpoint limit	$16384 \triangleq 100\%$	G20
K0183	Speed setpoint before limitation	$16384 \triangleq 100\%$	G20
K0190	Ramp-function generator output (before speed setpoint limitation)	$16384 \triangleq 100\%$	G20
K0191	dv/dt (rise in ramp-function generator output in time period set in P542)	$16384 \triangleq 100\%$	G20
K0192	Effective ramp-function generator input variable	$16384 \triangleq 100\%$	G20
K0193	Setpoint input for ramp-function generator	$16384 \triangleq 100\%$	G19
K0194	Total of main setpoint (limited) + additional setpoint	$16384 \triangleq 100\%$	G19
K0195	Ramp-function generator input before setpoint reduction	$16384 \triangleq 100\%$	G19
K0196	Effective positive limit for main setpoint	$16384 \triangleq 100\%$	G19
K0197	Effective negative limit for main setpoint	$16384 \triangleq 100\%$	G19
K0198	Main setpoint before limitation	$16384 \triangleq 100\%$	G19

Crawling setpoint, inching setpoint, oscillation, fixed setpoint			
K0201	Crawling setpoint	$16384 \triangleq 100\%$	G18
K0202	Inching setpoint	$16384 \triangleq 100\%$	G17
K0203	Oscillation setpoint	$16384 \triangleq 100\%$	G16
K0204	Fixed setpoint	$16384 \triangleq 100\%$	G15
K0206	Crawling setpoint: Output value of function block	$16384 \triangleq 100\%$	G18
K0207	Inching setpoint: Output value of function block	$16384 \triangleq 100\%$	G17
K0208	Oscillation/square wave generator: Output value of function block	$16384 \triangleq 100\%$	G16

Connector	Description	Normalization	Function diag., Sheet
K0209	Fixed setpoint: Output value of function block	16384 $\triangle$ 100%	G15

Motorized potentiometer			
K0240	Motorized potentiometer output (setpoint from potentiometer)	16384 $\triangle$ 100%	G14
K0241	dy/dt (rise in ramp-function generator output in time period set in P542 + P465)	16384 $\triangle$ 100%	G14
K0242	Ramp-function generator input in motorized potentiometer (setpoint)	16384 $\triangle$ 100%	G14

General connectors			
K0301	Line voltage U-V	16384 $\triangle$ P078.001	
K0302	Line voltage V-W	16384 $\triangle$ P078.001	
K0303	Line voltage W-U	16384 $\triangle$ P078.001	
K0305	Average line voltage, filtered	16384 $\triangle$ P078.001	
K0306	Line frequency	16384 $\triangle$ 50.0Hz	
K0309	Calculated motor temperature rise <u>Normalization:</u> 16384 $\triangle$ the overtemperature which is reached at a continuous current corresponding to the rated motor current	see Column 2	
K0310	Calculated thyristor temperature rise as % of maximum permissible thyristor temperature rise	16384 $\triangle$ 100%	

Fixed setpoints			
K0401	Fixed value 1 (P401)	16384 $\triangle$ 100%	G12
K0402	Fixed value 2 (P402)	16384 $\triangle$ 100%	G12
K0403	Fixed value 3 (P403)	16384 $\triangle$ 100%	G12
K0404	Fixed value 4 (P404)	16384 $\triangle$ 100%	G12
K0405	Fixed value 5 (P405)	16384 $\triangle$ 100%	G12
K0406	Fixed value 6 (P406)	16384 $\triangle$ 100%	G12
K0407	Fixed value 7 (P407)	16384 $\triangle$ 100%	G12
K0408	Fixed value 8 (P408)	16384 $\triangle$ 100%	G12
K0409	Fixed value 9 (P409)	16384 $\triangle$ 100%	G12
K0410	Fixed value 10 (P410)	16384 $\triangle$ 100%	G12
K0411	Fixed value 11 (P411)	16384 $\triangle$ 100%	G12
K0412	Fixed value 12 (P412)	16384 $\triangle$ 100%	G12
K0413	Fixed value 13 (P413)	16384 $\triangle$ 100%	G12
K0414	Fixed value 14 (P414)	16384 $\triangle$ 100%	G12
K0415	Fixed value 15 (P415)	16384 $\triangle$ 100%	G12
K0416	Fixed value 16 (P416)	16384 $\triangle$ 100%	G12

Start pulse for speed controller			
K0451	Fixed setting value 1 for n controller I component	16384 $\triangle$ 100% of P100	G23
K0452	Fixed setting value 1 for n controller I component, weighted	16384 $\triangle$ 100% of P100	G23
K0453	Fixed setting value 2 for n controller I component	16384 $\triangle$ 100% of P100	G23
K0454	Setting value 1 for n controller I component	16384 $\triangle$ 100% of P100	G23

Connector	Description	Normalization	Function diag., Sheet
Control inputs, control outputs			
K0500	Binary inputs, terminals 72 to 79 Bit0 = Status of terminal 72 Bit1 = Status of terminal 73 Bit2 = Status of terminal 74 Bit3 = Status of terminal 75 Bit4 = Status of terminal 76 Bit5 = Status of terminal 77 Bit6 = Status of terminal 78 Bit7 = Status of terminal 79	Bit = 0: Input is LOW (not activated) Bit = 1: Input is HIGH (activated)	G9
K0501	Binary outputs terminals 81/82 to 93/94 Bit0 = Status of terminal 81/82 Bit1 = Status of terminal 83/84 Bit2 = Status of terminal 85/86 Bit3 = Status of terminal 87/88 Bit4 = Status of terminal 89/90 Bit5 = Status of terminal 91/92 Bit6 = Status of terminal 93/94	Bit = 0: Output relay has not picked up Bit = 1: Output relay has picked up	G11

4 stage master switch

K0510	Setpoint of 4-stage master switch	16384 $\triangleq$ 100%	G13

General connectors

K0800	Operating status (code number) with one decimal place		
K0810	Limiting bits		

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		

K0960	Time interval between averaged line synchronization time reference point and "unfiltered" zero crossing of scanned and software-filtered line voltage in 1.334 μ s (when P152 = 1 to 20)	1 $\triangleq$ 1.334 μ s	
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)		
K0986	Last line zero crossing used (as T1 instant)		
K0987	Firing instant (as T1 instant)		
K0988	Firing pulse cycle time (time difference between current and previous firing instant) in T1 increments of 1.334 μ s 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 = Reserved Nibble 1 .. 1 = Requested firing angle has been implemented 2 = Reserved 3 = Firing angle at 180° 4 = Firing angle at 180° 5 = Requested firing angle cannot be implemented because of strong pulse compression 6 = Reserved 7 = Reserved 8 = Reserved Nibble 2 .. Code number for requested torque direction 0: Not RUN (≥ 01.0) 1: Torque direction acc. to current setpoint (==> M0, MI, MII) 2: Reserved 3: Reserved 4: Additional wait time in auto-reversing stage (==> M0) 5: Current has reached 0 (==> M0), phase reversal permitted 6: Current not yet 0 (==> M0), phase reversal not permitted yet 7: Reserved 8: Reserved 9: Reserved A: Wait for rotor contactor to switch (==> M0)		
K0990	Current total processor capacity utilization (C167)		
K0991	Projected total processor capacity utilization (C167) for maximum line frequency (65Hz)		
K0992	Current total processor capacity (C167) utilized by background routines		
K0994	Total processor capacity (C167) currently utilized by routines synchronized with firing pulses		

Serial interface 1 (USS1 on G-SST1)			
K2001	USS1 receive data, word 1	1 $\triangle$ 1	G29
K2002	USS1 receive data, word 2	1 $\triangle$ 1	G29
K2003	USS1 receive data, word 3	1 $\triangle$ 1	G29
K2004	USS1 receive data, word 4	1 $\triangle$ 1	G29
K2005	USS1 receive data, word 5	1 $\triangle$ 1	G29
K2006	USS1 receive data, word 6	1 $\triangle$ 1	G29
K2007	USS1 receive data, word 7	1 $\triangle$ 1	G29
K2008	USS1 receive data, word 8	1 $\triangle$ 1	G29
K2009	USS1 receive data, word 9	1 $\triangle$ 1	G29
K2010	USS1 receive data, word 10	1 $\triangle$ 1	G29
K2011	USS1 receive data, word 11	1 $\triangle$ 1	G29
K2012	USS1 receive data, word 12	1 $\triangle$ 1	G29
K2013	USS1 receive data, word 13	1 $\triangle$ 1	G29
K2014	USS1 receive data, word 14	1 $\triangle$ 1	G29
K2015	USS1 receive data, word 15	1 $\triangle$ 1	G29
K2016	USS1 receive data, word 16	1 $\triangle$ 1	G29
K2020	Output of binector/connector converter for G-SST1	1 $\triangle$ 1	G29

Process data exchange with 1 st CB/TB			
K3001	Receive data from 1 st CB/TB, word 1	1 $\triangle$ 1	G34
K3002	Receive data from 1 st CB/TB, word 2	1 $\triangle$ 1	G34
K3003	Receive data from 1 st CB/TB, word 3	1 $\triangle$ 1	G34

Connector	Description	Normalization	Function diag., Sheet
K3004	Receive data from 1 st CB/TB, word 4	1 $\triangle$ 1	G34
K3005	Receive data from 1 st CB/TB, word 5	1 $\triangle$ 1	G34
K3006	Receive data from 1 st CB/TB, word 6	1 $\triangle$ 1	G34
K3007	Receive data from 1 st CB/TB, word 7	1 $\triangle$ 1	G34
K3008	Receive data from 1 st CB/TB, word 8	1 $\triangle$ 1	G34
K3009	Receive data from 1 st CB/TB, word 9	1 $\triangle$ 1	G34
K3010	Receive data from 1 st CB/TB, word 10	1 $\triangle$ 1	G34
K3011	Receive data from 1 st CB/TB, word 11	1 $\triangle$ 1	G34
K3012	Receive data from 1 st CB/TB, word 12	1 $\triangle$ 1	G34
K3013	Receive data from 1 st CB/TB, word 13	1 $\triangle$ 1	G34
K3014	Receive data from 1 st CB/TB, word 14	1 $\triangle$ 1	G34
K3015	Receive data from 1 st CB/TB, word 15	1 $\triangle$ 1	G34
K3016	Receive data from 1 st CB/TB, word 16	1 $\triangle$ 1	G34

Expansion boards			
K5101	1 st analog input from 1 st EB1		Z1
K5102	2 nd analog input from 1 st EB1		Z1
K5103	3 rd analog input from 1 st EB1		Z1
K5104	1 st analog output from 1 st EB1		Z2
K5105	2 nd analog output from 1 st EB1		Z2
K5106	Binary inputs and outputs from 1 st EB1		Z3
K5111	Analog input from 1 st EB2		Z7
K5112	Analog output from 1 st EB2		Z7
K5113	Binary inputs and outputs from 1 st EB2		Z7
K5201	1 st analog input from 2 nd EB1		Z4
K5202	2 nd analog input from 2 nd EB1		Z4
K5203	3 rd analog input from 2 nd EB1		Z4
K5204	1 st analog output from 2 nd EB1		Z5
K5205	2 nd analog output from 2 nd EB1		Z5
K5206	Binary inputs and outputs from 2 nd EB1		Z6
K5211	Analog input from 2 nd EB2		Z8
K5212	Analog output from 2 nd EB2		Z8
K5213	Binary inputs and outputs from 2 nd EB2		Z8

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)			
K6001	USS2 / Peer2 receive data, word 1	1 $\triangle$ 1	G30, G32
K6002	USS2 / Peer2 receive data, word 2	1 $\triangle$ 1	G30, G32
K6003	USS2 / Peer2 receive data, word 3	1 $\triangle$ 1	G30, G32
K6004	USS2 / Peer2 receive data, word 4	1 $\triangle$ 1	G30, G32
K6005	USS2 / Peer2 receive data, word 5	1 $\triangle$ 1	G30, G32
K6006	USS2 receive data, word 6	1 $\triangle$ 1	G30
K6007	USS2 receive data, word 7	1 $\triangle$ 1	G30
K6008	USS2 receive data, word 8	1 $\triangle$ 1	G30
K6009	USS2 receive data, word 9	1 $\triangle$ 1	G30
K6010	USS2 receive data, word 10	1 $\triangle$ 1	G30
K6011	USS2 receive data, word 11	1 $\triangle$ 1	G30
K6012	USS2 receive data, word 12	1 $\triangle$ 1	G30
K6013	USS2 receive data, word 13	1 $\triangle$ 1	G30
K6014	USS2 receive data, word 14	1 $\triangle$ 1	G30
K6015	USS2 receive data, word 15	1 $\triangle$ 1	G30

Connector	Description	Normalization	Function diag., Sheet
K6016	USS2 receive data, word 16	1 $\triangle$ 1	G30
K6020	Output of binector/connector converter for G-SST2	1 $\triangle$ 1	G30, G32

Process data exchange with SIMOLINK			
K7001	Receive data from SIMOLINK, word 1	1 $\triangle$ 1	Z11
K7002	Receive data from SIMOLINK, word 2	1 $\triangle$ 1	Z11
K7003	Receive data from SIMOLINK, word 3	1 $\triangle$ 1	Z11
K7004	Receive data from SIMOLINK, word 4	1 $\triangle$ 1	Z11
K7005	Receive data from SIMOLINK, word 5	1 $\triangle$ 1	Z11
K7006	Receive data from SIMOLINK, word 6	1 $\triangle$ 1	Z11
K7007	Receive data from SIMOLINK, word 7	1 $\triangle$ 1	Z11
K7008	Receive data from SIMOLINK, word 8	1 $\triangle$ 1	Z11
K7009	Receive data from SIMOLINK, word 9	1 $\triangle$ 1	Z11
K7010	Receive data from SIMOLINK, word 10	1 $\triangle$ 1	Z11
K7011	Receive data from SIMOLINK, word 11	1 $\triangle$ 1	Z11
K7012	Receive data from SIMOLINK, word 12	1 $\triangle$ 1	Z11
K7013	Receive data from SIMOLINK, word 13	1 $\triangle$ 1	Z11
K7014	Receive data from SIMOLINK, word 14	1 $\triangle$ 1	Z11
K7015	Receive data from SIMOLINK, word 15	1 $\triangle$ 1	Z11
K7016	Receive data from SIMOLINK, word 16	1 $\triangle$ 1	Z11

Process data exchange with 2 nd CB			
K8001	Receive data from 2 nd CB, word 1	1 $\triangle$ 1	G35
K8002	Receive data from 2 nd CB, word 2	1 $\triangle$ 1	G35
K8003	Receive data from 2 nd CB, word 3	1 $\triangle$ 1	G35
K8004	Receive data from 2 nd CB, word 4	1 $\triangle$ 1	G35
K8005	Receive data from 2 nd CB, word 5	1 $\triangle$ 1	G35
K8006	Receive data from 2 nd CB, word 6	1 $\triangle$ 1	G35
K8007	Receive data from 2 nd CB, word 7	1 $\triangle$ 1	G35
K8008	Receive data from 2 nd CB, word 8	1 $\triangle$ 1	G35
K8009	Receive data from 2 nd CB, word 9	1 $\triangle$ 1	G35
K8010	Receive data from 2 nd CB, word 10	1 $\triangle$ 1	G35
K8011	Receive data from 2 nd CB, word 11	1 $\triangle$ 1	G35
K8012	Receive data from 2 nd CB, word 12	1 $\triangle$ 1	G35
K8013	Receive data from 2 nd CB, word 13	1 $\triangle$ 1	G35
K8014	Receive data from 2 nd CB, word 14	1 $\triangle$ 1	G35
K8015	Receive data from 2 nd CB, word 15	1 $\triangle$ 1	G35
K8016	Receive data from 2 nd CB, word 16	1 $\triangle$ 1	G35

Serial interface 3 (USS3 / Peer-to-peer 3 on G-SST3)			
K9001	USS3 / Peer3 receive data, word 1	1 $\triangle$ 1	G31, G33
K9002	USS3 / Peer3 receive data, word 2	1 $\triangle$ 1	G31, G33
K9003	USS3 / Peer3 receive data, word 3	1 $\triangle$ 1	G31, G33
K9004	USS3 / Peer3 receive data, word 4	1 $\triangle$ 1	G31, G33
K9005	USS3 / Peer3 receive data, word 5	1 $\triangle$ 1	G31, G33
K9006	USS3 receive data, word 6	1 $\triangle$ 1	G31
K9007	USS3 receive data, word 7	1 $\triangle$ 1	G31
K9008	USS3 receive data, word 8	1 $\triangle$ 1	G31
K9009	USS3 receive data, word 9	1 $\triangle$ 1	G31
K9010	USS3 receive data, word 10	1 $\triangle$ 1	G31

Connector	Description	Normalization	Function diag., Sheet
K9011	USS3 receive data, word 11	$1 \triangle 1$	G31
K9012	USS3 receive data, word 12	$1 \triangle 1$	G31
K9013	USS3 receive data, word 13	$1 \triangle 1$	G31
K9014	USS3 receive data, word 14	$1 \triangle 1$	G31
K9015	USS3 receive data, word 15	$1 \triangle 1$	G31
K9016	USS3 receive data, word 16	$1 \triangle 1$	G31
K9020	Output of binector/connector converter for G-SST3	$1 \triangle 1$	G31, G33

Technology software S00: Binector/connector converters

K9113	Output of binector/connector converter 1	FB 13	$1 \triangle 1$	B3
K9114	Output of binector/connector converter 2	FB 14	$1 \triangle 1$	B3
K9115	Output of binector/connector converter 3	FB 14	$1 \triangle 1$	B3

Technology software S00: Adders / Subtracters

K9120	Output of adder/subtractor 1	FB 20	$16384 \triangle 100\%$	B4
K9121	Output of adder/subtractor 2	FB 21	$16384 \triangle 100\%$	B4
K9122	Output of adder/subtractor 3	FB 22	$16384 \triangle 100\%$	B4
K9123	Output of adder/subtractor 4	FB 23	$16384 \triangle 100\%$	B4
K9124	Output of adder/subtractor 5	FB 24	$16384 \triangle 100\%$	B4
K9125	Output of adder/subtractor 6	FB 25	$16384 \triangle 100\%$	B4
K9126	Output of adder/subtractor 7	FB 26	$16384 \triangle 100\%$	B4
K9127	Output of adder/subtractor 8	FB 27	$16384 \triangle 100\%$	B4
K9128	Output of adder/subtractor 9	FB 28	$16384 \triangle 100\%$	B4
K9129	Output of adder/subtractor 10	FB 29	$16384 \triangle 100\%$	B4
K9130	Output of adder/subtractor 11	FB 30	$16384 \triangle 100\%$	B4
K9131	Output of adder/subtractor 12	FB 31	$16384 \triangle 100\%$	B4

Technology software S00: Sign inverters, switchable sign inverters

K9135	Output of sign inverter 1	FB 35	$16384 \triangle 100\%$	B4
K9136	Output of sign inverter 2	FB 36	$16384 \triangle 100\%$	B4
K9137	Output of sign inverter 3	FB 37	$16384 \triangle 100\%$	B4
K9138	Output of sign inverter 4	FB 38	$16384 \triangle 100\%$	B4
K9140	Output of switchable sign inverter 1	FB 40	$16384 \triangle 100\%$	B4
K9141	Output of switchable sign inverter 2	FB 41	$16384 \triangle 100\%$	B4

Technology software S00: Dividers, multipliers, high-resolution multipliers/dividers

K9145	Output of divider 1	FB 45	$16384 \triangle 100\%$	B5
K9146	Output of divider 2	FB 46	$16384 \triangle 100\%$	B5
K9147	Output of divider 3	FB 47	$16384 \triangle 100\%$	B5
K9150	Output of multiplier 1	FB 50	$16384 \triangle 100\%$	B5
K9151	Output of multiplier 2	FB 51	$16384 \triangle 100\%$	B5
K9152	Output of multiplier 3	FB 52	$16384 \triangle 100\%$	B5
K9153	Output of multiplier 4	FB 53	$16384 \triangle 100\%$	B5
K9155	Output of high-resolution multiplier/divider 1	FB 55	$16384 \triangle 100\%$	B5
K9156	Output of high-resolution multiplier/divider 2	FB 56	$16384 \triangle 100\%$	B5
K9157	Output of high-resolution multiplier/divider 3	FB 57	$16384 \triangle 100\%$	B5

Technology software S00: Absolute-value generator with filter

K9160	Output of absolute-value generator with filter 1	FB 60	$16384 \triangle 100\%$	B6
K9161	Output of absolute-value generator with filter 2	FB 61	$16384 \triangle 100\%$	B6

Connector	Description	Normalization	Function diag., Sheet
K9162	Output of absolute-value generator with filter 3	FB 62	16384 $\triangle$ 100%
K9163	Output of absolute-value generator with filter 4	FB 63	16384 $\triangle$ 100%

Technology software S00: Limiters

K9165	Limiter 1: Fixed limiting value	FB 65	16384 $\triangle$ 100%	B6
K9166	Limiter 1: Positive limiting value * (-1)	FB 65	16384 $\triangle$ 100%	B6
K9167	Limiter 1: Output	FB 65	16384 $\triangle$ 100%	B6
K9168	Limiter 2: Fixed limiting value	FB 66	16384 $\triangle$ 100%	B6
K9169	Limiter 2: Positive limiting value * (-1)	FB 66	16384 $\triangle$ 100%	B6
K9170	Limiter 2: Output	FB 66	16384 $\triangle$ 100%	B6
K9171	Limiter 3: Fixed limiting value	FB 67	16384 $\triangle$ 100%	B6
K9172	Limiter 3: Positive limiting value * (-1)	FB 67	16384 $\triangle$ 100%	B6
K9173	Limiter 3: Output	FB 67	16384 $\triangle$ 100%	B6

Technology software S00: Limit-value monitor with filter

K9180	Limit-value monitor with filter 1: Filtered input quantity	FB 70	16384 $\triangle$ 100%	B7
K9181	Limit-value monitor with filter 1: Fixed operating point	FB 70	16384 $\triangle$ 100%	B7
K9182	Limit-value monitor with filter 2: Filtered input quantity	FB 71	16384 $\triangle$ 100%	B7
K9183	Limit-value monitor with filter 2: Fixed operating point	FB 71	16384 $\triangle$ 100%	B7
K9184	Limit-value monitor with filter 3: Filtered input quantity	FB 72	16384 $\triangle$ 100%	B7
K9185	Limit-value monitor with filter 3: Fixed operating point	FB 72	16384 $\triangle$ 100%	B7

Technology software S00: Limit-value monitor without filter

K9186	Limit-value monitor without filter 1: Fixed operating point	FB 73	16384 $\triangle$ 100%	B8
K9187	Limit-value monitor without filter 2: Fixed operating point	FB 74	16384 $\triangle$ 100%	B8
K9188	Limit-value monitor without filter 3: Fixed operating point	FB 75	16384 $\triangle$ 100%	B8
K9189	Limit-value monitor without filter 4: Fixed operating point	FB 76	16384 $\triangle$ 100%	B8
K9190	Limit-value monitor without filter 5: Fixed operating point	FB 77	16384 $\triangle$ 100%	B9
K9191	Limit-value monitor without filter 6: Fixed operating point	FB 78	16384 $\triangle$ 100%	B9
K9192	Limit-value monitor without filter 7: Fixed operating point	FB 79	16384 $\triangle$ 100%	B9

Technology software S00: Minimum selection, maximum selection

K9193	Minimum selection output	FB 80	16384 $\triangle$ 100%	B10
K9194	Maximum selection output	FB 81	16384 $\triangle$ 100%	B10

Technology software S00: Tracking/storage elements

K9195	Output of tracking/storage element 1	FB 82	16384 $\triangle$ 100%	B10
K9196	Output of tracking/storage element 2	FB 83	16384 $\triangle$ 100%	B10

Technology software S00: Analog signal memory

K9197	Output of analog signal memory 1	FB 84	16384 $\triangle$ 100%	B10
K9198	Output of analog signal memory 2	FB 85	16384 $\triangle$ 100%	B10

Technology software S00: Analog signal selector switch

K9210	Output of analog signal selector switch 1	FB 90	16384 $\triangle$ 100%	B11
K9211	Output of analog signal selector switch 2	FB 91	16384 $\triangle$ 100%	B11
K9212	Output of analog signal selector switch 3	FB 92	16384 $\triangle$ 100%	B11
K9213	Output of analog signal selector switch 4	FB 93	16384 $\triangle$ 100%	B11
K9214	Output of analog signal selector switch 5	FB 94	16384 $\triangle$ 100%	B11
K9215	Output of analog signal selector switch 6	FB 95	16384 $\triangle$ 100%	B11

Connector	Description	Normalization	Function diag., Sheet
K9216	Output of analog signal selector switch 7	FB 96	16384 $\triangle$ 100%
K9217	Output of analog signal selector switch 8	FB 97	16384 $\triangle$ 100%
K9218	Output of analog signal selector switch 9	FB 98	16384 $\triangle$ 100%
K9219	Output of analog signal selector switch 10	FB 99	16384 $\triangle$ 100%

Technology software S00: Integrators

K9220	Output of integrator 1	FB 100	16384 $\triangle$ 100%
K9221	Output of integrator 2	FB 101	16384 $\triangle$ 100%
K9222	Output of integrator 3	FB 102	16384 $\triangle$ 100%

Technology software S00: DT1 elements

K9223	Output of DT1 element 1	FB 103	16384 $\triangle$ 100%
K9224	Output of DT1 element 1, inverted	FB 103	16384 $\triangle$ 100%
K9225	Output of DT1 element 2	FB 104	16384 $\triangle$ 100%
K9226	Output of DT1 element 2, inverted	FB 104	16384 $\triangle$ 100%
K9227	Output of DT1 element 3	FB 105	16384 $\triangle$ 100%
K9228	Output of DT1 element 3, inverted	FB 105	16384 $\triangle$ 100%

Technology software S00: Characteristic blocks

K9229	Output of characteristic block 1	FB 106	16384 $\triangle$ 100%
K9230	Output of characteristic block 2	FB 107	16384 $\triangle$ 100%
K9231	Output of characteristic block 3	FB 108	16384 $\triangle$ 100%

Technology software S00: Dead zones

K9232	Output of dead zone 1	FB 109	16384 $\triangle$ 100%
K9233	Output of dead zone 2	FB 110	16384 $\triangle$ 100%
K9234	Output of dead zone 3	FB 111	16384 $\triangle$ 100%

Technology software S00: Setpoint branching

K9235	Setpoint branching output	FB 112	16384 $\triangle$ 100%

Technology software S00: Simple ramp-function generator

K9236	Simple ramp-function generator output	FB 113	16384 $\triangle$ 100%

Technology software S00: Technology controller

K9240	Technology controller, signed actual value	FB 114	16384 $\triangle$ 100%
K9241	Technology controller, absolute actual value	FB 114	16384 $\triangle$ 100%
K9242	D component	FB 114	16384 $\triangle$ 100%
K9243	Technology controller, setpoint	FB 114	16384 $\triangle$ 100%
K9244	Technology controller, filtered setpoint	FB 114	16384 $\triangle$ 100%
K9245	Setpoint/actual value deviation	FB 114	16384 $\triangle$ 100%
K9246	Setpoint/actual value deviation after droop	FB 114	16384 $\triangle$ 100%
K9247	P component	FB 114	16384 $\triangle$ 100%
K9248	I component	FB 114	16384 $\triangle$ 100%
K9249	Technology controller output before limitation	FB 114	16384 $\triangle$ 100%
K9250	Positive limit for technology controller output	FB 114	16384 $\triangle$ 100%
K9251	Negative limit for technology controller output	FB 114	16384 $\triangle$ 100%
K9252	Positive limit for technology controller output * (-1)	FB 114	16384 $\triangle$ 100%
K9253	Technology controller output after limitation	FB 114	16384 $\triangle$ 100%
K9254	Technology controller output after multiplication with weighting factor	FB 114	16384 $\triangle$ 100%

Connector	Description	Normalization	Function diag., Sheet
Technology software S00: Speed/velocity calculator, velocity/speed calculator			
K9256	Speed/velocity calculator: Actual velocity	FB 115	16384 $\triangle$ 100%
K9257	Velocity/speed calculator: Speed setpoint	FB 115	16384 $\triangle$ 100%

General connectors			
K9801	Alarm word 1 (= parameter r953)		
K9802	Alarm word 2 (= parameter r954)		
K9803	Alarm word 3 (= parameter r955)		
K9804	Alarm word 4 (= parameter r956)		
K9805	Alarm word 5 (= parameter r957)		
K9806	Alarm word 6 (= parameter r958)		
K9807	Alarm word 7 (= parameter r959)		
K9808	Alarm word 8 (= parameter r960)		
K9811	Fault number 1 (= parameter r947.01, last fault number)		
K9812	Fault number 2 (= parameter r947.09, second last fault number)		
K9813	Fault number 3 (= parameter r947.17, third last fault number)		
K9814	Fault number 4 (= parameter r947.25, fourth last fault number)		
K9815	Fault number 5 (= parameter r947.33)		
K9816	Fault number 6 (= parameter r947.41)		
K9817	Fault number 7 (= parameter r947.49)		
K9818	Fault number 8 (= parameter r947.57)		

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		
K9999	Output of binary connector converter for SIMOVIS Trace function		

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	G12
B0001	Fixed value 1	G12

Binary inputs, terminals 36 to 43		
B0010	Status of terminal 36	G2
B0011	Status of terminal 36, inverted	G2
B0012	Status of terminal 37	G2
B0013	Status of terminal 37, inverted	G2
B0014	Status of terminal 38	G2
B0015	Status of terminal 38, inverted	G2
B0016	Status of terminal 39	G2
B0017	Status of terminal 39, inverted	G2
B0018	Status of terminal 40	G3
B0019	Status of terminal 40, inverted	G3
B0020	Status of terminal 41	G3
B0021	Status of terminal 41, inverted	G3
B0022	Status of terminal 42	G3
B0023	Status of terminal 42, inverted	G3
B0024	Status of terminal 43	G3
B0025	Status of terminal 43, inverted	G3

Binary inputs, terminals 211 to 214		
B0040	Status of terminal 211	G42
B0041	Status of terminal 211, inverted	G42
B0042	Status of terminal 212	G42
B0043	Status of terminal 212, inverted	G42
B0044	Status of terminal 213	G42
B0045	Status of terminal 213, inverted	G42
B0046	Status of terminal 214	G42
B0047	Status of terminal 214, inverted	G42

Analog inputs		
B0050	Analog input, terminal 4: 1 = Open circuit ($i \leq 2$ mA)	G5
B0051	Analog input, terminal 6: 1 = Open circuit ($i \leq 2$ mA)	G5

Pulse encoder evaluation		
B0052	Fault in digital speed sensing circuit	G22

Status word 1		
B0100	Stat.word 1, bit 0: 0=not ready to switch on, 1=ready to switch on	G39
B0101	Stat.word 1, bit 0 inverted	G39
B0102	Stat.word 1, bit 1: 0=not ready, 1=ready (pulses disabled)	G39
B0103	Stat.word 1, bit 1 inverted	G39
B0104	Stat.word 1, bit 2: 0=pulses disabled, 1=Run (output terminals energized)	G39
B0105	Stat.word 1, bit 2 inverted	G39

Binector	Name, description	Function diag., Sheet
B0106	Stat.word 1, bit 3: 0=no active fault, 1=active fault (pulses disabled)	G39
B0107	Stat.word 1, bit 3 inverted	G39
B0108	Stat.word 1, bit 4: 0=OFF2 active, 1=no active OFF2	G39
B0109	Stat.word 1, bit 4 inverted	G39
B0110	Stat.word 1, bit 5: 0=OFF3 active, 1=no active OFF3	G39
B0111	Stat.word 1, bit 5 inverted	G39
B0112	Stat.word 1, bit 6: 0=no starting lockout (unit can be switched on), 1=starting lockout active	G39
B0113	Stat.word 1, bit 6 inverted	G39
B0114	Stat.word 1, bit 7: 0=no active alarm, 1=alarm active	G39
B0115	Stat.word 1, bit 7 inverted	G39
B0116	Stat.word 1, bit 8: 0=setp./act. val. deviation detected, 1=no setp./act. val. deviation	G39
B0117	Stat.word 1, bit 8 inverted	G39
B0120	Stat.word 1, bit 10: 0=comparison setpoint not reached, 1=comparison setpoint reached	G39
B0121	Stat.word 1, bit 10 inverted	G39
B0122	Stat.word 1, bit 11: 0=undervoltage fault not active, 1=undervoltage fault active	G39
B0123	Stat.word 1, bit 11 inverted	G39
B0124	Stat.word 1, bit 12: 0=main contactor request not active, 1=request to energize main contactor active	G39
B0125	Stat.word 1, bit 12 inverted	G39
B0126	Stat.word 1, bit 13: 0=ramp-function generator not active, 1=ramp-function generator active	G39
B0127	Stat.word 1, bit 13 inverted	G39
B0128	Stat.word 1, bit 14: 0=negative speed setpoint, 1=positive speed setpoint	G39
B0129	Stat.word 1, bit 14 inverted	G39

Status word 2		
B0136	Stat.word 2, bit 18: 0=overspeed, 1=no overspeed	G40
B0137	Stat.word 2, bit 18 inverted	G40
B0138	Stat.word 2, bit 19: 0=no external fault 1 active, 1=external fault 1 active	G40
B0139	Stat.word 2, bit 19 inverted	G40
B0140	Stat.word 2, bit 20: 0=no external fault 2 active, 1=external fault 2 active	G40
B0141	Stat.word 2, bit 20 inverted	G40
B0142	Stat.word 2, bit 21: 0=no external alarm active, 1=external alarm active	G40
B0143	Stat.word 2, bit 21 inverted	G40
B0144	Stat.word 2, bit 22: 0=no overload alarm active, 1=overload alarm active	G40
B0145	Stat.word 2, bit 22 inverted	G40
B0146	Stat.word 2, bit 23: 0=no overtemperature fault active, 1=overtemperature fault active	G40
B0147	Stat.word 2, bit 23 inverted	G40
B0148	Stat.word 2, bit 24: 0=no overtemperature alarm active, 1=overtemperature alarm active	G40
B0149	Stat.word 2, bit 24 inverted	G40
B0150	Stat.word 2, bit 25: 0=no motor overtemperature alarm active, 1=motor overtemperature alarm active	G40
B0151	Stat.word 2, bit 25 inverted	G40
B0152	Stat.word 2, bit 26: 0=no motor overtemperature fault active, 1=motor overtemperature fault active	G40
B0153	Stat.word 2, bit 26 inverted	G40
B0156	Stat.word 2, bit 28: 0=no motor blocked fault active, 1=motor blocked fault active	G40

Messages		
B0160	0=OFF1 active, 1=no OFF1 active	G37
B0161	B0160 inverted	G37
B0164	$1 = n < n_{min}$	G43
B0165	B0164 inverted	G43
B0166	1 = Voltage at power section is active	

Binector	Name, description	Function diag., Sheet
B0167	B0166 inverted	
B0168	1 = E-Stop is active	
B0169	B0168 inverted	
B0170	1=Voltage at power section AND operating state <= o7	G11
B0171	B0170 inverted	G11

Binary inputs		
B0180	1=Terminal 211 not activated for more than 10 s.	G42
B0181	1=Terminal 212 activated for more than 2 s.	G42
B0182	1=Terminal 213 not activated for more than 40 s while in operating state < o6	G42
B0183	1=Terminal 214 not activated for more than 10 s.	G42

Temperature sensor inputs		
B0184	1=Alarm motor temperature 1	G41
B0185	1=Alarm motor temperature 2	G41

Alarm messages		
B0186	1=Alarm A037 (I2t motor) active	
B0187	1=Alarm A039 (I2t power section) active	
B0188	1=Alarm A067 (heatsink temperature) active	
B0189	1=Alarm A067 (converter fan) active	

Torque limitation, current limitation, current controller		
B0200	Current limitation active	G27
B0201	Speed limiting controller active	G26
B0202	Upper torque limitation active	G26
B0203	Lower torque limitation active	G26
B0204	Torque or current limitation active or current controller at limitation	G28

Speed controller		
B0205	Speed controller enabling by sequencing control	G24

Setpoint processing, ramp-function generator		
B0206	Limitation after ramp-function generator (setpoint limitation) has responded	G20
B0207	Ramp-function generator output = 0 (y = 0)	G20
B0208	Ramp-function generator, ramp-up	G20
B0209	Ramp-function generator, ramp-down	G20
B0210	1 = no direction of rotation enabled	G19
B0211	Ramp-function generator: Enable setpoint (1 = setpoint enabled)	G20

Torque limitation		
B0212	"Zero delay-angle" command	G26

Gating unit		
B0220	Enabled torque direction	G28

Motorized potentiometer		
B0240	Motorized potentiometer output = 0 (y = 0)	G14
B0241	Ramp-up/ramp-down finished (y = x)	G14

Binector	Name, description	Function diag., Sheet
Brake control		
B0250	Brake control (1=close brake, 0=release brake)	G21
B0251	1=auxiliaries ON, 0=auxiliaries OFF	see Sect. 9.7
B0252	1=converter fan ON, 0=converter fan OFF	
B0255	Brake control (1=release brake, 0=close brake) (= B0250 inverted)	G21
B0256	1=auxiliaries OFF, 0=auxiliaries ON (= B0251 inverted)	see Sect. 9.7

Fixed control bits		
B0421	Control bit 1 (P421)	G12
B0422	Control bit 2 (P422)	G12
B0423	Control bit 3 (P423)	G12
B0424	Control bit 4 (P424)	G12
B0425	Control bit 5 (P425)	G12
B0426	Control bit 6 (P426)	G12
B0427	Control bit 7 (P427)	G12
B0428	Control bit 8 (P428)	G12

Control inputs		
B0500	Status of terminal 72	G9
B0501	Status of terminal 72, inverted	G9
B0502	Status of terminal 73	G9
B0503	Status of terminal 73, inverted	G9
B0504	Status of terminal 74	G9
B0505	Status of terminal 74, inverted	G9
B0506	Status of terminal 75	G9
B0507	Status of terminal 75, inverted	G9
B0508	Status of terminal 76	G10
B0509	Status of terminal 76, inverted	G10
B0510	Status of terminal 77	G10
B0511	Status of terminal 77, inverted	G10
B0512	Status of terminal 78	G10
B0513	Status of terminal 78, inverted	G10
B0514	Status of terminal 79	G10
B0515	Status of terminal 79, inverted	G10

Control outputs		
B0520	Status of relay at terminal 81/82	G11
B0521	Status of relay at terminal 81/82, inverted	G11
B0522	Status of relay at terminal 83/84	G11
B0523	Status of relay at terminal 83/84, inverted	G11
B0524	Status of relay at terminal 85/86	G11
B0525	Status of relay at terminal 85/86, inverted	G11
B0526	Status of relay at terminal 87/88	G11
B0527	Status of relay at terminal 87/88, inverted	G11
B0528	Status of relay at terminal 89/90	G11
B0529	Status of relay at terminal 89/90, inverted	G11
B0530	Status of relay at terminal 91/92	G11
B0531	Status of relay at terminal 91/92, inverted	G11
B0532	Status of relay at terminal 93/94	G11
B0533	Status of relay at terminal 93/94, inverted	G11

Binector	Name, description	Function diag., Sheet

Messages

B0540	1=nset on ramp-function generator is greater than U628	G20
B0541	B0540 inverted	G20

Serial interface 1 (USS1 on G-SST1)

B2030	USS1 telegram monitoring timeout - maintained signal	G29
B2031	USS1 telegram monitoring timeout - 1s pulse	G29

Serial interface 1 (USS1 on G-SST1)

B2100	USS1 receive data, word 1, bit 0	G29
B2101	USS1 receive data, word 1, bit 1	G29
B2102	USS1 receive data, word 1, bit 2	G29
B2103	USS1 receive data, word 1, bit 3	G29
B2104	USS1 receive data, word 1, bit 4	G29
B2105	USS1 receive data, word 1, bit 5	G29
B2106	USS1 receive data, word 1, bit 6	G29
B2107	USS1 receive data, word 1, bit 7	G29
B2108	USS1 receive data, word 1, bit 8	G29
B2109	USS1 receive data, word 1, bit 9	G29
B2110	USS1 receive data, word 1, bit 10	G29
B2111	USS1 receive data, word 1, bit 11	G29
B2112	USS1 receive data, word 1, bit 12	G29
B2113	USS1 receive data, word 1, bit 13	G29
B2114	USS1 receive data, word 1, bit 14	G29
B2115	USS1 receive data, word 1, bit 15	G29
B2200	USS1 receive data, word 2, bit 0	G29
B2201	USS1 receive data, word 2, bit 1	G29
B2202	USS1 receive data, word 2, bit 2	G29
B2203	USS1 receive data, word 2, bit 3	G29
B2204	USS1 receive data, word 2, bit 4	G29
B2205	USS1 receive data, word 2, bit 5	G29
B2206	USS1 receive data, word 2, bit 6	G29
B2207	USS1 receive data, word 2, bit 7	G29
B2208	USS1 receive data, word 2, bit 8	G29
B2209	USS1 receive data, word 2, bit 9	G29
B2210	USS1 receive data, word 2, bit 10	G29
B2211	USS1 receive data, word 2, bit 11	G29
B2212	USS1 receive data, word 2, bit 12	G29
B2213	USS1 receive data, word 2, bit 13	G29
B2214	USS1 receive data, word 2, bit 14	G29
B2215	USS1 receive data, word 2, bit 15	G29
B2300	USS1 receive data, word 3, bit 0	G29
B2301	USS1 receive data, word 3, bit 1	G29
B2302	USS1 receive data, word 3, bit 2	G29
B2303	USS1 receive data, word 3, bit 3	G29
B2304	USS1 receive data, word 3, bit 4	G29
B2305	USS1 receive data, word 3, bit 5	G29
B2306	USS1 receive data, word 3, bit 6	G29
B2307	USS1 receive data, word 3, bit 7	G29

Binector	Name, description	Function diag., Sheet
B2308	USS1 receive data, word 3, bit 8	G29
B2309	USS1 receive data, word 3, bit 9	G29
B2310	USS1 receive data, word 3, bit 10	G29
B2311	USS1 receive data, word 3, bit 11	G29
B2312	USS1 receive data, word 3, bit 12	G29
B2313	USS1 receive data, word 3, bit 13	G29
B2314	USS1 receive data, word 3, bit 14	G29
B2315	USS1 receive data, word 3, bit 15	G29
B2400	USS1 receive data, word 4, bit 0	G29
B2401	USS1 receive data, word 4, bit 1	G29
B2402	USS1 receive data, word 4, bit 2	G29
B2403	USS1 receive data, word 4, bit 3	G29
B2404	USS1 receive data, word 4, bit 4	G29
B2405	USS1 receive data, word 4, bit 5	G29
B2406	USS1 receive data, word 4, bit 6	G29
B2407	USS1 receive data, word 4, bit 7	G29
B2408	USS1 receive data, word 4, bit 8	G29
B2409	USS1 receive data, word 4, bit 9	G29
B2410	USS1 receive data, word 4, bit 10	G29
B2411	USS1 receive data, word 4, bit 11	G29
B2412	USS1 receive data, word 4, bit 12	G29
B2413	USS1 receive data, word 4, bit 13	G29
B2414	USS1 receive data, word 4, bit 14	G29
B2415	USS1 receive data, word 4, bit 15	G29
B2500	USS1 receive data, word 5, bit 0	G29
B2501	USS1 receive data, word 5, bit 1	G29
B2502	USS1 receive data, word 5, bit 2	G29
B2503	USS1 receive data, word 5, bit 3	G29
B2504	USS1 receive data, word 5, bit 4	G29
B2505	USS1 receive data, word 5, bit 5	G29
B2506	USS1 receive data, word 5, bit 6	G29
B2507	USS1 receive data, word 5, bit 7	G29
B2508	USS1 receive data, word 5, bit 8	G29
B2509	USS1 receive data, word 5, bit 9	G29
B2510	USS1 receive data, word 5, bit 10	G29
B2511	USS1 receive data, word 5, bit 11	G29
B2512	USS1 receive data, word 5, bit 12	G29
B2513	USS1 receive data, word 5, bit 13	G29
B2514	USS1 receive data, word 5, bit 14	G29
B2515	USS1 receive data, word 5, bit 15	G29
B2600	USS1 receive data, word 6, bit 0	G29
B2601	USS1 receive data, word 6, bit 1	G29
B2602	USS1 receive data, word 6, bit 2	G29
B2603	USS1 receive data, word 6, bit 3	G29
B2604	USS1 receive data, word 6, bit 4	G29
B2605	USS1 receive data, word 6, bit 5	G29
B2606	USS1 receive data, word 6, bit 6	G29
B2607	USS1 receive data, word 6, bit 7	G29
B2608	USS1 receive data, word 6, bit 8	G29

Binector	Name, description	Function diag., Sheet
B2609	USS1 receive data, word 6, bit 9	G29
B2610	USS1 receive data, word 6, bit 10	G29
B2611	USS1 receive data, word 6, bit 11	G29
B2612	USS1 receive data, word 6, bit 12	G29
B2613	USS1 receive data, word 6, bit 13	G29
B2614	USS1 receive data, word 6, bit 14	G29
B2615	USS1 receive data, word 6, bit 15	G29
B2700	USS1 receive data, word 7, bit 0	G29
B2701	USS1 receive data, word 7, bit 1	G29
B2702	USS1 receive data, word 7, bit 2	G29
B2703	USS1 receive data, word 7, bit 3	G29
B2704	USS1 receive data, word 7, bit 4	G29
B2705	USS1 receive data, word 7, bit 5	G29
B2706	USS1 receive data, word 7, bit 6	G29
B2707	USS1 receive data, word 7, bit 7	G29
B2708	USS1 receive data, word 7, bit 8	G29
B2709	USS1 receive data, word 7, bit 9	G29
B2710	USS1 receive data, word 7, bit 10	G29
B2711	USS1 receive data, word 7, bit 11	G29
B2712	USS1 receive data, word 7, bit 12	G29
B2713	USS1 receive data, word 7, bit 13	G29
B2714	USS1 receive data, word 7, bit 14	G29
B2715	USS1 receive data, word 7, bit 15	G29
B2800	USS1 receive data, word 8, bit 0	G29
B2801	USS1 receive data, word 8, bit 1	G29
B2802	USS1 receive data, word 8, bit 2	G29
B2803	USS1 receive data, word 8, bit 3	G29
B2804	USS1 receive data, word 8, bit 4	G29
B2805	USS1 receive data, word 8, bit 5	G29
B2806	USS1 receive data, word 8, bit 6	G29
B2807	USS1 receive data, word 8, bit 7	G29
B2808	USS1 receive data, word 8, bit 8	G29
B2809	USS1 receive data, word 8, bit 9	G29
B2810	USS1 receive data, word 8, bit 10	G29
B2811	USS1 receive data, word 8, bit 11	G29
B2812	USS1 receive data, word 8, bit 12	G29
B2813	USS1 receive data, word 8, bit 13	G29
B2814	USS1 receive data, word 8, bit 14	G29
B2815	USS1 receive data, word 8, bit 15	G29
B2900	USS1 receive data, word 9, bit 0	G29
B2901	USS1 receive data, word 9, bit 1	G29
B2902	USS1 receive data, word 9, bit 2	G29
B2903	USS1 receive data, word 9, bit 3	G29
B2904	USS1 receive data, word 9, bit 4	G29
B2905	USS1 receive data, word 9, bit 5	G29
B2906	USS1 receive data, word 9, bit 6	G29
B2907	USS1 receive data, word 9, bit 7	G29
B2908	USS1 receive data, word 9, bit 8	G29
B2909	USS1 receive data, word 9, bit 9	G29

Binector	Name, description	Function diag., Sheet
B2910	USS1 receive data, word 9, bit 10	G29
B2911	USS1 receive data, word 9, bit 11	G29
B2912	USS1 receive data, word 9, bit 12	G29
B2913	USS1 receive data, word 9, bit 13	G29
B2914	USS1 receive data, word 9, bit 14	G29
B2915	USS1 receive data, word 9, bit 15	G29

Process data exchange with 1 st CB/TB		
B3030	Message timeout on 1 st CB/TB - maintained signal	G34
B3031	Message timeout on 1 st CB/TB - 1s pulse	G34

Process data exchange with 1 st CB/TB		
B3100	Receive data from 1 st CB/TB, word 1, bit 0	G34
B3101	Receive data from 1 st CB/TB, word 1, bit 1	G34
B3102	Receive data from 1 st CB/TB, word 1, bit 2	G34
B3103	Receive data from 1 st CB/TB, word 1, bit 3	G34
B3104	Receive data from 1 st CB/TB, word 1, bit 4	G34
B3105	Receive data from 1 st CB/TB, word 1, bit 5	G34
B3106	Receive data from 1 st CB/TB, word 1, bit 6	G34
B3107	Receive data from 1 st CB/TB, word 1, bit 7	G34
B3108	Receive data from 1 st CB/TB, word 1, bit 8	G34
B3109	Receive data from 1 st CB/TB, word 1, bit 9	G34
B3110	Receive data from 1 st CB/TB, word 1, bit 10	G34
B3111	Receive data from 1 st CB/TB, word 1, bit 11	G34
B3112	Receive data from 1 st CB/TB, word 1, bit 12	G34
B3113	Receive data from 1 st CB/TB, word 1, bit 13	G34
B3114	Receive data from 1 st CB/TB, word 1, bit 14	G34
B3115	Receive data from 1 st CB/TB, word 1, bit 15	G34
B3200	Receive data from 1 st CB/TB, word 2, bit 0	G34
B3201	Receive data from 1 st CB/TB, word 2, bit 1	G34
B3202	Receive data from 1 st CB/TB, word 2, bit 2	G34
B3203	Receive data from 1 st CB/TB, word 2, bit 3	G34
B3204	Receive data from 1 st CB/TB, word 2, bit 4	G34
B3205	Receive data from 1 st CB/TB, word 2, bit 5	G34
B3206	Receive data from 1 st CB/TB, word 2, bit 6	G34
B3207	Receive data from 1 st CB/TB, word 2, bit 7	G34
B3208	Receive data from 1 st CB/TB, word 2, bit 8	G34
B3209	Receive data from 1 st CB/TB, word 2, bit 9	G34
B3210	Receive data from 1 st CB/TB, word 2, bit 10	G34
B3211	Receive data from 1 st CB/TB, word 2, bit 11	G34
B3212	Receive data from 1 st CB/TB, word 2, bit 12	G34
B3213	Receive data from 1 st CB/TB, word 2, bit 13	G34
B3214	Receive data from 1 st CB/TB, word 2, bit 14	G34
B3215	Receive data from 1 st CB/TB, word 2, bit 15	G34
B3300	Receive data from 1 st CB/TB, word 3, bit 0	G34
B3301	Receive data from 1 st CB/TB, word 3, bit 1	G34
B3302	Receive data from 1 st CB/TB, word 3, bit 2	G34
B3303	Receive data from 1 st CB/TB, word 3, bit 3	G34
B3304	Receive data from 1 st CB/TB, word 3, bit 4	G34
B3305	Receive data from 1 st CB/TB, word 3, bit 5	G34

Binector	Name, description	Function diag., Sheet
B3306	Receive data from 1 st CB/TB, word 3, bit 6	G34
B3307	Receive data from 1 st CB/TB, word 3, bit 7	G34
B3308	Receive data from 1 st CB/TB, word 3, bit 8	G34
B3309	Receive data from 1 st CB/TB, word 3, bit 9	G34
B3310	Receive data from 1 st CB/TB, word 3, bit 10	G34
B3311	Receive data from 1 st CB/TB, word 3, bit 11	G34
B3312	Receive data from 1 st CB/TB, word 3, bit 12	G34
B3313	Receive data from 1 st CB/TB, word 3, bit 13	G34
B3314	Receive data from 1 st CB/TB, word 3, bit 14	G34
B3315	Receive data from 1 st CB/TB, word 3, bit 15	G34
B3400	Receive data from 1 st CB/TB, word 4, bit 0	G34
B3401	Receive data from 1 st CB/TB, word 4, bit 1	G34
B3402	Receive data from 1 st CB/TB, word 4, bit 2	G34
B3403	Receive data from 1 st CB/TB, word 4, bit 3	G34
B3404	Receive data from 1 st CB/TB, word 4, bit 4	G34
B3405	Receive data from 1 st CB/TB, word 4, bit 5	G34
B3406	Receive data from 1 st CB/TB, word 4, bit 6	G34
B3407	Receive data from 1 st CB/TB, word 4, bit 7	G34
B3408	Receive data from 1 st CB/TB, word 4, bit 8	G34
B3409	Receive data from 1 st CB/TB, word 4, bit 9	G34
B3410	Receive data from 1 st CB/TB, word 4, bit 10	G34
B3411	Receive data from 1 st CB/TB, word 4, bit 11	G34
B3412	Receive data from 1 st CB/TB, word 4, bit 12	G34
B3413	Receive data from 1 st CB/TB, word 4, bit 13	G34
B3414	Receive data from 1 st CB/TB, word 4, bit 14	G34
B3415	Receive data from 1 st CB/TB, word 4, bit 15	G34
B3500	Receive data from 1 st CB/TB, word 5, bit 0	G34
B3501	Receive data from 1 st CB/TB, word 5, bit 1	G34
B3502	Receive data from 1 st CB/TB, word 5, bit 2	G34
B3503	Receive data from 1 st CB/TB, word 5, bit 3	G34
B3504	Receive data from 1 st CB/TB, word 5, bit 4	G34
B3505	Receive data from 1 st CB/TB, word 5, bit 5	G34
B3506	Receive data from 1 st CB/TB, word 5, bit 6	G34
B3507	Receive data from 1 st CB/TB, word 5, bit 7	G34
B3508	Receive data from 1 st CB/TB, word 5, bit 8	G34
B3509	Receive data from 1 st CB/TB, word 5, bit 9	G34
B3510	Receive data from 1 st CB/TB, word 5, bit 10	G34
B3511	Receive data from 1 st CB/TB, word 5, bit 11	G34
B3512	Receive data from 1 st CB/TB, word 5, bit 12	G34
B3513	Receive data from 1 st CB/TB, word 5, bit 13	G34
B3514	Receive data from 1 st CB/TB, word 5, bit 14	G34
B3515	Receive data from 1 st CB/TB, word 5, bit 15	G34
B3600	Receive data from 1 st CB/TB, word 6, bit 0	G34
B3601	Receive data from 1 st CB/TB, word 6, bit 1	G34
B3602	Receive data from 1 st CB/TB, word 6, bit 2	G34
B3603	Receive data from 1 st CB/TB, word 6, bit 3	G34
B3604	Receive data from 1 st CB/TB, word 6, bit 4	G34
B3605	Receive data from 1 st CB/TB, word 6, bit 5	G34
B3606	Receive data from 1 st CB/TB, word 6, bit 6	G34

Binector	Name, description	Function diag., Sheet
B3607	Receive data from 1 st CB/TB, word 6, bit 7	G34
B3608	Receive data from 1 st CB/TB, word 6, bit 8	G34
B3609	Receive data from 1 st CB/TB, word 6, bit 9	G34
B3610	Receive data from 1 st CB/TB, word 6, bit 10	G34
B3611	Receive data from 1 st CB/TB, word 6, bit 11	G34
B3612	Receive data from 1 st CB/TB, word 6, bit 12	G34
B3613	Receive data from 1 st CB/TB, word 6, bit 13	G34
B3614	Receive data from 1 st CB/TB, word 6, bit 14	G34
B3615	Receive data from 1 st CB/TB, word 6, bit 15	G34
B3700	Receive data from 1 st CB/TB, word 7, bit 0	G34
B3701	Receive data from 1 st CB/TB, word 7, bit 1	G34
B3702	Receive data from 1 st CB/TB, word 7, bit 2	G34
B3703	Receive data from 1 st CB/TB, word 7, bit 3	G34
B3704	Receive data from 1 st CB/TB, word 7, bit 4	G34
B3705	Receive data from 1 st CB/TB, word 7, bit 5	G34
B3706	Receive data from 1 st CB/TB, word 7, bit 6	G34
B3707	Receive data from 1 st CB/TB, word 7, bit 7	G34
B3708	Receive data from 1 st CB/TB, word 7, bit 8	G34
B3709	Receive data from 1 st CB/TB, word 7, bit 9	G34
B3710	Receive data from 1 st CB/TB, word 7, bit 10	G34
B3711	Receive data from 1 st CB/TB, word 7, bit 11	G34
B3712	Receive data from 1 st CB/TB, word 7, bit 12	G34
B3713	Receive data from 1 st CB/TB, word 7, bit 13	G34
B3714	Receive data from 1 st CB/TB, word 7, bit 14	G34
B3715	Receive data from 1 st CB/TB, word 7, bit 15	G34
B3800	Receive data from 1 st CB/TB, word 8, bit 0	G34
B3801	Receive data from 1 st CB/TB, word 8, bit 1	G34
B3802	Receive data from 1 st CB/TB, word 8, bit 2	G34
B3803	Receive data from 1 st CB/TB, word 8, bit 3	G34
B3804	Receive data from 1 st CB/TB, word 8, bit 4	G34
B3805	Receive data from 1 st CB/TB, word 8, bit 5	G34
B3806	Receive data from 1 st CB/TB, word 8, bit 6	G34
B3807	Receive data from 1 st CB/TB, word 8, bit 7	G34
B3808	Receive data from 1 st CB/TB, word 8, bit 8	G34
B3809	Receive data from 1 st CB/TB, word 8, bit 9	G34
B3810	Receive data from 1 st CB/TB, word 8, bit 10	G34
B3811	Receive data from 1 st CB/TB, word 8, bit 11	G34
B3812	Receive data from 1 st CB/TB, word 8, bit 12	G34
B3813	Receive data from 1 st CB/TB, word 8, bit 13	G34
B3814	Receive data from 1 st CB/TB, word 8, bit 14	G34
B3815	Receive data from 1 st CB/TB, word 8, bit 15	G34
B3900	Receive data from 1 st CB/TB, word 9, bit 0	G34
B3901	Receive data from 1 st CB/TB, word 9, bit 1	G34
B3902	Receive data from 1 st CB/TB, word 9, bit 2	G34
B3903	Receive data from 1 st CB/TB, word 9, bit 3	G34
B3904	Receive data from 1 st CB/TB, word 9, bit 4	G34
B3905	Receive data from 1 st CB/TB, word 9, bit 5	G34
B3906	Receive data from 1 st CB/TB, word 9, bit 6	G34
B3907	Receive data from 1 st CB/TB, word 9, bit 7	G34

Binector	Name, description	Function diag., Sheet
B3908	Receive data from 1 st CB/TB, word 9, bit 8	G34
B3909	Receive data from 1 st CB/TB, word 9, bit 9	G34
B3910	Receive data from 1 st CB/TB, word 9, bit 10	G34
B3911	Receive data from 1 st CB/TB, word 9, bit 11	G34
B3912	Receive data from 1 st CB/TB, word 9, bit 12	G34
B3913	Receive data from 1 st CB/TB, word 9, bit 13	G34
B3914	Receive data from 1 st CB/TB, word 9, bit 14	G34
B3915	Receive data from 1 st CB/TB, word 9, bit 15	G34

Expansion boards		
B5101	Open circuit on 1 st analog input of 1 st EB1	Z1
B5102	Digital use of 2 nd analog input of 1 st EB1	Z1
B5103	Digital use of 3 rd analog input of 1 st EB1	Z1
B5104	1 st digital input (terminal 43) of 1 st EB1 inverted	Z3
B5105	1 st digital input (terminal 43) of 1 st EB1	Z3
B5106	2 nd digital input (terminal 44) of 1 st EB1 inverted	Z3
B5107	2 nd digital input (terminal 44) of 1 st EB1	Z3
B5108	3 rd digital input (terminal 45) of 1 st EB1 inverted	Z3
B5109	3 rd digital input (terminal 45) of 1 st EB1	Z3
B5110	4 th digital input (terminal 46) of 1 st EB1 inverted	Z3
B5111	5 th digital input (terminal 46) of 1 st EB1	Z3
B5112	5 th digital input (terminal 40) of 1 st EB1 inverted	Z3
B5113	5 th digital input (terminal 40) of 1 st EB1	Z3
B5114	6 th digital input (terminal 41) of 1 st EB1 inverted	Z3
B5115	6 th digital input (terminal 41) of 1 st EB1	Z3
B5116	7 th digital input (terminal 42) of 1 st EB1 inverted	Z3
B5117	7 th digital input (terminal 42) of 1 st EB1	Z3
B5121	Open circuit (I<2mA) on 1 st analog input of 1 st EB2	Z7
B5122	1 st digital input (terminal 53) of 1 st EB2 inverted	Z7
B5123	1 st digital input (terminal 53) of 1 st EB2	Z7
B5124	2 nd digital input (terminal 54) of 1 st EB2 inverted	Z7
B5125	2 nd digital input (terminal 54) of 1 st EB2	Z7
B5201	Open circuit (I<2mA) on 1 st analog input of 2 nd EB1	Z4
B5202	Digital use of 2 nd analog input of 2 nd EB1	Z4
B5203	Digital use of 3 rd analog input of 2 nd EB1	Z4
B5204	1 st digital input (terminal 43) of 2 nd EB1 inverted	Z6
B5205	1 st digital input (terminal 43) of 2 nd EB1	Z6
B5206	2 nd digital input (terminal 44) of 2 nd EB1 inverted	Z6
B5207	2 nd digital input (terminal 44) of 2 nd EB1	Z6
B5208	3 rd digital input (terminal 45) of 2 nd EB1 inverted	Z6
B5209	3 rd digital input (terminal 45) of 2 nd EB1	Z6
B5210	4 th digital input (terminal 46) of 2 nd EB1 inverted	Z6
B5211	4 th digital input (terminal 46) of 2 nd EB1	Z6
B5212	5 th digital input (terminal 40) of 2 nd EB1 inverted	Z6
B5213	5 th digital input (terminal 40) of 2 nd EB1	Z6
B5214	6 th digital input (terminal 41) of 2 nd EB1 inverted	Z6
B5215	6 th digital input (terminal 41) of 2 nd EB1	Z6
B5216	7 th digital input (terminal 42) of 2 nd EB1 inverted	Z6
B5217	7 th digital input (terminal 42) of 2 nd EB1	Z6

Binector	Name, description	Function diag., Sheet
B5221	Open circuit ($I < 2\text{mA}$) on 1 st analog input of 2 nd EB2	Z8
B5222	1 st digital input (terminal 53) of 2 nd EB2 inverted	Z8
B5223	1 st digital input (terminal 53) of 2 nd EB2	Z8
B5224	2 nd digital input (terminal 54) of 2 nd EB2 inverted	Z8
B5225	2 nd digital input (terminal 54) of 2 nd EB2	Z8

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)		
B6030	USS2 / Peer2 - Telegram monitoring timeout - maintained signal	G30, G32
B6031	USS2 / Peer2 - Telegram monitoring timeout - 1s pulse	G30, G32

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)		
B6100	USS2 / Peer2 receive data, word 1, bit 0	G30, G32
B6101	USS2 / Peer2 receive data, word 1, bit 1	G30, G32
B6102	USS2 / Peer2 receive data, word 1, bit 2	G30, G32
B6103	USS2 / Peer2 receive data, word 1, bit 3	G30, G32
B6104	USS2 / Peer2 receive data, word 1, bit 4	G30, G32
B6105	USS2 / Peer2 receive data, word 1, bit 5	G30, G32
B6106	USS2 / Peer2 receive data, word 1, bit 6	G30, G32
B6107	USS2 / Peer2 receive data, word 1, bit 7	G30, G32
B6108	USS2 / Peer2 receive data, word 1, bit 8	G30, G32
B6109	USS2 / Peer2 receive data, word 1, bit 9	G30, G32
B6110	USS2 / Peer2 receive data, word 1, bit 10	G30, G32
B6111	USS2 / Peer2 receive data, word 1, bit 11	G30, G32
B6112	USS2 / Peer2 receive data, word 1, bit 12	G30, G32
B6113	USS2 / Peer2 receive data, word 1, bit 13	G30, G32
B6114	USS2 / Peer2 receive data, word 1, bit 14	G30, G32
B6115	USS2 / Peer2 receive data, word 1, bit 15	G30, G32
B6200	USS2 / Peer2 receive data, word 2, bit 0	G30, G32
B6201	USS2 / Peer2 receive data, word 2, bit 1	G30, G32
B6202	USS2 / Peer2 receive data, word 2, bit 2	G30, G32
B6203	USS2 / Peer2 receive data, word 2, bit 3	G30, G32
B6204	USS2 / Peer2 receive data, word 2, bit 4	G30, G32
B6205	USS2 / Peer2 receive data, word 2, bit 5	G30, G32
B6206	USS2 / Peer2 receive data, word 2, bit 6	G30, G32
B6207	USS2 / Peer2 receive data, word 2, bit 7	G30, G32
B6208	USS2 / Peer2 receive data, word 2, bit 8	G30, G32
B6209	USS2 / Peer2 receive data, word 2, bit 9	G30, G32
B6210	USS2 / Peer2 receive data, word 2, bit 10	G30, G32
B6211	USS2 / Peer2 receive data, word 2, bit 11	G30, G32
B6212	USS2 / Peer2 receive data, word 2, bit 12	G30, G32
B6213	USS2 / Peer2 receive data, word 2, bit 13	G30, G32
B6214	USS2 / Peer2 receive data, word 2, bit 14	G30, G32
B6215	USS2 / Peer2 receive data, word 2, bit 15	G30, G32

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)		
B6300	USS2 / Peer2 receive data, word 3, bit 0	G30, G32
B6301	USS2 / Peer2 receive data, word 3, bit 1	G30, G32
B6302	USS2 / Peer2 receive data, word 3, bit 2	G30, G32
B6303	USS2 / Peer2 receive data, word 3, bit 3	G30, G32
B6304	USS2 / Peer2 receive data, word 3, bit 4	G30, G32

Binector	Name, description	Function diag., Sheet
B6305	USS2 / Peer2 receive data, word 3, bit 5	G30, G32
B6306	USS2 / Peer2 receive data, word 3, bit 6	G30, G32
B6307	USS2 / Peer2 receive data, word 3, bit 7	G30, G32
B6308	USS2 / Peer2 receive data, word 3, bit 8	G30, G32
B6309	USS2 / Peer2 receive data, word 3, bit 9	G30, G32
B6310	USS2 / Peer2 receive data, word 3, bit 10	G30, G32
B6311	USS2 / Peer2 receive data, word 3, bit 11	G30, G32
B6312	USS2 / Peer2 receive data, word 3, bit 12	G30, G32
B6313	USS2 / Peer2 receive data, word 3, bit 13	G30, G32
B6314	USS2 / Peer2 receive data, word 3, bit 14	G30, G32
B6315	USS2 / Peer2 receive data, word 3, bit 15	G30, G32

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)		
B6400	USS2 / Peer2 receive data, word 4, bit 0	G30, G32
B6401	USS2 / Peer2 receive data, word 4, bit 1	G30, G32
B6402	USS2 / Peer2 receive data, word 4, bit 2	G30, G32
B6403	USS2 / Peer2 receive data, word 4, bit 3	G30, G32
B6404	USS2 / Peer2 receive data, word 4, bit 4	G30, G32
B6405	USS2 / Peer2 receive data, word 4, bit 5	G30, G32
B6406	USS2 / Peer2 receive data, word 4, bit 6	G30, G32
B6407	USS2 / Peer2 receive data, word 4, bit 7	G30, G32
B6408	USS2 / Peer2 receive data, word 4, bit 8	G30, G32
B6409	USS2 / Peer2 receive data, word 4, bit 9	G30, G32
B6410	USS2 / Peer2 receive data, word 4, bit 10	G30, G32
B6411	USS2 / Peer2 receive data, word 4, bit 11	G30, G32
B6412	USS2 / Peer2 receive data, word 4, bit 12	G30, G32
B6413	USS2 / Peer2 receive data, word 4, bit 13	G30, G32
B6414	USS2 / Peer2 receive data, word 4, bit 14	G30, G32
B6415	USS2 / Peer2 receive data, word 4, bit 15	G30, G32

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)		
B6500	USS2 / Peer2 receive data, word 5, bit 0	G30, G32
B6501	USS2 / Peer2 receive data, word 5, bit 1	G30, G32
B6502	USS2 / Peer2 receive data, word 5, bit 2	G30, G32
B6503	USS2 / Peer2 receive data, word 5, bit 3	G30, G32
B6504	USS2 / Peer2 receive data, word 5, bit 4	G30, G32
B6505	USS2 / Peer2 receive data, word 5, bit 5	G30, G32
B6506	USS2 / Peer2 receive data, word 5, bit 6	G30, G32
B6507	USS2 / Peer2 receive data, word 5, bit 7	G30, G32
B6508	USS2 / Peer2 receive data, word 5, bit 8	G30, G32
B6509	USS2 / Peer2 receive data, word 5, bit 9	G30, G32
B6510	USS2 / Peer2 receive data, word 5, bit 10	G30, G32
B6511	USS2 / Peer2 receive data, word 5, bit 11	G30, G32
B6512	USS2 / Peer2 receive data, word 5, bit 12	G30, G32
B6513	USS2 / Peer2 receive data, word 5, bit 13	G30, G32
B6514	USS2 / Peer2 receive data, word 5, bit 14	G30, G32
B6515	USS2 / Peer2 receive data, word 5, bit 15	G30, G32

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)		
B6600	USS2 receive data, word 6, bit 0	G30

Binector	Name, description	Function diag., Sheet
B6601	USS2 receive data, word 6, bit 1	G30
B6602	USS2 receive data, word 6, bit 2	G30
B6603	USS2 receive data, word 6, bit 3	G30
B6604	USS2 receive data, word 6, bit 4	G30
B6605	USS2 receive data, word 6, bit 5	G30
B6606	USS2 receive data, word 6, bit 6	G30
B6607	USS2 receive data, word 6, bit 7	G30
B6608	USS2 receive data, word 6, bit 8	G30
B6609	USS2 receive data, word 6, bit 9	G30
B6610	USS2 receive data, word 6, bit 10	G30
B6611	USS2 receive data, word 6, bit 11	G30
B6612	USS2 receive data, word 6, bit 12	G30
B6613	USS2 receive data, word 6, bit 13	G30
B6614	USS2 receive data, word 6, bit 14	G30
B6615	USS2 receive data, word 6, bit 15	G30

Serial interface 2 (USS2 / Peer-to-peer 2 on G-SST2)		
B6700	USS2 receive data, word 7, bit 0	G30
B6701	USS2 receive data, word 7, bit 1	G30
B6702	USS2 receive data, word 7, bit 2	G30
B6703	USS2 receive data, word 7, bit 3	G30
B6704	USS2 receive data, word 7, bit 4	G30
B6705	USS2 receive data, word 7, bit 5	G30
B6706	USS2 receive data, word 7, bit 6	G30
B6707	USS2 receive data, word 7, bit 7	G30
B6708	USS2 receive data, word 7, bit 8	G30
B6709	USS2 receive data, word 7, bit 9	G30
B6710	USS2 receive data, word 7, bit 10	G30
B6711	USS2 receive data, word 7, bit 11	G30
B6712	USS2 receive data, word 7, bit 12	G30
B6713	USS2 receive data, word 7, bit 13	G30
B6714	USS2 receive data, word 7, bit 14	G30
B6715	USS2 receive data, word 7, bit 15	G30
B6800	USS2 receive data, word 8, bit 0	G30
B6801	USS2 receive data, word 8, bit 1	G30
B6802	USS2 receive data, word 8, bit 2	G30
B6803	USS2 receive data, word 8, bit 3	G30
B6804	USS2 receive data, word 8, bit 4	G30
B6805	USS2 receive data, word 8, bit 5	G30
B6806	USS2 receive data, word 8, bit 6	G30
B6807	USS2 receive data, word 8, bit 7	G30
B6808	USS2 receive data, word 8, bit 8	G30
B6809	USS2 receive data, word 8, bit 9	G30
B6810	USS2 receive data, word 8, bit 10	G30
B6811	USS2 receive data, word 8, bit 11	G30
B6812	USS2 receive data, word 8, bit 12	G30
B6813	USS2 receive data, word 8, bit 13	G30
B6814	USS2 receive data, word 8, bit 14	G30
B6815	USS2 receive data, word 8, bit 15	G30

Binector	Name, description	Function diag., Sheet
B6900	USS2 receive data, word 9, bit 0	G30
B6901	USS2 receive data, word 9, bit 1	G30
B6902	USS2 receive data, word 9, bit 2	G30
B6903	USS2 receive data, word 9, bit 3	G30
B6904	USS2 receive data, word 9, bit 4	G30
B6905	USS2 receive data, word 9, bit 5	G30
B6906	USS2 receive data, word 9, bit 6	G30
B6907	USS2 receive data, word 9, bit 7	G30
B6908	USS2 receive data, word 9, bit 8	G30
B6909	USS2 receive data, word 9, bit 9	G30
B6910	USS2 receive data, word 9, bit 10	G30
B6911	USS2 receive data, word 9, bit 11	G30
B6912	USS2 receive data, word 9, bit 12	G30
B6913	USS2 receive data, word 9, bit 13	G30
B6914	USS2 receive data, word 9, bit 14	G30
B6915	USS2 receive data, word 9, bit 15	G30

Binectors from SBP pulse encoder board		
B7000	SBP check track	Z9
B7001	SBP digital input 1 (High on terminal 65 of terminal strip X400 means binector set)	Z9
B7002	SBP digital input 2 (High on terminal 66 of terminal strip X400 means binector set)	Z9
B7003	SBP digital input 3 (High on terminal 67 of terminal strip X400 means binector set)	Z9

SIMOLINK binectors		
B7010	SLB application flag 0	Z11
B7011	SLB application flag 1	Z11
B7012	SLB application flag 2	Z11
B7013	SLB application flag 3	Z11
B7030	SLB missing telegram	Z11
B7040	SLB Time out	Z11
B7050	SLB runup alarm	Z11

Process data exchange with SIMOLINK		
B7100	Receive data from SIMOLINK, word 1, bit 0	Z11
B7101	Receive data from SIMOLINK, word 1, bit 1	Z11
B7102	Receive data from SIMOLINK, word 1, bit 2	Z11
B7103	Receive data from SIMOLINK, word 1, bit 3	Z11
B7104	Receive data from SIMOLINK, word 1, bit 4	Z11
B7105	Receive data from SIMOLINK, word 1, bit 5	Z11
B7106	Receive data from SIMOLINK, word 1, bit 6	Z11
B7107	Receive data from SIMOLINK, word 1, bit 7	Z11
B7108	Receive data from SIMOLINK, word 1, bit 8	Z11
B7109	Receive data from SIMOLINK, word 1, bit 9	Z11
B7110	Receive data from SIMOLINK, word 1, bit 10	Z11
B7111	Receive data from SIMOLINK, word 1, bit 11	Z11
B7112	Receive data from SIMOLINK, word 1, bit 12	Z11
B7113	Receive data from SIMOLINK, word 1, bit 13	Z11
B7114	Receive data from SIMOLINK, word 1, bit 14	Z11
B7115	Receive data from SIMOLINK, word 1, bit 15	Z11
B7200	Receive data from SIMOLINK, word 2, bit 0	Z11

Binector	Name, description	Function diag., Sheet
B7201	Receive data from SIMOLINK, word 2, bit 1	Z11
B7202	Receive data from SIMOLINK, word 2, bit 2	Z11
B7203	Receive data from SIMOLINK, word 2, bit 3	Z11
B7204	Receive data from SIMOLINK, word 2, bit 4	Z11
B7205	Receive data from SIMOLINK, word 2, bit 5	Z11
B7206	Receive data from SIMOLINK, word 2, bit 6	Z11
B7207	Receive data from SIMOLINK, word 2, bit 7	Z11
B7208	Receive data from SIMOLINK, word 2, bit 8	Z11
B7209	Receive data from SIMOLINK, word 2, bit 9	Z11
B7210	Receive data from SIMOLINK, word 2, bit 10	Z11
B7211	Receive data from SIMOLINK, word 2, bit 11	Z11
B7212	Receive data from SIMOLINK, word 2, bit 12	Z11
B7213	Receive data from SIMOLINK, word 2, bit 13	Z11
B7214	Receive data from SIMOLINK, word 2, bit 14	Z11
B7215	Receive data from SIMOLINK, word 2, bit 15	Z11
B7300	Receive data from SIMOLINK, word 3, bit 0	Z11
B7301	Receive data from SIMOLINK, word 3, bit 1	Z11
B7302	Receive data from SIMOLINK, word 3, bit 2	Z11
B7303	Receive data from SIMOLINK, word 3, bit 3	Z11
B7304	Receive data from SIMOLINK, word 3, bit 4	Z11
B7305	Receive data from SIMOLINK, word 3, bit 5	Z11
B7306	Receive data from SIMOLINK, word 3, bit 6	Z11
B7307	Receive data from SIMOLINK, word 3, bit 7	Z11
B7308	Receive data from SIMOLINK, word 3, bit 8	Z11
B7309	Receive data from SIMOLINK, word 3, bit 9	Z11
B7310	Receive data from SIMOLINK, word 3, bit 10	Z11
B7311	Receive data from SIMOLINK, word 3, bit 11	Z11
B7312	Receive data from SIMOLINK, word 3, bit 12	Z11
B7313	Receive data from SIMOLINK, word 3, bit 13	Z11
B7314	Receive data from SIMOLINK, word 3, bit 14	Z11
B7315	Receive data from SIMOLINK, word 3, bit 15	Z11
B7400	Receive data from SIMOLINK, word 4, bit 0	Z11
B7401	Receive data from SIMOLINK, word 4, bit 1	Z11
B7402	Receive data from SIMOLINK, word 4, bit 2	Z11
B7403	Receive data from SIMOLINK, word 4, bit 3	Z11
B7404	Receive data from SIMOLINK, word 4, bit 4	Z11
B7405	Receive data from SIMOLINK, word 4, bit 5	Z11
B7406	Receive data from SIMOLINK, word 4, bit 6	Z11
B7407	Receive data from SIMOLINK, word 4, bit 7	Z11
B7408	Receive data from SIMOLINK, word 4, bit 8	Z11
B7409	Receive data from SIMOLINK, word 4, bit 9	Z11
B7410	Receive data from SIMOLINK, word 4, bit 10	Z11
B7411	Receive data from SIMOLINK, word 4, bit 11	Z11
B7412	Receive data from SIMOLINK, word 4, bit 12	Z11
B7413	Receive data from SIMOLINK, word 4, bit 13	Z11
B7414	Receive data from SIMOLINK, word 4, bit 14	Z11
B7415	Receive data from SIMOLINK, word 4, bit 15	Z11
B7500	Receive data from SIMOLINK, word 5, bit 0	Z11
B7501	Receive data from SIMOLINK, word 5, bit 1	Z11

Binector	Name, description	Function diag., Sheet
B7502	Receive data from SIMOLINK, word 5, bit 2	Z11
B7503	Receive data from SIMOLINK, word 5, bit 3	Z11
B7504	Receive data from SIMOLINK, word 5, bit 4	Z11
B7505	Receive data from SIMOLINK, word 5, bit 5	Z11
B7506	Receive data from SIMOLINK, word 5, bit 6	Z11
B7507	Receive data from SIMOLINK, word 5, bit 7	Z11
B7508	Receive data from SIMOLINK, word 5, bit 8	Z11
B7509	Receive data from SIMOLINK, word 5, bit 9	Z11
B7510	Receive data from SIMOLINK, word 5, bit 10	Z11
B7511	Receive data from SIMOLINK, word 5, bit 11	Z11
B7512	Receive data from SIMOLINK, word 5, bit 12	Z11
B7513	Receive data from SIMOLINK, word 5, bit 13	Z11
B7514	Receive data from SIMOLINK, word 5, bit 14	Z11
B7515	Receive data from SIMOLINK, word 5, bit 15	Z11
B7600	Receive data from SIMOLINK, word 6, bit 0	Z11
B7601	Receive data from SIMOLINK, word 6, bit 1	Z11
B7602	Receive data from SIMOLINK, word 6, bit 2	Z11
B7603	Receive data from SIMOLINK, word 6, bit 3	Z11
B7604	Receive data from SIMOLINK, word 6, bit 4	Z11
B7605	Receive data from SIMOLINK, word 6, bit 5	Z11
B7606	Receive data from SIMOLINK, word 6, bit 6	Z11
B7607	Receive data from SIMOLINK, word 6, bit 7	Z11
B7608	Receive data from SIMOLINK, word 6, bit 8	Z11
B7609	Receive data from SIMOLINK, word 6, bit 9	Z11
B7610	Receive data from SIMOLINK, word 6, bit 10	Z11
B7611	Receive data from SIMOLINK, word 6, bit 11	Z11
B7612	Receive data from SIMOLINK, word 6, bit 12	Z11
B7613	Receive data from SIMOLINK, word 6, bit 13	Z11
B7614	Receive data from SIMOLINK, word 6, bit 14	Z11
B7615	Receive data from SIMOLINK, word 6, bit 15	Z11
B7700	Receive data from SIMOLINK, word 7, bit 0	Z11
B7701	Receive data from SIMOLINK, word 7, bit 1	Z11
B7702	Receive data from SIMOLINK, word 7, bit 2	Z11
B7703	Receive data from SIMOLINK, word 7, bit 3	Z11
B7704	Receive data from SIMOLINK, word 7, bit 4	Z11
B7705	Receive data from SIMOLINK, word 7, bit 5	Z11
B7706	Receive data from SIMOLINK, word 7, bit 6	Z11
B7707	Receive data from SIMOLINK, word 7, bit 7	Z11
B7708	Receive data from SIMOLINK, word 7, bit 8	Z11
B7709	Receive data from SIMOLINK, word 7, bit 9	Z11
B7710	Receive data from SIMOLINK, word 7, bit 10	Z11
B7711	Receive data from SIMOLINK, word 7, bit 11	Z11
B7712	Receive data from SIMOLINK, word 7, bit 12	Z11
B7713	Receive data from SIMOLINK, word 7, bit 13	Z11
B7714	Receive data from SIMOLINK, word 7, bit 14	Z11
B7715	Receive data from SIMOLINK, word 7, bit 15	Z11
B7800	Receive data from SIMOLINK, word 8, bit 0	Z11
B7801	Receive data from SIMOLINK, word 8, bit 1	Z11
B7802	Receive data from SIMOLINK, word 8, bit 2	Z11

Binector	Name, description	Function diag., Sheet
B7803	Receive data from SIMOLINK, word 8, bit 3	Z11
B7804	Receive data from SIMOLINK, word 8, bit 4	Z11
B7805	Receive data from SIMOLINK, word 8, bit 5	Z11
B7806	Receive data from SIMOLINK, word 8, bit 6	Z11
B7807	Receive data from SIMOLINK, word 8, bit 7	Z11
B7808	Receive data from SIMOLINK, word 8, bit 8	Z11
B7809	Receive data from SIMOLINK, word 8, bit 9	Z11
B7810	Receive data from SIMOLINK, word 8, bit 10	Z11
B7811	Receive data from SIMOLINK, word 8, bit 11	Z11
B7812	Receive data from SIMOLINK, word 8, bit 12	Z11
B7813	Receive data from SIMOLINK, word 8, bit 13	Z11
B7814	Receive data from SIMOLINK, word 8, bit 14	Z11
B7815	Receive data from SIMOLINK, word 8, bit 15	Z11
B7900	Receive data from SIMOLINK, word 9, bit 0	Z11
B7901	Receive data from SIMOLINK, word 9, bit 1	Z11
B7902	Receive data from SIMOLINK, word 9, bit 2	Z11
B7903	Receive data from SIMOLINK, word 9, bit 3	Z11
B7904	Receive data from SIMOLINK, word 9, bit 4	Z11
B7905	Receive data from SIMOLINK, word 9, bit 5	Z11
B7906	Receive data from SIMOLINK, word 9, bit 6	Z11
B7907	Receive data from SIMOLINK, word 9, bit 7	Z11
B7908	Receive data from SIMOLINK, word 9, bit 8	Z11
B7909	Receive data from SIMOLINK, word 9, bit 9	Z11
B7910	Receive data from SIMOLINK, word 9, bit 10	Z11
B7911	Receive data from SIMOLINK, word 9, bit 11	Z11
B7912	Receive data from SIMOLINK, word 9, bit 12	Z11
B7913	Receive data from SIMOLINK, word 9, bit 13	Z11
B7914	Receive data from SIMOLINK, word 9, bit 14	Z11
B7915	Receive data from SIMOLINK, word 9, bit 15	Z11

Process data exchange with 2nd CB

B8030	Message timeout on 2 nd CB - maintained signal	G35
B8031	Message timeout on 2 nd CB - 1s pulse	G35

Process data exchange with 2nd CB

B8100	Receive data from 2 nd CB, word 1, bit 0	G35
B8101	Receive data from 2 nd CB, word 1, bit 1	G35
B8102	Receive data from 2 nd CB, word 1, bit 2	G35
B8103	Receive data from 2 nd CB, word 1, bit 3	G35
B8104	Receive data from 2 nd CB, word 1, bit 4	G35
B8105	Receive data from 2 nd CB, word 1, bit 5	G35
B8106	Receive data from 2 nd CB, word 1, bit 6	G35
B8107	Receive data from 2 nd CB, word 1, bit 7	G35
B8108	Receive data from 2 nd CB, word 1, bit 8	G35
B8109	Receive data from 2 nd CB, word 1, bit 9	G35
B8110	Receive data from 2 nd CB, word 1, bit 10	G35
B8111	Receive data from 2 nd CB, word 1, bit 11	G35
B8112	Receive data from 2 nd CB, word 1, bit 12	G35
B8113	Receive data from 2 nd CB, word 1, bit 13	G35
B8114	Receive data from 2 nd CB, word 1, bit 14	G35

Binector	Name, description	Function diag., Sheet
B8115	Receive data from 2 nd CB, word 1, bit 15	G35
B8200	Receive data from 2 nd CB, word 2, bit 0	G35
B8201	Receive data from 2 nd CB, word 2, bit 1	G35
B8202	Receive data from 2 nd CB, word 2, bit 2	G35
B8203	Receive data from 2 nd CB, word 2, bit 3	G35
B8204	Receive data from 2 nd CB, word 2, bit 4	G35
B8205	Receive data from 2 nd CB, word 2, bit 5	G35
B8206	Receive data from 2 nd CB, word 2, bit 6	G35
B8207	Receive data from 2 nd CB, word 2, bit 7	G35
B8208	Receive data from 2 nd CB, word 2, bit 8	G35
B8209	Receive data from 2 nd CB, word 2, bit 9	G35
B8210	Receive data from 2 nd CB, word 2, bit 10	G35
B8211	Receive data from 2 nd CB, word 2, bit 11	G35
B8212	Receive data from 2 nd CB, word 2, bit 12	G35
B8213	Receive data from 2 nd CB, word 2, bit 13	G35
B8214	Receive data from 2 nd CB, word 2, bit 14	G35
B8215	Receive data from 2 nd CB, word 2, bit 15	G35
B8300	Receive data from 2 nd CB, word 3, bit 0	G35
B8301	Receive data from 2 nd CB, word 3, bit 1	G35
B8302	Receive data from 2 nd CB, word 3, bit 2	G35
B8303	Receive data from 2 nd CB, word 3, bit 3	G35
B8304	Receive data from 2 nd CB, word 3, bit 4	G35
B8305	Receive data from 2 nd CB, word 3, bit 5	G35
B8306	Receive data from 2 nd CB, word 3, bit 6	G35
B8307	Receive data from 2 nd CB, word 3, bit 7	G35
B8308	Receive data from 2 nd CB, word 3, bit 8	G35
B8309	Receive data from 2 nd CB, word 3, bit 9	G35
B8310	Receive data from 2 nd CB, word 3, bit 10	G35
B8311	Receive data from 2 nd CB, word 3, bit 11	G35
B8312	Receive data from 2 nd CB, word 3, bit 12	G35
B8313	Receive data from 2 nd CB, word 3, bit 13	G35
B8314	Receive data from 2 nd CB, word 3, bit 14	G35
B8315	Receive data from 2 nd CB, word 3, bit 15	G35
B8400	Receive data from 2 nd CB, word 4, bit 0	G35
B8401	Receive data from 2 nd CB, word 4, bit 1	G35
B8402	Receive data from 2 nd CB, word 4, bit 2	G35
B8403	Receive data from 2 nd CB, word 4, bit 3	G35
B8404	Receive data from 2 nd CB, word 4, bit 4	G35
B8405	Receive data from 2 nd CB, word 4, bit 5	G35
B8406	Receive data from 2 nd CB, word 4, bit 6	G35
B8407	Receive data from 2 nd CB, word 4, bit 7	G35
B8408	Receive data from 2 nd CB, word 4, bit 8	G35
B8409	Receive data from 2 nd CB, word 4, bit 9	G35
B8410	Receive data from 2 nd CB, word 4, bit 10	G35
B8411	Receive data from 2 nd CB, word 4, bit 11	G35
B8412	Receive data from 2 nd CB, word 4, bit 12	G35
B8413	Receive data from 2 nd CB, word 4, bit 13	G35
B8414	Receive data from 2 nd CB, word 4, bit 14	G35
B8415	Receive data from 2 nd CB, word 4, bit 15	G35

Binector	Name, description	Function diag., Sheet
B8500	Receive data from 2 nd CB, word 5, bit 0	G35
B8501	Receive data from 2 nd CB, word 5, bit 1	G35
B8502	Receive data from 2 nd CB, word 5, bit 2	G35
B8503	Receive data from 2 nd CB, word 5, bit 3	G35
B8504	Receive data from 2 nd CB, word 5, bit 4	G35
B8505	Receive data from 2 nd CB, word 5, bit 5	G35
B8506	Receive data from 2 nd CB, word 5, bit 6	G35
B8507	Receive data from 2 nd CB, word 5, bit 7	G35
B8508	Receive data from 2 nd CB, word 5, bit 8	G35
B8509	Receive data from 2 nd CB, word 5, bit 9	G35
B8510	Receive data from 2 nd CB, word 5, bit 10	G35
B8511	Receive data from 2 nd CB, word 5, bit 11	G35
B8512	Receive data from 2 nd CB, word 5, bit 12	G35
B8513	Receive data from 2 nd CB, word 5, bit 13	G35
B8514	Receive data from 2 nd CB, word 5, bit 14	G35
B8515	Receive data from 2 nd CB, word 5, bit 15	G35
B8600	Receive data from 2 nd CB, word 6, bit 0	G35
B8601	Receive data from 2 nd CB, word 6, bit 1	G35
B8602	Receive data from 2 nd CB, word 6, bit 2	G35
B8603	Receive data from 2 nd CB, word 6, bit 3	G35
B8604	Receive data from 2 nd CB, word 6, bit 4	G35
B8605	Receive data from 2 nd CB, word 6, bit 5	G35
B8606	Receive data from 2 nd CB, word 6, bit 6	G35
B8607	Receive data from 2 nd CB, word 6, bit 7	G35
B8608	Receive data from 2 nd CB, word 6, bit 8	G35
B8609	Receive data from 2 nd CB, word 6, bit 9	G35
B8610	Receive data from 2 nd CB, word 6, bit 10	G35
B8611	Receive data from 2 nd CB, word 6, bit 11	G35
B8612	Receive data from 2 nd CB, word 6, bit 12	G35
B8613	Receive data from 2 nd CB, word 6, bit 13	G35
B8614	Receive data from 2 nd CB, word 6, bit 14	G35
B8615	Receive data from 2 nd CB, word 6, bit 15	G35
B8700	Receive data from 2 nd CB, word 7, bit 0	G35
B8701	Receive data from 2 nd CB, word 7, bit 1	G35
B8702	Receive data from 2 nd CB, word 7, bit 2	G35
B8703	Receive data from 2 nd CB, word 7, bit 3	G35
B8704	Receive data from 2 nd CB, word 7, bit 4	G35
B8705	Receive data from 2 nd CB, word 7, bit 5	G35
B8706	Receive data from 2 nd CB, word 7, bit 6	G35
B8707	Receive data from 2 nd CB, word 7, bit 7	G35
B8708	Receive data from 2 nd CB, word 7, bit 8	G35
B8709	Receive data from 2 nd CB, word 7, bit 9	G35
B8710	Receive data from 2 nd CB, word 7, bit 10	G35
B8711	Receive data from 2 nd CB, word 7, bit 11	G35
B8712	Receive data from 2 nd CB, word 7, bit 12	G35
B8713	Receive data from 2 nd CB, word 7, bit 13	G35
B8714	Receive data from 2 nd CB, word 7, bit 14	G35
B8715	Receive data from 2 nd CB, word 7, bit 15	G35
B8800	Receive data from 2 nd CB, word 8, bit 0	G35

Binector	Name, description	Function diag., Sheet
B8801	Receive data from 2 nd CB, word 8, bit 1	G35
B8802	Receive data from 2 nd CB, word 8, bit 2	G35
B8803	Receive data from 2 nd CB, word 8, bit 3	G35
B8804	Receive data from 2 nd CB, word 8, bit 4	G35
B8805	Receive data from 2 nd CB, word 8, bit 5	G35
B8806	Receive data from 2 nd CB, word 8, bit 6	G35
B8807	Receive data from 2 nd CB, word 8, bit 7	G35
B8808	Receive data from 2 nd CB, word 8, bit 8	G35
B8809	Receive data from 2 nd CB, word 8, bit 9	G35
B8810	Receive data from 2 nd CB, word 8, bit 10	G35
B8811	Receive data from 2 nd CB, word 8, bit 11	G35
B8812	Receive data from 2 nd CB, word 8, bit 12	G35
B8813	Receive data from 2 nd CB, word 8, bit 13	G35
B8814	Receive data from 2 nd CB, word 8, bit 14	G35
B8815	Receive data from 2 nd CB, word 8, bit 15	G35
B8900	Receive data from 2 nd CB, word 9, bit 0	G35
B8901	Receive data from 2 nd CB, word 9, bit 1	G35
B8902	Receive data from 2 nd CB, word 9, bit 2	G35
B8903	Receive data from 2 nd CB, word 9, bit 3	G35
B8904	Receive data from 2 nd CB, word 9, bit 4	G35
B8905	Receive data from 2 nd CB, word 9, bit 5	G35
B8906	Receive data from 2 nd CB, word 9, bit 6	G35
B8907	Receive data from 2 nd CB, word 9, bit 7	G35
B8908	Receive data from 2 nd CB, word 9, bit 8	G35
B8909	Receive data from 2 nd CB, word 9, bit 9	G35
B8910	Receive data from 2 nd CB, word 9, bit 10	G35
B8911	Receive data from 2 nd CB, word 9, bit 11	G35
B8912	Receive data from 2 nd CB, word 9, bit 12	G35
B8913	Receive data from 2 nd CB, word 9, bit 13	G35
B8914	Receive data from 2 nd CB, word 9, bit 14	G35
B8915	Receive data from 2 nd CB, word 9, bit 15	G35

Serial interface 3 (USS2 / Peer-to-peer 3 on G-SST3)

B9030	USS3 / Peer3 - Telegram monitoring timeout - maintained signal	G31, G33
B9031	USS3 / Peer3 - Telegram monitoring timeout - 1s pulse	G31, G33

Technology software S00: Voltage monitor for electronics power supply

B9050	Power ON (100ms pulse on connection of voltage)	FB 1	B1
B9051	Power OFF (10ms pulse on disconnection of voltage)	FB 1	B1

Technology software S00: Connector/binector converters

B9052	Connector/binector converter 1, bit 0	FB 10	B2
B9053	Connector/binector converter 1, bit 1	FB 10	B2
B9054	Connector/binector converter 1, bit 2	FB 10	B2
B9055	Connector/binector converter 1, bit 3	FB 10	B2
B9056	Connector/binector converter 1, bit 4	FB 10	B2
B9057	Connector/binector converter 1, bit 5	FB 10	B2
B9058	Connector/binector converter 1, bit 6	FB 10	B2
B9059	Connector/binector converter 1, bit 7	FB 10	B2
B9060	Connector/binector converter 1, bit 8	FB 10	B2

Binector	Name, description	Function diag., Sheet
B9061	Connector/binector converter 1, bit 9	FB 10 B2
B9062	Connector/binector converter 1, bit 10	FB 10 B2
B9063	Connector/binector converter 1, bit 11	FB 10 B2
B9064	Connector/binector converter 1, bit 12	FB 10 B2
B9065	Connector/binector converter 1, bit 13	FB 10 B2
B9066	Connector/binector converter 1, bit 14	FB 10 B2
B9067	Connector/binector converter 1, bit 15	FB 10 B2
B9068	Connector/binector converter 2, bit 0	FB 11 B2
B9069	Connector/binector converter 2, bit 1	FB 11 B2
B9070	Connector/binector converter 2, bit 2	FB 11 B2
B9071	Connector/binector converter 2, bit 3	FB 11 B2
B9072	Connector/binector converter 2, bit 4	FB 11 B2
B9073	Connector/binector converter 2, bit 5	FB 11 B2
B9074	Connector/binector converter 2, bit 6	FB 11 B2
B9075	Connector/binector converter 2, bit 7	FB 11 B2
B9076	Connector/binector converter 2, bit 8	FB 11 B2
B9077	Connector/binector converter 2, bit 9	FB 11 B2
B9078	Connector/binector converter 2, bit 10	FB 11 B2
B9079	Connector/binector converter 2, bit 11	FB 11 B2
B9080	Connector/binector converter 2, bit 12	FB 11 B2
B9081	Connector/binector converter 2, bit 13	FB 11 B2
B9082	Connector/binector converter 2, bit 14	FB 11 B2
B9083	Connector/binector converter 2, bit 15	FB 11 B2
B9084	Connector/binector converter 3, bit 0	FB 12 B2
B9085	Connector/binector converter 3, bit 1	FB 12 B2
B9086	Connector/binector converter 3, bit 2	FB 12 B2
B9087	Connector/binector converter 3, bit 3	FB 12 B2
B9088	Connector/binector converter 3, bit 4	FB 12 B2
B9089	Connector/binector converter 3, bit 5	FB 12 B2
B9090	Connector/binector converter 3, bit 6	FB 12 B2
B9091	Connector/binector converter 3, bit 7	FB 12 B2
B9092	Connector/binector converter 3, bit 8	FB 12 B2
B9093	Connector/binector converter 3, bit 9	FB 12 B2
B9094	Connector/binector converter 3, bit 10	FB 12 B2
B9095	Connector/binector converter 3, bit 11	FB 12 B2
B9096	Connector/binector converter 3, bit 12	FB 12 B2
B9097	Connector/binector converter 3, bit 13	FB 12 B2
B9098	Connector/binector converter 3, bit 14	FB 12 B2
B9099	Connector/binector converter 3, bit 15	FB 12 B2

Serial interface 3 (USS2 / Peer-to-peer 3 on G-SST3)		
B9100	USS3 / Peer3 receive data, word 1, bit 0	G31, G33
B9101	USS3 / Peer3 receive data, word 1, bit 1	G31, G33
B9102	USS3 / Peer3 receive data, word 1, bit 2	G31, G33
B9103	USS3 / Peer3 receive data, word 1, bit 3	G31, G33
B9104	USS3 / Peer3 receive data, word 1, bit 4	G31, G33
B9105	USS3 / Peer3 receive data, word 1, bit 5	G31, G33
B9106	USS3 / Peer3 receive data, word 1, bit 6	G31, G33
B9107	USS3 / Peer3 receive data, word 1, bit 7	G31, G33

Binector	Name, description	Function diag., Sheet
B9108	USS3 / Peer3 receive data, word 1, bit 8	G31, G33
B9109	USS3 / Peer3 receive data, word 1, bit 9	G31, G33
B9110	USS3 / Peer3 receive data, word 1, bit 10	G31, G33
B9111	USS3 / Peer3 receive data, word 1, bit 11	G31, G33
B9112	USS3 / Peer3 receive data, word 1, bit 12	G31, G33
B9113	USS3 / Peer3 receive data, word 1, bit 13	G31, G33
B9114	USS3 / Peer3 receive data, word 1, bit 14	G31, G33
B9115	USS3 / Peer3 receive data, word 1, bit 15	G31, G33

Technology software S00: Limiters			
B9150	Limiter 1: Positive limitation has responded	FB 65	B6
B9151	Limiter 1: Negative limitation has responded	FB 65	B6
B9152	Limiter 2: Positive limitation has responded	FB 66	B6
B9153	Limiter 2: Negative limitation has responded	FB 66	B6
B9154	Limiter 3: Positive limitation has responded	FB 67	B6
B9155	Limiter 3: Negative limitation has responded	FB 67	B6

Technology software S00: Limit-value monitor with filter			
B9160	Limit-value monitor with filter 1: $ A < B$ has responded	FB 70	B7
B9161	Limit-value monitor with filter 1: $A < B$ has responded	FB 70	B7
B9162	Limit-value monitor with filter 1: $A = B$ has responded	FB 70	B7
B9163	Limit-value monitor with filter 2: $ A < B$ has responded	FB 71	B7
B9164	Limit-value monitor with filter 2: $A < B$ has responded	FB 71	B7
B9165	Limit-value monitor with filter 2: $A = B$ has responded	FB 71	B7
B9166	Limit-value monitor with filter 3: $ A < B$ has responded	FB 72	B7
B9167	Limit-value monitor with filter 3: $A < B$ has responded	FB 72	B7
B9168	Limit-value monitor with filter 3: $A = B$ has responded	FB 72	B7

Technology software S00: Limit-value monitor without filter			
B9169	Limit-value monitor without filter 1: $ A < B$ has responded	FB 73	B8
B9170	Limit-value monitor without filter 1: $A < B$ has responded	FB 73	B8
B9171	Limit-value monitor without filter 1: $A = B$ has responded	FB 73	B8
B9172	Limit-value monitor without filter 2: $ A < B$ has responded	FB 74	B8
B9173	Limit-value monitor without filter 2: $A < B$ has responded	FB 74	B8
B9174	Limit-value monitor without filter 2: $A = B$ has responded	FB 74	B8
B9175	Limit-value monitor without filter 3: $ A < B$ has responded	FB 75	B8
B9176	Limit-value monitor without filter 3: $A < B$ has responded	FB 75	B8
B9177	Limit-value monitor without filter 3: $A = B$ has responded	FB 75	B8
B9178	Limit-value monitor without filter 4: $ A < B$ has responded	FB 76	B8
B9179	Limit-value monitor without filter 4: $A < B$ has responded	FB 76	B8
B9180	Limit-value monitor without filter 4: $A = B$ has responded	FB 76	B8
B9181	Limit-value monitor without filter 5: $ A < B$ has responded	FB 77	B9
B9182	Limit-value monitor without filter 5: $A < B$ has responded	FB 77	B9
B9183	Limit-value monitor without filter 5: $A = B$ has responded	FB 77	B9
B9184	Limit-value monitor without filter 6: $ A < B$ has responded	FB 78	B9
B9185	Limit-value monitor without filter 6: $A < B$ has responded	FB 78	B9
B9186	Limit-value monitor without filter 6: $A = B$ has responded	FB 78	B9
B9187	Limit-value monitor without filter 7: $ A < B$ has responded	FB 79	B9
B9188	Limit-value monitor without filter 7: $A < B$ has responded	FB 79	B9
B9189	Limit-value monitor without filter 7: $A = B$ has responded	FB 79	B9

Binector	Name, description	Function diag., Sheet

Technology software S00: Simple ramp-function generator		
B9190	Ramp-function generator output = ramp-function generator input ($y = x$)	FB 113 B14
B9191	0 = ramp-function generator initial run	FB 113 B14

Technology software S00: EXCLUSIVE OR elements with 2 inputs each		
B9195	Output of EXCLUSIVE OR element 1	FB 170 B19
B9196	Output of EXCLUSIVE OR element 2	FB 171 B19
B9197	Output of EXCLUSIVE OR element 3	FB 172 B19
B9198	Output of EXCLUSIVE OR element 4	FB 173 B19

Serial interface 3 (USS2 / Peer-to-peer 3 on G-SST3)		
B9200	USS3 / Peer3 receive data, word 2, bit 0	G31, G33
B9201	USS3 / Peer3 receive data, word 2, bit 1	G31, G33
B9202	USS3 / Peer3 receive data, word 2, bit 2	G31, G33
B9203	USS3 / Peer3 receive data, word 2, bit 3	G31, G33
B9204	USS3 / Peer3 receive data, word 2, bit 4	G31, G33
B9205	USS3 / Peer3 receive data, word 2, bit 5	G31, G33
B9206	USS3 / Peer3 receive data, word 2, bit 6	G31, G33
B9207	USS3 / Peer3 receive data, word 2, bit 7	G31, G33
B9208	USS3 / Peer3 receive data, word 2, bit 8	G31, G33
B9209	USS3 / Peer3 receive data, word 2, bit 9	G31, G33
B9210	USS3 / Peer3 receive data, word 2, bit 10	G31, G33
B9211	USS3 / Peer3 receive data, word 2, bit 11	G31, G33
B9212	USS3 / Peer3 receive data, word 2, bit 12	G31, G33
B9213	USS3 / Peer3 receive data, word 2, bit 13	G31, G33
B9214	USS3 / Peer3 receive data, word 2, bit 14	G31, G33
B9215	USS3 / Peer3 receive data, word 2, bit 15	G31, G33

Technology software S00: Decoders / demultiplexers, binary to 1 of 8		
B9250	Decoder / demultiplexer 1: Q0	FB 118 B17
B9251	Decoder / demultiplexer 1: Q1	FB 118 B17
B9252	Decoder / demultiplexer 1: Q2	FB 118 B17
B9253	Decoder / demultiplexer 1: Q3	FB 118 B17
B9254	Decoder / demultiplexer 1: Q4	FB 118 B17
B9255	Decoder / demultiplexer 1: Q5	FB 118 B17
B9256	Decoder / demultiplexer 1: Q6	FB 118 B17
B9257	Decoder / demultiplexer 1: Q7	FB 118 B17
B9260	Decoder / demultiplexer 1: /Q0	FB 118 B17
B9261	Decoder / demultiplexer 1: /Q1	FB 118 B17
B9262	Decoder / demultiplexer 1: /Q2	FB 118 B17
B9263	Decoder / demultiplexer 1: /Q3	FB 118 B17
B9264	Decoder / demultiplexer 1: /Q4	FB 118 B17
B9265	Decoder / demultiplexer 1: /Q5	FB 118 B17
B9266	Decoder / demultiplexer 1: /Q6	FB 118 B17
B9267	Decoder / demultiplexer 1: /Q7	FB 118 B17
B9270	Decoder / demultiplexer 2: Q0	FB 119 B17
B9271	Decoder / demultiplexer 2: Q1	FB 119 B17
B9272	Decoder / demultiplexer 2: Q2	FB 119 B17
B9273	Decoder / demultiplexer 2: Q3	FB 119 B17

Binector	Name, description	Function diag., Sheet
B9274	Decoder / demultiplexer 2: Q4	FB 119 B17
B9275	Decoder / demultiplexer 2: Q5	FB 119 B17
B9276	Decoder / demultiplexer 2: Q6	FB 119 B17
B9277	Decoder / demultiplexer 2: Q7	FB 119 B17
B9280	Decoder / demultiplexer 2: /Q0	FB 119 B17
B9281	Decoder / demultiplexer 2: /Q1	FB 119 B17
B9282	Decoder / demultiplexer 2: /Q2	FB 119 B17
B9283	Decoder / demultiplexer 2: /Q3	FB 119 B17
B9284	Decoder / demultiplexer 2: /Q4	FB 119 B17
B9285	Decoder / demultiplexer 2: /Q5	FB 119 B17
B9286	Decoder / demultiplexer 2: /Q6	FB 119 B17
B9287	Decoder / demultiplexer 2: /Q7	FB 119 B17

Serial interface 3 (USS2 / Peer-to-peer 3 on G-SST3)		
B9300	USS3 / Peer3 receive data, word 3, bit 0	G31, G33
B9301	USS3 / Peer3 receive data, word 3, bit 1	G31, G33
B9302	USS3 / Peer3 receive data, word 3, bit 2	G31, G33
B9303	USS3 / Peer3 receive data, word 3, bit 3	G31, G33
B9304	USS3 / Peer3 receive data, word 3, bit 4	G31, G33
B9305	USS3 / Peer3 receive data, word 3, bit 5	G31, G33
B9306	USS3 / Peer3 receive data, word 3, bit 6	G31, G33
B9307	USS3 / Peer3 receive data, word 3, bit 7	G31, G33
B9308	USS3 / Peer3 receive data, word 3, bit 8	G31, G33
B9309	USS3 / Peer3 receive data, word 3, bit 9	G31, G33
B9310	USS3 / Peer3 receive data, word 3, bit 10	G31, G33
B9311	USS3 / Peer3 receive data, word 3, bit 11	G31, G33
B9312	USS3 / Peer3 receive data, word 3, bit 12	G31, G33
B9313	USS3 / Peer3 receive data, word 3, bit 13	G31, G33
B9314	USS3 / Peer3 receive data, word 3, bit 14	G31, G33
B9315	USS3 / Peer3 receive data, word 3, bit 15	G31, G33

Technology software S00: AND elements with 3 inputs each		
B9350	Output of AND element 1	FB 120 B18
B9351	Output of AND element 2	FB 121 B18
B9352	Output of AND element 3	FB 122 B18
B9353	Output of AND element 4	FB 123 B18
B9354	Output of AND element 5	FB 124 B18
B9355	Output of AND element 6	FB 125 B18
B9356	Output of AND element 7	FB 126 B18
B9357	Output of AND element 8	FB 127 B18
B9358	Output of AND element 9	FB 128 B18
B9359	Output of AND element 10	FB 129 B18
B9360	Output of AND element 11	FB 130 B18
B9361	Output of AND element 12	FB 131 B18
B9362	Output of AND element 13	FB 132 B18
B9363	Output of AND element 14	FB 133 B18
B9364	Output of AND element 15	FB 134 B18
B9365	Output of AND element 16	FB 135 B18
B9366	Output of AND element 17	FB 136 B18
B9367	Output of AND element 18	FB 137 B18

Binector	Name, description	Function diag., Sheet
B9368	Output of AND element 19	FB 138 B18
B9369	Output of AND element 20	FB 139 B18
B9370	Output of AND element 21	FB 140 B18
B9371	Output of AND element 22	FB 141 B18
B9372	Output of AND element 23	FB 142 B18
B9373	Output of AND element 24	FB 143 B18
B9374	Output of AND element 25	FB 144 B18
B9375	Output of AND element 26	FB 145 B18
B9376	Output of AND element 27	FB 146 B18
B9377	Output of AND element 28	FB 147 B18

Technology software S00: OR elements with 3 inputs each		
B9380	Output of OR element 1	FB 150 B19
B9381	Output of OR element 2	FB 151 B19
B9382	Output of OR element 3	FB 152 B19
B9383	Output of OR element 4	FB 153 B19
B9384	Output of OR element 5	FB 154 B19
B9385	Output of OR element 6	FB 155 B19
B9386	Output of OR element 7	FB 156 B19
B9387	Output of OR element 8	FB 157 B19
B9388	Output of OR element 9	FB 158 B19
B9389	Output of OR element 10	FB 159 B19
B9390	Output of OR element 11	FB 160 B19
B9391	Output of OR element 12	FB 161 B19
B9392	Output of OR element 13	FB 162 B19
B9393	Output of OR element 14	FB 163 B19
B9394	Output of OR element 15	FB 164 B19
B9395	Output of OR element 16	FB 165 B19
B9396	Output of OR element 17	FB 166 B19
B9397	Output of OR element 18	FB 167 B19
B9398	Output of OR element 19	FB 168 B19
B9399	Output of OR element 20	FB 169 B19

Serial interface 3 (USS2 / Peer-to-peer 3 on G-SST3)		
B9400	USS3 / Peer3 receive data, word 4, bit 0	G31, G33
B9401	USS3 / Peer3 receive data, word 4, bit 1	G31, G33
B9402	USS3 / Peer3 receive data, word 4, bit 2	G31, G33
B9403	USS3 / Peer3 receive data, word 4, bit 3	G31, G33
B9404	USS3 / Peer3 receive data, word 4, bit 4	G31, G33
B9405	USS3 / Peer3 receive data, word 4, bit 5	G31, G33
B9406	USS3 / Peer3 receive data, word 4, bit 6	G31, G33
B9407	USS3 / Peer3 receive data, word 4, bit 7	G31, G33
B9408	USS3 / Peer3 receive data, word 4, bit 8	G31, G33
B9409	USS3 / Peer3 receive data, word 4, bit 9	G31, G33
B9410	USS3 / Peer3 receive data, word 4, bit 10	G31, G33
B9411	USS3 / Peer3 receive data, word 4, bit 11	G31, G33
B9412	USS3 / Peer3 receive data, word 4, bit 12	G31, G33
B9413	USS3 / Peer3 receive data, word 4, bit 13	G31, G33
B9414	USS3 / Peer3 receive data, word 4, bit 14	G31, G33
B9415	USS3 / Peer3 receive data, word 4, bit 15	G31, G33

Binector	Name, description	Function diag., Sheet

Technology software S00: Inverters

B9450	Output of inverter 1	FB 180	B20
B9451	Output of inverter 2	FB 181	B20
B9452	Output of inverter 3	FB 182	B20
B9453	Output of inverter 4	FB 183	B20
B9454	Output of inverter 5	FB 184	B20
B9455	Output of inverter 6	FB 185	B20
B9456	Output of inverter 7	FB 186	B20
B9457	Output of inverter 8	FB 187	B20
B9458	Output of inverter 9	FB 188	B20
B9459	Output of inverter 10	FB 189	B20
B9460	Output of inverter 11	FB 190	B20
B9461	Output of inverter 12	FB 191	B20
B9462	Output of inverter 13	FB 192	B20
B9463	Output of inverter 14	FB 193	B20
B9464	Output of inverter 15	FB 194	B20
B9465	Output of inverter 16	FB 195	B20

Technology software S00: NAND elements with 3 inputs each

B9470	Output of NAND element 1	FB 200	B20
B9471	Output of NAND element 2	FB 201	B20
B9472	Output of NAND element 3	FB 202	B20
B9473	Output of NAND element 4	FB 203	B20
B9474	Output of NAND element 5	FB 204	B20
B9475	Output of NAND element 6	FB 205	B20
B9476	Output of NAND element 7	FB 206	B20
B9477	Output of NAND element 8	FB 207	B20
B9478	Output of NAND element 9	FB 208	B20
B9479	Output of NAND element 10	FB 209	B20
B9480	Output of NAND element 11	FB 210	B20
B9481	Output of NAND element 12	FB 211	B20

Technology software S00: Binary signal selector switches

B9482	Output of binary signal selector switch 1	FB 250	B24
B9483	Output of binary signal selector switch 2	FB 251	B24
B9484	Output of binary signal selector switch 3	FB 252	B24
B9485	Output of binary signal selector switch 4	FB 253	B24
B9486	Output of binary signal selector switch 5	FB 254	B24

Technology software S00: D flipflops

B9490	D flipflop 1: Output Q	FB 230	B22
B9491	D flipflop 1: Output /Q	FB 230	B22
B9492	D flipflop 2: Output Q	FB 231	B22
B9493	D flipflop 2: Output /Q	FB 231	B22
B9494	D flipflop 3: Output Q	FB 232	B22
B9495	D flipflop 3: Output /Q	FB 232	B22
B9496	D flipflop 4: Output Q	FB 233	B22
B9497	D flipflop 4: Output /Q	FB 233	B22

Binector	Name, description	Function diag., Sheet
Technology software S00: Technology controller		
B9499	Ramp-function generator output = ramp-function generator input ($y = x$)	FB 113 B14

Serial interface 3 (USS2 / Peer-to-peer 3 on G-SST3)		
B9500	USS3 / Peer3 receive data, word 5, bit 0	G31, G33
B9501	USS3 / Peer3 receive data, word 5, bit 1	G31, G33
B9502	USS3 / Peer3 receive data, word 5, bit 2	G31, G33
B9503	USS3 / Peer3 receive data, word 5, bit 3	G31, G33
B9504	USS3 / Peer3 receive data, word 5, bit 4	G31, G33
B9505	USS3 / Peer3 receive data, word 5, bit 5	G31, G33
B9506	USS3 / Peer3 receive data, word 5, bit 6	G31, G33
B9507	USS3 / Peer3 receive data, word 5, bit 7	G31, G33
B9508	USS3 / Peer3 receive data, word 5, bit 8	G31, G33
B9509	USS3 / Peer3 receive data, word 5, bit 9	G31, G33
B9510	USS3 / Peer3 receive data, word 5, bit 10	G31, G33
B9511	USS3 / Peer3 receive data, word 5, bit 11	G31, G33
B9512	USS3 / Peer3 receive data, word 5, bit 12	G31, G33
B9513	USS3 / Peer3 receive data, word 5, bit 13	G31, G33
B9514	USS3 / Peer3 receive data, word 5, bit 14	G31, G33
B9515	USS3 / Peer3 receive data, word 5, bit 15	G31, G33

Technology software S00: RS flipflops		
B9550	RS flipflop 1: Output Q	FB 215 B21
B9551	RS flipflop 1: Output /Q	FB 215 B21
B9552	RS flipflop 2: Output Q	FB 216 B21
B9553	RS flipflop 2: Output /Q	FB 216 B21
B9554	RS flipflop 3: Output Q	FB 217 B21
B9555	RS flipflop 3: Output /Q	FB 217 B21
B9556	RS flipflop 4: Output Q	FB 218 B21
B9557	RS flipflop 4: Output /Q	FB 218 B21
B9558	RS flipflop 5: Output Q	FB 219 B21
B9559	RS flipflop 5: Output /Q	FB 219 B21
B9560	RS flipflop 6: Output Q	FB 220 B21
B9561	RS flipflop 6: Output /Q	FB 220 B21
B9562	RS flipflop 7: Output Q	FB 221 B21
B9563	RS flipflop 7: Output /Q	FB 221 B21
B9564	RS flipflop 8: Output Q	FB 222 B21
B9565	RS flipflop 8: Output /Q	FB 222 B21
B9566	RS flipflop 9: Output Q	FB 223 B21
B9567	RS flipflop 9: Output /Q	FB 223 B21
B9568	RS flipflop 10: Output Q	FB 224 B21
B9569	RS flipflop 10: Output /Q	FB 224 B21
B9570	RS flipflop 11: Output Q	FB 225 B21
B9571	RS flipflop 11: Output /Q	FB 225 B21
B9572	RS flipflop 12: Output Q	FB 226 B21
B9573	RS flipflop 12: Output /Q	FB 226 B21
B9574	RS flipflop 13: Output Q	FB 227 B21
B9575	RS flipflop 13: Output /Q	FB 227 B21
B9576	RS flipflop 14: Output Q	FB 228 B21
B9577	RS flipflop 14: Output /Q	FB 228 B21

Binector	Name, description	Function diag., Sheet

Technology software S00: Timers			
B9580	Timer 1: Output	FB 240	B23
B9581	Timer 1: Output inverted	FB 240	B23
B9582	Timer 2: Output	FB 241	B23
B9583	Timer 2: Output inverted	FB 241	B23
B9584	Timer 3: Output	FB 242	B23
B9585	Timer 3: Output inverted	FB 242	B23
B9586	Timer 4: Output	FB 243	B23
B9587	Timer 4: Output inverted	FB 243	B23
B9588	Timer 5: Output	FB 244	B23
B9589	Timer 5: Output inverted	FB 244	B23
B9590	Timer 6: Output	FB 245	B23
B9591	Timer 6: Output inverted	FB 245	B23
B9592	Timer 7: Output	FB 246	B24
B9593	Timer 7: Output inverted	FB 246	B24
B9594	Timer 8: Output	FB 247	B24
B9595	Timer 8: Output inverted	FB 247	B24
B9596	Timer 9: Output	FB 248	B24
B9597	Timer 9: Output inverted	FB 248	B24
B9598	Timer 10: Output	FB 249	B24
B9599	Timer 10: Output inverted	FB 249	B24

Serial interface 3 (USS2 / Peer-to-peer 3 on G-SST3)			
B9600	USS3 receive data, word 6, bit 0		G31
B9601	USS3 receive data, word 6, bit 1		G31
B9602	USS3 receive data, word 6, bit 2		G31
B9603	USS3 receive data, word 6, bit 3		G31
B9604	USS3 receive data, word 6, bit 4		G31
B9605	USS3 receive data, word 6, bit 5		G31
B9606	USS3 receive data, word 6, bit 6		G31
B9607	USS3 receive data, word 6, bit 7		G31
B9608	USS3 receive data, word 6, bit 8		G31
B9609	USS3 receive data, word 6, bit 9		G31
B9610	USS3 receive data, word 6, bit 10		G31
B9611	USS3 receive data, word 6, bit 11		G31
B9612	USS3 receive data, word 6, bit 12		G31
B9613	USS3 receive data, word 6, bit 13		G31
B9614	USS3 receive data, word 6, bit 14		G31
B9615	USS3 receive data, word 6, bit 15		G31
B9700	USS3 receive data, word 7, bit 0		G31
B9701	USS3 receive data, word 7, bit 1		G31
B9702	USS3 receive data, word 7, bit 2		G31
B9703	USS3 receive data, word 7, bit 3		G31
B9704	USS3 receive data, word 7, bit 4		G31
B9705	USS3 receive data, word 7, bit 5		G31
B9706	USS3 receive data, word 7, bit 6		G31
B9707	USS3 receive data, word 7, bit 7		G31
B9708	USS3 receive data, word 7, bit 8		G31
B9709	USS3 receive data, word 7, bit 9		G31

Binector	Name, description	Function diag., Sheet
B9710	USS3 receive data, word 7, bit 10	G31
B9711	USS3 receive data, word 7, bit 11	G31
B9712	USS3 receive data, word 7, bit 12	G31
B9713	USS3 receive data, word 7, bit 13	G31
B9714	USS3 receive data, word 7, bit 14	G31
B9715	USS3 receive data, word 7, bit 15	G31
B9800	USS3 receive data, word 8, bit 0	G31
B9801	USS3 receive data, word 8, bit 1	G31
B9802	USS3 receive data, word 8, bit 2	G31
B9803	USS3 receive data, word 8, bit 3	G31
B9804	USS3 receive data, word 8, bit 4	G31
B9805	USS3 receive data, word 8, bit 5	G31
B9806	USS3 receive data, word 8, bit 6	G31
B9807	USS3 receive data, word 8, bit 7	G31
B9808	USS3 receive data, word 8, bit 8	G31
B9809	USS3 receive data, word 8, bit 9	G31
B9810	USS3 receive data, word 8, bit 10	G31
B9811	USS3 receive data, word 8, bit 11	G31
B9812	USS3 receive data, word 8, bit 12	G31
B9813	USS3 receive data, word 8, bit 13	G31
B9814	USS3 receive data, word 8, bit 14	G31
B9815	USS3 receive data, word 8, bit 15	G31
B9900	USS3 receive data, word 9, bit 0	G31
B9901	USS3 receive data, word 9, bit 1	G31
B9902	USS3 receive data, word 9, bit 2	G31
B9903	USS3 receive data, word 9, bit 3	G31
B9904	USS3 receive data, word 9, bit 4	G31
B9905	USS3 receive data, word 9, bit 5	G31
B9906	USS3 receive data, word 9, bit 6	G31
B9907	USS3 receive data, word 9, bit 7	G31
B9908	USS3 receive data, word 9, bit 8	G31
B9909	USS3 receive data, word 9, bit 9	G31
B9910	USS3 receive data, word 9, bit 10	G31
B9911	USS3 receive data, word 9, bit 11	G31
B9912	USS3 receive data, word 9, bit 12	G31
B9913	USS3 receive data, word 9, bit 13	G31
B9914	USS3 receive data, word 9, bit 14	G31
B9915	USS3 receive data, word 9, bit 15	G31

13 Maintenance



WARNING

Hazardous voltages are present in this electrical equipment during operation.

A hazardous voltage may be present at the signalling relays in the customer installation.

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

When carrying out maintenance work on this converter, please read all safety instructions included in this section and attached to the product itself.



- Maintenance work on the converter may be carried out only by qualified personnel who are thoroughly familiar with all safety notices in this manual and with the installation, operating and maintenance instructions.
- Before carrying out visual checks and maintenance work, ensure that the AC power supply is disconnected and locked out and that the converter is grounded. Before the AC supply is disconnected, both converters and motors are at hazardous voltage levels. Even when the converter contactor is open, hazardous voltages are still present.
- The snubber capacitors continue to carry hazardous voltage for up to 2 minutes 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 SIMOTRAS HD converter must be thoroughly protected against the ingress of dirt so as to prevent voltage flashovers and thus 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 SIMOTRAS HD 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 (upgrading to a new software version)

1

Read out and write down all parameter contents. (also note software version in r060.001!)

Note:

The parameter set can be transferred to a PC or programming device by means of SIMOVIS (see also Section 15).

2

Switch off electronics power supply

3

Connect one COM port on the PC to connector X300 on the SIMOTRAS HD

Cable order number: 6SX7005-0AB00

Cable and connector assignments, see Sect. 15.3

4

Switch on electronics power supply AND press down the UP key on the PMU of the SIMOTRAS HD converter at the same time
⇒ The SIMOTRAS HD converter switches to operating state o13.0

Note:

A software update can be started only from the PMU panel and not via an OP1S or the SIMOVIS system

5

Open a DOS window on the PC and enter program call:

HEXLOAD 7001A_xx.H86 7001B_xx.H86 COMx

Start the program by pressing Return

⇒ The software update is performed automatically

Note:

HEXLOAD.EXE: Loading program
7001A_xx.H86 and 7001_Bxx.H86:
Data files which contain the SIMOTRAS HD software
xx is the SW release

COMx: COM1 or COM2

6

⇒ When the software has been updated successfully, the SIMOTRAS HD switches to operating state o13.2 for approx. 1 s

⇒ The SIMOTRAS HD 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 address is displayed on the PMU while the update is in progress

The current status of the update routine is displayed on the PC

7

Was the electronics supply disconnected while step 6 was in progress?

?

yes

8b

Acknowledge any fault message that may appear on the SIMOTRAS HD device

9b

Restore default setting (see Section 7.4)

10b

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 SIMOVIS.

11

End

13.2 Replacement of components

13.2.1 Replacement of fan



WARNING

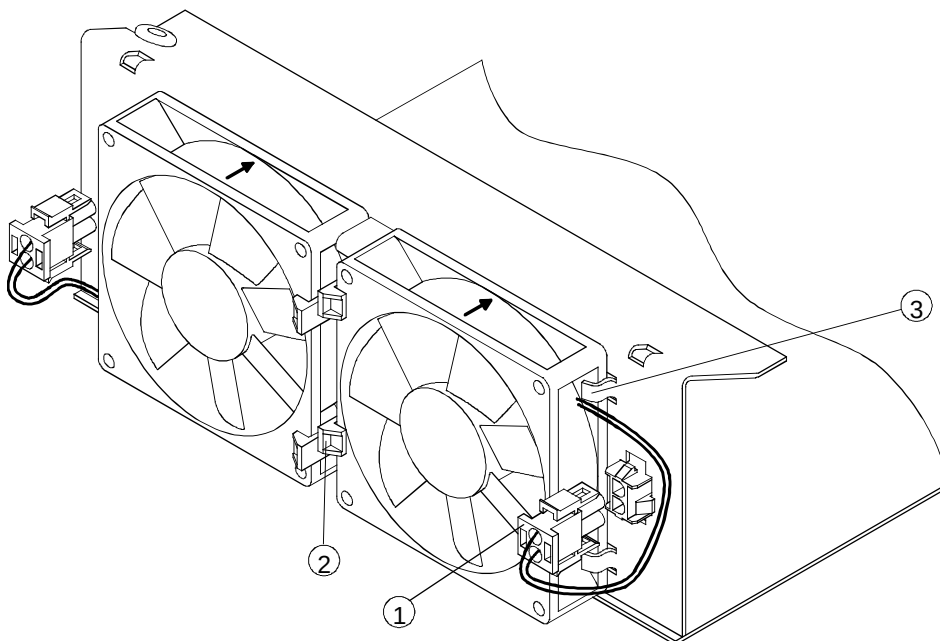
The converter fan may be replaced only by properly qualified personnel.



The snubber capacitors continue to carry hazardous voltage for up to 2 minutes after isolation from the supply. For this reason, the converter must not be opened for at least two minutes after switch-off.

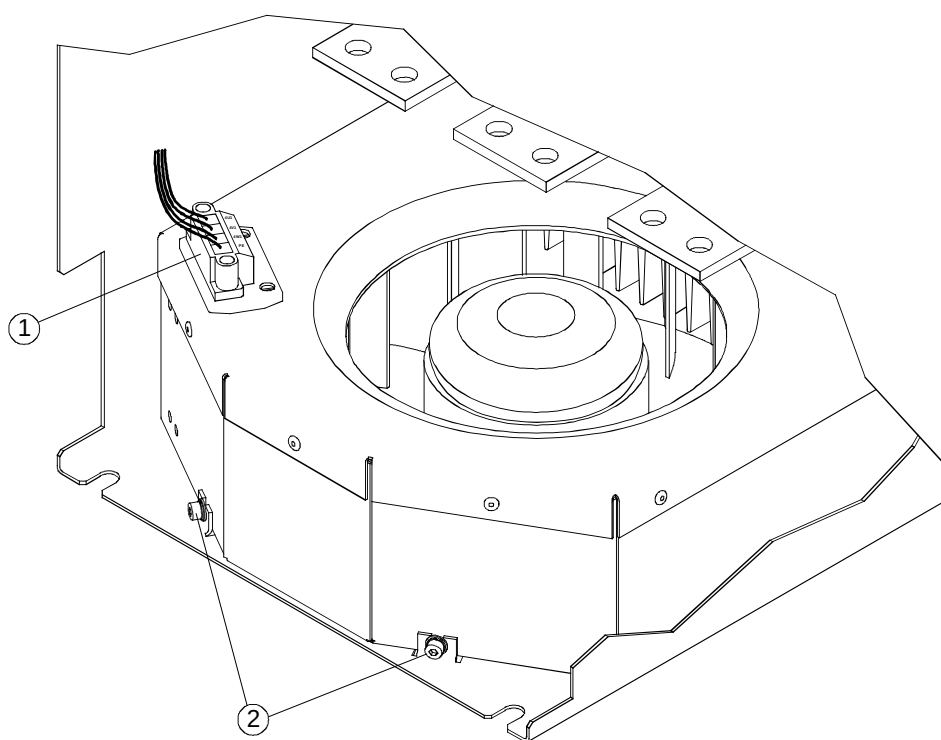
Non-observance of the safety instructions can result in death, severe personal injury or substantial property damage.

Replacement of fan on D400 / 98 – 180 Mre converters



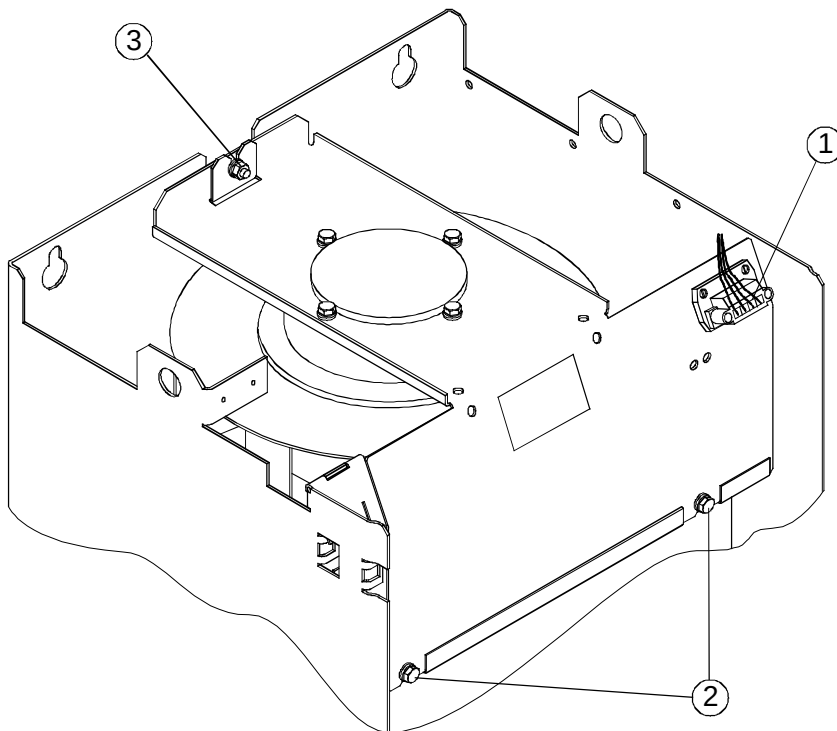
The two fans are mounted on the underside of the converter.

- Remove connector ①.
- Release the two retaining clips ② on the fan and swing fan out downwards.
- Make sure that the new fan is mounted in the correct position.
- Insert the fan into lugs ③ and push upwards until it engages in retaining clips ②.
- Insert connector ① again

Replacement of fan on D400 / 225 – 525 Mre converters

The fan is mounted on the underside of the converter.

- Remove connector ①.
- Use a T20 screwdriver to undo the two Torx screws ②.
- Lift the fan using the fixing straps and pull out downwards.
- Install the new fan in the reverse order.

Replacement of fan on D400 / 680 Mre converters

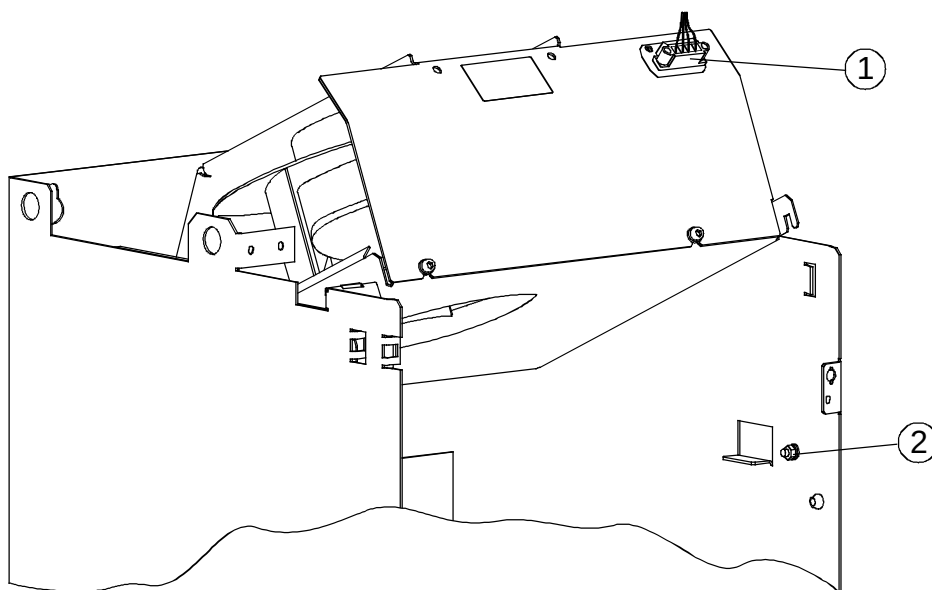
The fan is mounted on top of the converter.

- Remove connector ①.
- Undo the two M6 hexagon-head screws ②.
- Undo the M6 hexagonal nut M6 ③.
- Pull fan upwards out of its guideway and then forwards to remove.
- Install the new fan in the reverse order.

Replacement of fan on D400 / 900 Mre 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 M6 ②.
- Swing fan upwards and pull it out towards you.
- Install the new fan in the reverse order.

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.



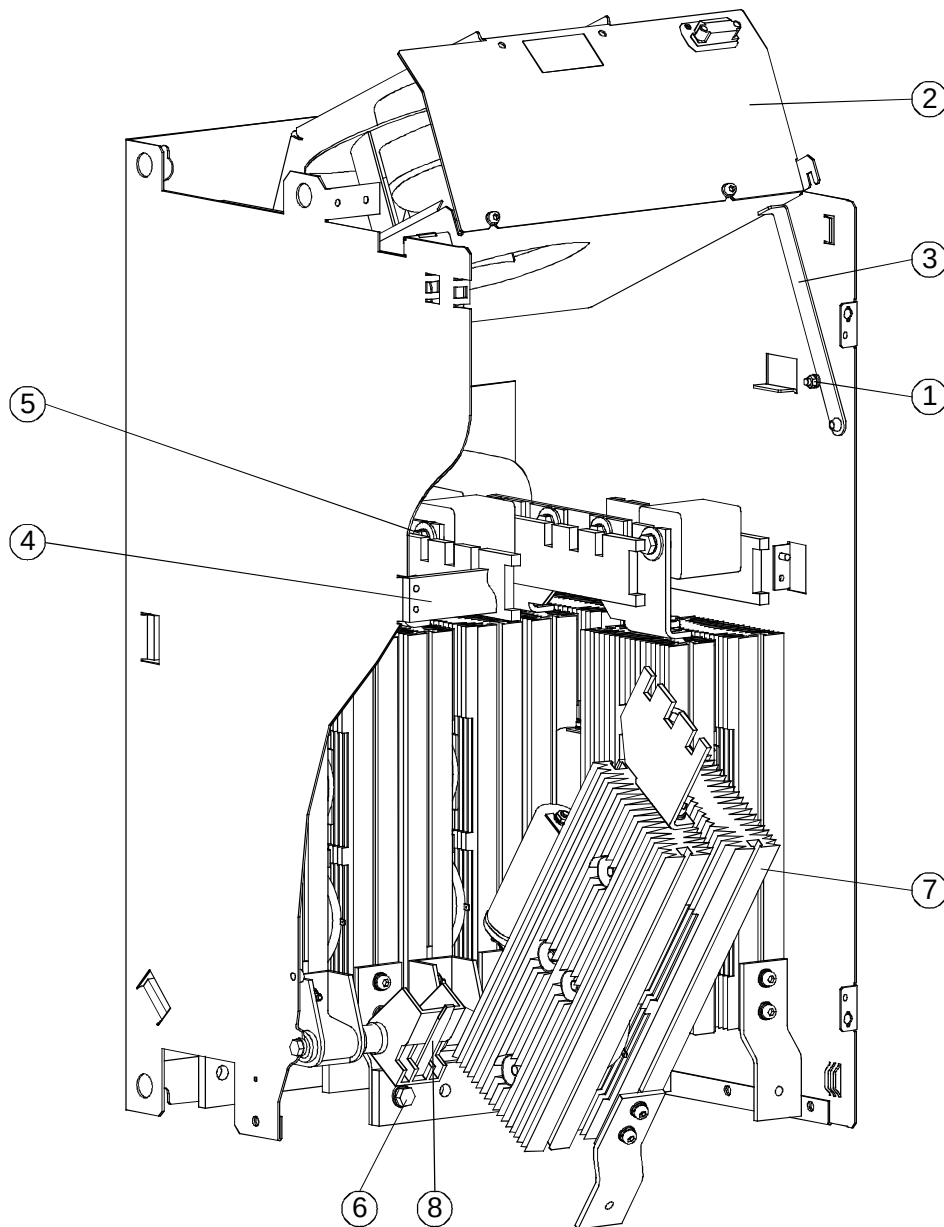
CAUTION

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 thyristor modules on D400 / 60 – 680 Mre converters

The 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. It is absolutely essential that screws with metric thread of the original length with retaining elements (washer and high-tension ring) are used to secure the thyristor modules. Screws with metric thread of the original length with retaining elements (washer and high-tension ring) must also be used to screw the modules to the busbars.

13.2.4 Replacement of fuses and thyristor assemblies on D400 / 900 Mre converters



- Undo the M6 hexagonal nut ①.
- Swing the fan ② 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, then 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!

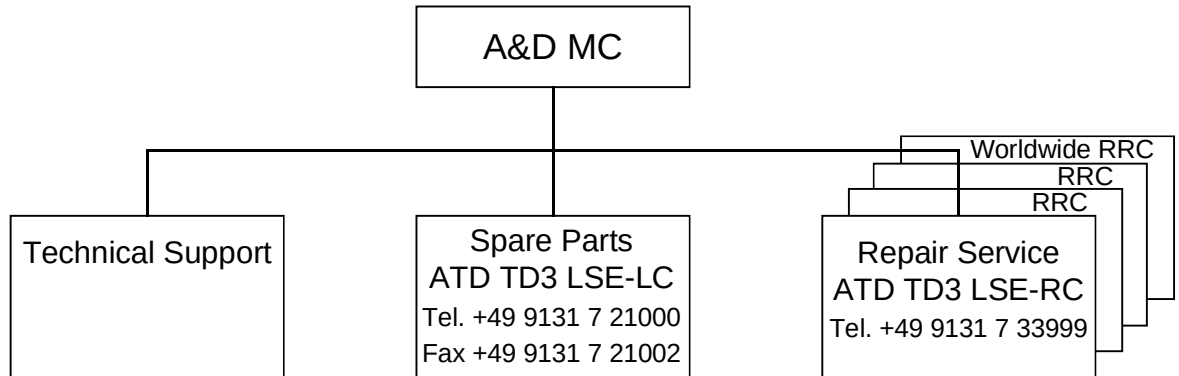
14 Servicing / Spare parts

14.1 Servicing

Customer servicing agreements

A contact partner for servicing

14.1.1 Europe / World



Contact the Spare Parts Service via your local SIEMENS sales office

- Supply of all mechanical and electrical components which are required as spares.

Contact the Repair Service via your local SIEMENS sales office

Repairs are carried out on converters for variable-speed drives as a repair or a unit replacement.

- Direct settlement of accounts with guarantor (manufacturing plants)
- Technical/commercial support provided by worldwide Regional Repair Centers (RRC)

14.2 Spare parts

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 electronics board (screen printing on component side)
- Hardware version and software version of supplementary boards (if installed)

6SG7050 . . . 65 – 0EB60

Order No. (MLFB)	Description	6SG70 . . – 0EB60-0					
		<u>50</u> 60A	<u>52</u> 78A	<u>55</u> 98A	<u>60</u> 112A	<u>62</u> 142A	<u>65</u> 180A
	Printed circuit boards						
6RY1703-0AA00	Electronics + terminals A7001-L1	1x	1x	1x	1x	1x	1x
6RY1703-1HD01	Power interface + terminals A7020-L4	1x	1x	1x	1x	1x	1x
6RY1704-0AA00	Operator panel A7005-L1	1x	1x	1x	1x	1x	1x
6RY1703-1HD02	Snubber circuit A7021-L1	1x	1x	1x	1x	1x	1x
	Thyristors						
6RY1700-0HD01	W98624-S7000-C2 SKKT72/16E	5x					
6RY1700-0AA05	W98624-S1002-C82 SKKT106/18EH1		5x	5x	5x		
6SY7010-0AA2	W97020-Z1009—C412 TT162 N16					5x	5x
	Other spare parts						
6SY7010-6AA01	NTC thermistor W98628-S1001-C24	1x	1x	1x	1x	1x	1x
6RY1702-0AA01	Current convertor C98130-A1023-C751	2x	2x	2x	2x		
6RY1702-0AA02	Current convertor C98130-A1023-C752					2x	2x
6RY1701-0AA07	Fan (complete) C98130-A1256-C553			2x	2x	2x	2x
6RY1702-0BA00	Fuse-link F1,F2 C97327-Z1006-C215	2x	2x	2x	2x	2x	2x

Order No. (MLFB)	Description	6SG70 . . – 0EB60-0					
		<u>50</u> 60A	<u>52</u> 78A	<u>55</u> 98A	<u>60</u> 112A	<u>62</u> 142A	<u>65</u> 180A
	Cables						

6SG7070 . . . 85 – 0EB60

Order No. (MLFB)	Description	6SG70 . . – 0EB60-0					
		<u>70</u> 225A	<u>72</u> 285A	<u>76</u> 360A	<u>80</u> 525A	<u>82</u> 680A	<u>85</u> 900A
	Printed circuit boards						
6RY1703-0AA00	Electronics + terminals A7001-L1	1x	1x	1x	1x	1x	1x
6RY1703-1HD01	Power interface + terminals A7020-L4	1x	1x	1x	1x	1x	1x
6RY1704-0AA00	Operator panel A7005-L1	1x	1x	1x	1x	1x	1x
6RY1703-1HD02	Snubber circuit A7021-L1	1x	1x	1x			
6RY1703-1HD03	Snubber circuit A7011-L7				1x	1x	
	Thyristors						
6RY1700-0HD04	W98624-S1000-C1 MCC170-16 i01	5x					
6SY7010-0AA03	W98624-S1002-C8 TT251 N16		5x				
6SY7010-0AA05	W98624-S1002-C48 MCC312-16i01			5x			
6SY7010-0AA04	W98624-S1002-C39 TT500 N16				5x		
6RY1700-0AA04	W98624-S1002-C97 TT570N16					5x	
6RY1702-0CA01	Thyristor assembly C98130-A1256-B320						5x
	Other spare parts						
6SY7010-6AA01	NTC thermistor W98628-S1001-C24	1x	1x	1x	1x	1x	
6RY1700-0TF00	NTC thermistor						1x
6RY1702-0AA03	Current convertor C98130-A1023-C771	2x	2x	2x			
6RY1702-0AA06	Current convertor C98130-A1023-C850				2x	2x	
6RY1702-0AA05	Current convertor C98130-A1023-C773						2x
6RY1701-0AA08	Fan module C98130-A1256-B140	1x	1x	1x	1x		
6RY1701-0AA04	Fan radial C98247-S1002-C25					1x	1x

Order No. (MLFB)	Description	6SG70 . . – 0EB60-0					
		<u>70</u> 225A	<u>72</u> 285A	<u>76</u> 360A	<u>80</u> 525A	<u>82</u> 680A	<u>85</u> 900A
6RY1705-0AA02	Snubber resistance W98511-S1001-C207				3x		
6SY7010-3AA06	Snubber resistance W98511-S1001-C105					5x	
6RY1702-0BA00	Fuse-link F1,F2 C97327-Z1006-C215	2x	2x	2x	2x	2x	
6RY1702-0BA01	Fuse-links C98327-S1002-C83						3x
	Cables						

Software:

Can be downloaded from the Internet (see inside front cover for address)

Accessories:

Supplementary boards, pulse encoders, adapters, etc., see Section 2.2

15 SIMOVIS

The software tool SIMOVIS V5.x is available for starting up, parameterizing and diagnosing the SIEMOTRAS HD using a PC.

15.1 Scope of supply

SIMOVIS can be ordered under the **order no. 6SG7000-0CD00**.

The SIMOVIS tool can also be ordered as an **option** with **short code D64** together with a 6SG70 unit.

15.2 Installation of software

The software is supplied on CD together with the operating instructions in Word 97 format.

A brief overview of the CD contents can be found in file START.HTM. If you have installed an HTML Browser on your PC, you can start the overview by double clicking on START-HTML. Otherwise you can find information in text format in the README.TXT file.

If your target PC has no CD drive, you will need to create installation diskettes first. To do so, you will need a PC with a CD drive. The SIMOVIS CD contains "Diskette images" in directories SIMOVIS\DISK1, \DISK2, ...

After selection of the desired language, the SIMOVIS installation is called via the links [SIMOVIS V5.x - Install SIMOVIS - Start Installation](#).

For safety reasons, older Internet browsers are not in a position to start programs. In this case a "Setup.exe - Save as" dialog is displayed after [Start Installation](#).

In this case, you can start the Setup program manually in subcatalog:

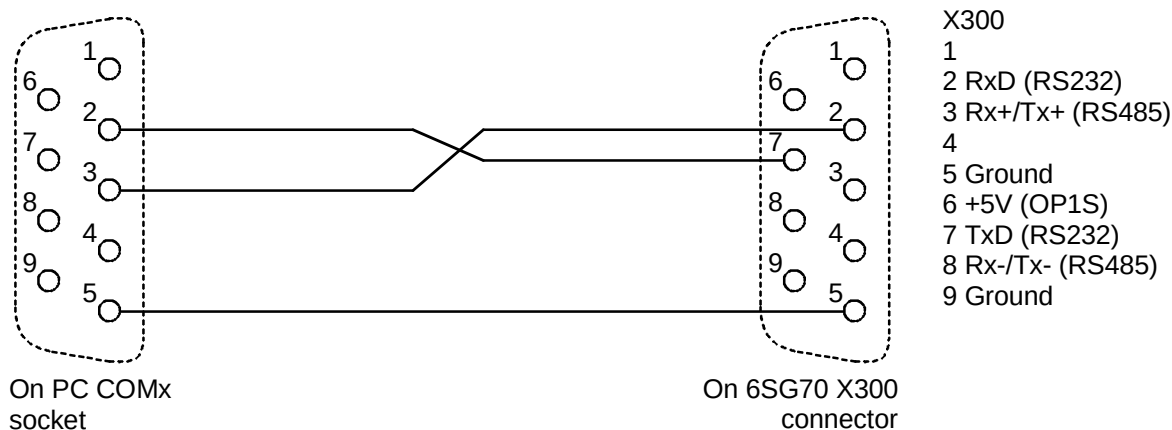
SIMOVIS\setup.exe

Then following the instructions displayed by the installation program.

SIMOVIS is installed as standard in subcatalog C:\SIEMENS\SIMOVIS . An icon "SIMOVIS(USS)" for starting the program is displayed on the desktop.

15.3 Connection of SIMOTRAS HD to PC

The simplest link is made by connecting connector X300 on the front of the SIMOTRAS HD with a COM port of the PC using a cable that can be ordered under order no. 6SX7005-0AB00.



15.4 Further information

For further information regarding installation and operation of the SIMOVIS tool, including operation in a STEP7 environment and communication with equipment via Profibus as well as software operating instructions, can be found in the README.TXT file in the SIMOVIS installation directory and the ONLINE Help.

NOTE
SIMOVIS V5.x can run only under Windows95 or Windows NT 4.0, 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 + ABC	Bayblend
	ABS	Novodur
Plastic components in converter:	ABS	Novodur
	PA 6.6	
	SE1-GFN1	Noryl
Insulation:	PC (FR) fl Lexan	Makrolon or
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 Configuration example

Overview

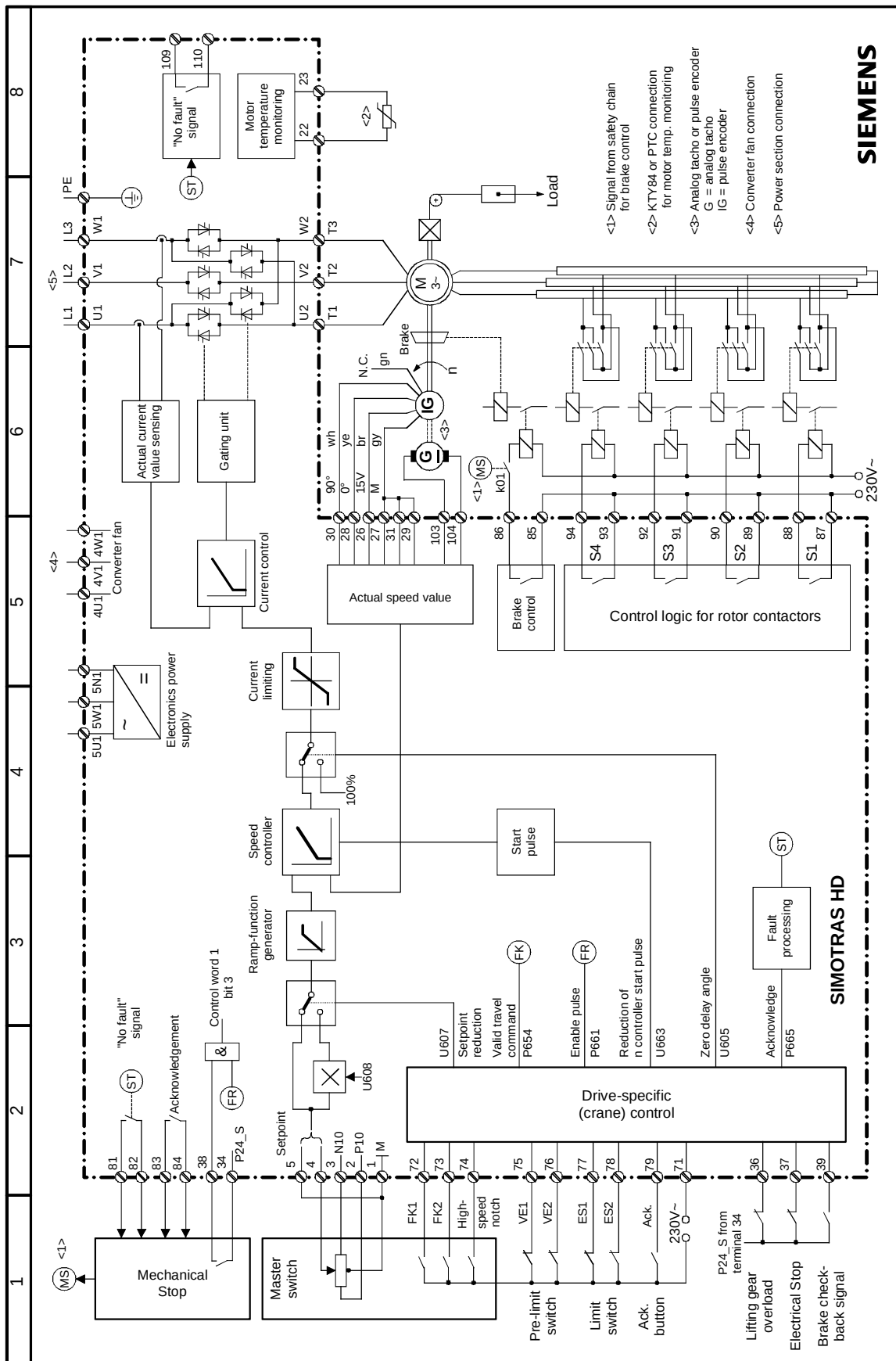


Figure 1, Block diagram

17.1 Task

The task is to design a crane drive with 100 kW output and a four-pole motor with a duty cycle of S3-60%.

The task includes the design of the following components, including the ordering information.

- Motor and accessories
- Converter and any accessories required
- Rotor resistors
- Rotor contactors
- Master switch

Note

- Catalog HE 1 • 1999 will be required when selecting the necessary components. The accessories for SIMOTRAS HD can be found in Catalog DA 65.10 • 1998/99.
- The SIMOTRAS HD three-phase power controller will be included in the Catalog at a later date.

17.2 Selecting a motor

The following motor, which has 3 integral and interconnected temperature sensors that will shut down the motor if an overtemperature occurs, is to be used (see Catalog HE 1, page 2/19):

Order No.: 1LT8310-4AA40-Z, Z = A11.

The relevant data with respect to the design of the rheostatic controller and the three-phase power controller are:

- Rated motor current $i_1 = 173 \text{ A}$
- Rotor current $i_2 = 199 \text{ A}$
- Locked-rotor voltage $u_2 = 310 \text{ V}$
- Characteristic rotor resistance $k = 0.9$

$$\text{Formula for } k: k = \frac{u_2}{(i_2 \times \sqrt{3})}$$

The characteristic rotor resistance is required in order to select the correct rotor resistors (see Section 17.4).

17.3 Selecting an actual value sensor

A pulse encoder is the preferred type of actual value sensor.

The pulse encoder is ordered quoting a short code, e.g. H73 (Catalog M11 • 1999), and a flange such as G37. The pulse encoder in this case is a Hübner HOG 10 D 1024 I.

Note the following regarding the retrofitting of the encoder to an existing motor.

We recommend the pulse encoder 6SG7000-2AC15 (2 x 250 pulses/rotation, 15 V supply voltage). The scope of supply of the pulse encoder includes 3 shaft extensions to facilitate fitting to the motor shaft.

- Motors from the Catalog HE 1:
 - Unbraked motors:
The pulse encoder can be fitted easily to all motors.
 - Braked motors:
Retrofitting of a pulse encoder (such as a DC tachometer) is not a simple matter.
- Third-party motors:
If there is a tapped centre hole on the free shaft end, fitting of the pulse encoder is usually very straightforward.

17.4 Selecting a rotor resistor

Please note

- 4 contactor stages are to be configured. This circuit is recommended.
- Do not use any special resistor packet assemblies!
- Resistor banks of the same size should always be used (5th digit of order number). Reasons: Simpler spare parts holding and easier to install when the resistor banks are installed above one another.
- A 3PR3, HE 1 cast-iron resistor bank (see page 3/40 ff.) is used.

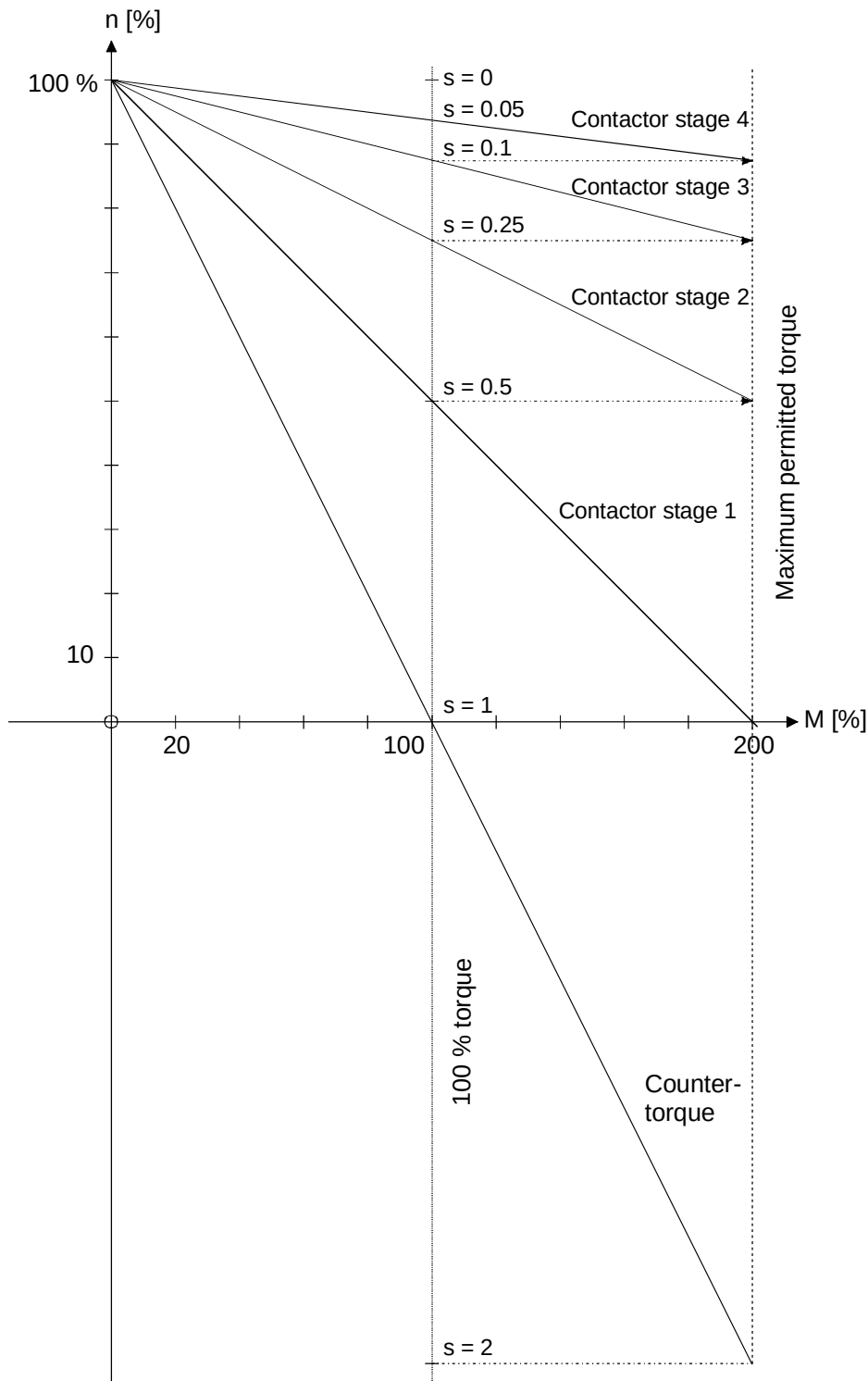


Figure 2, Speed-torque diagram with 4 contactor stages

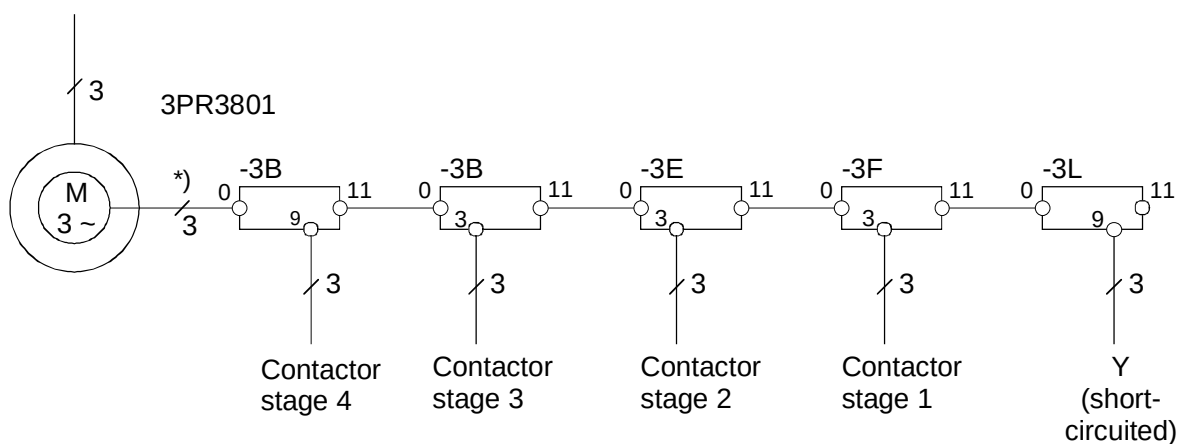
Notes to Figure 2

- The maximum torque is determined by the converter or the pull-out torque of the motor. In this case the rated controller current is based on two times the overload figure.
- The characteristic curves can also be different, especially for contactor stage 1, as the position of the curves varies from application to application.

Resistor selection table

Contactor stage	s	$R = s \times k$	$\ddot{u}$	$I_R = i_2 \times \ddot{u}$	Selected resistance value	Calculated tap/ tap terminal	Order number
4	0,05	0,05 Ω	1,2	239 A	3 x 0,07 Ω	71 % / 9	3PR3 801-3B
3	0,1	0,1 Ω	1	199 A	3 x 0,07 Ω	43 % / 5	3PR3 801-3B
2	0,25	0,23 Ω	1	199A	3 x 0,19 Ω	47 % / 5	3PR3 801-3E
1	0,5	0,45 Ω	1	199 A	3 x 0,26 Ω	46 % / 5	3PR3 801-3F
Y	2	1,8 Ω	0,6	119 A	3 x 1,4 Ω	86 % / 9	3PR3 801-3L

- s: slip, see Figure 2, speed-torque diagram.
- k: characteristic rotor resistance k, see motor data.
- R: required resistance value for selected contactor stage.
- $\ddot{u}$: field values, can be varied on the plant by changing the connections on the resistor taps.
- I_R : current through resistor or rotor current.
- Y: counter-torque stage, see 2 usually
- tap, example for contactor stage 2
 Required: 0.3 Ω , Σ selected resistance values contactor stages 4 and 3 = 0.14 Ω .
 $\Rightarrow 0.23 \Omega - 0.14 \Omega = 0.09 \Omega$ will be required.
 One resistance bank of 0.19 Ω is selected.
 $\Rightarrow 0.09 \Omega / 0.19 \Omega \times 100 \% = 47 \%$ of the resistance will be required. Terminal 3 is selected from the associated connection diagram (no. A 081 064) for cast-iron resistor bank 3PR3 801-01-3E.
- Start-up:
 It will be necessary in many cases to improve the drive response on the plant by reconnecting the contactor stages to optimize resistance grading.



*) Caution: the resistance of the rotor cable may have to be taken into account in contactor stage 4

Figure 3, Connection diagram for rotor resistors

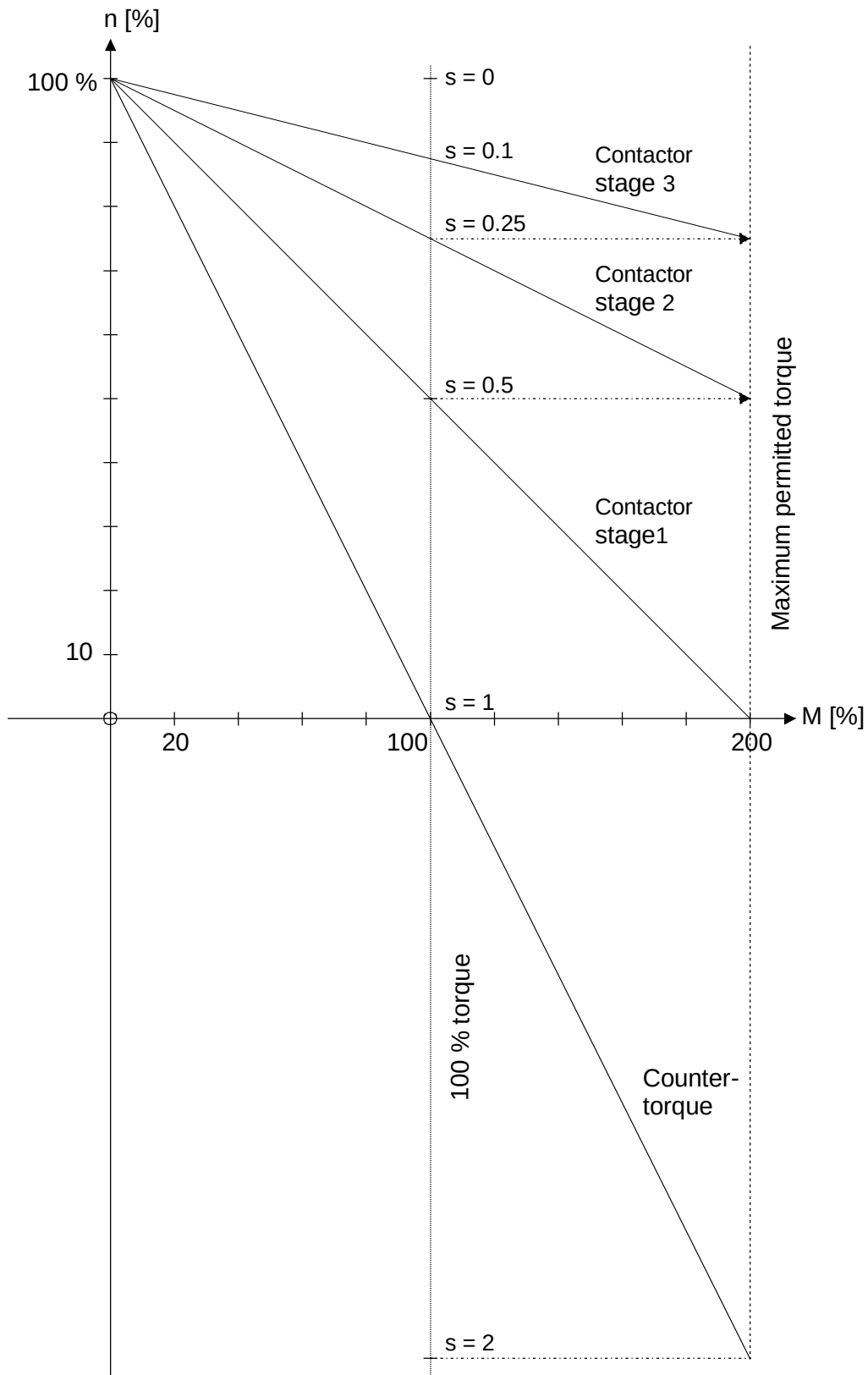


Figure 4, Speed-torque diagram with 3 contactor stages for information purposes.
The notes to Figure 2 apply accordingly.

17.5 Selecting a SIMOTRAS HD converter

A converter with a rated current of 180 A is selected. Order No.: 6SG7065-0EB60-0

Accessories

The SIMOTRAS HD supplementary boards are described in detail in Catalog DA 65.10 • 1998/99.

The converter accessories might be used in the following case:

- PROFIBUS DP interface:
CBP communications board, order no.: 6SX7010-0FF00 will be required.

Note

The following parts are necessary to install the CBP:

- LBA backplane bus system, order no.: 6SE7090-0XX84-4HA0
- ADB adapter board, order no.: 6SX7010-0KA00.
The adapter board can hold a maximum of 2 supplementary boards.

17.6 Selecting the contactors

The same rotor contactors and contactor relays are used for all contactor stages.

- Contactor relays, see NS K Low-Voltage Controlgear, Switchgear and Systems catalog:
The rotor contactors must be controlled via contactor relays. The contactor relays recommended here are suitable for all the stator and rotor contactors suggested in HE 1.
Recommended contactor relays: 3TH20 22-0...
Contactor relay with 2 NC and 2 NO contacts.
- Rotor contactors, see HE 1 page 4/42 ff. and the NS K catalog:
designed for S3-60 % duty, rated contactor current for this crane application 210 A:
Recommended rotor contactors: 3TF53 22-0...
Rotor contactor with 2 NC and 2 NO auxiliary contacts.

Caution:

Contactors for delta connection, see Figure 1, for example.

17.7 Selecting a master switch

The master switch should have the following features, see Catalog HE 1, page 471 ff.

- gold contacts
- 6 contacts
- handle
- linear potentiometer

Order No.: 3SJ3 003-0AS05-Z, Z = B3

Note

The connecting cable for the potentiometer must be ordered separately (order no.: 3SX4 175, or 3SX4 232).

Operation with 4 stage master switch

Two input coupling elements (order no. 3TX7002-2BF02) will be required.

- Suggested connection: see Section 6.1 Block Diagram with suggested connection using 4 stage master switch.
- Function: see Section 8 Function Diagrams (Sheet 13) – Evaluation
- Parameter settings: see Section 7.6.6.2 Operation with 4 stage master switch.

18 Appendix

18.1 Compatibility with SIMOTRAS HE (6GA4625 series)

It is desirable to make the inputs and outputs of the SIMOTRAS HD (6SG70 series) as compatible as possible with its predecessor (the SIMOTRAS HE, 6GA4625 series). The following parameters therefore need to be changed from the factory settings:

Caution: With these parameter settings, the drive-specific (crane) control according to Section 6.4 is not active.

Terminal on SIMOTRAS HE (6GA4625 series)	Settings or measures necessary on SIMOTRAS HD (6SG70 series) to implement the functions of the terminal in the left hand column
Term. 72 (FS ... enable setpoint)	P662.001 = 500 [G37.3] P662.002 = 500 [G37.3]
Term. 73 (FR ... enable controller)	P654.001 = 502 [G18.1] P654.002 = 502 [G18.1] P661.001 = 502 [G37.1] P661.002 = 502 [G37.1] U617 = 0 .. Term. 37 inactive [G18.1] U617 = 0 .. Term. 38 inactive [G37.1]
Term. 74 (FZ ... enable additional setpoint)	U249 = 504 [K8.4] P401.001 .. 4 = 60% .. 100% [K12.5] U628 = 95% [G26.6]
Term. 75 (VE .. pre-limit switch)	U607.001 = 506 [G19.5] U607.002 = 506 [G19.5] U608.001 .. 4 = setpoint reduction factor [G19.5]
Term. 76 (TL .. inch anticlockwise *)	P430.001 = 508 [G15.2] P431.001 = 402 [G15.2] P402 = inch anticlockwise setpoint [G12.1]
Term. 77 (TR .. inch clockwise *)	P430.002 = 510 [G15.2] P431.002 = 403 [G15.2] P402 = inch clockwise setpoint [G12.1]
Kl. 76 + Kl. 77 (reduced start pulse) (i.e. same control as terminals 76 and 77)	U347.001 = 508 [B18.8] U347.002 = 510 [B18.8] U347.003 = 1 [B18.8] U657.001 = 9377 [G23.5] U657.002 = 9377 [G23.5] U652.001 .. 4 = start pulse reduction factor [G23.4] If this function is used, P402 must be = P403
Term. 78 (RS .. reset fault memory)	P665.001 = 512 [G37.1] P665.002 = 512 [G37.1]

*) The "inch" function on SIMOTRAS HE corresponds to the "fixed setpoint" on SIMOTRAS HD

Term. 81/82 (MB .. ready message)	U621.001 = 162 U621.002 = 162	[G11.3] [G11.3]
Term. 83/84 (ST .. setpoint in controlled range)	U622.001 = 540 U622.002 = 540	[G11.3] [G11.3]
Term. 85/86 (BR .. $n \geq n_{\min}$)	U623.001 = 165 U623.002 = 165	[G11.3] [G11.3]
Term. 87/88 (S1 .. rotor contactor stage 1)		[G11.4]
Term. 89/92 (S2 .. rotor contactor stage 2)	For SIMOTRAS HD this is Term. 89/90	[G11.4]
Term. 90/92 (S3 .. rotor contactor stage 3)	For SIMOTRAS HD this is Term. 91/92	[G11.4]
Term. 91/92 (S4 .. rotor contactor stage 4)	For SIMOTRAS HD this is Term. 93/94	[G11.4]
	Terminals 90, 92 and 94 must be linked	
Term. 11/22 (MW .. message "temperature pre-warning")	For SIMOTRAS HD this is Term. 109/110 U619.001 = 148 U619.002 = 148	[G4.6] [G4.5] [G4.5]

Potentiometer on SIMOTRAS HE (6GA4625 series)	Corresponding parameter on SIMOTRAS HD (6SG70 series)	
TF – Delayed enable	P319 (factory setting = 0.05 s)	[G20.2]
TZ – Brake application time monitoring	This function must be implemented using free modules if required (similar to ramp-down monitoring on Sheet K15 in Section 8)	
NT – Tachometer voltage normalization	P741 (factory setting = 60.00 V)	[G5.2]
NS – Speed setpoint normalization	P320 (factory setting = 100.00 %)	[G19.2]
SH – Lift start pulse	U651 (factory setting = 0.00 %)	[G23.2]
NZ – Additional setpoint normalization	No setting necessary as the "zero delay angle" function is implemented in a different way.	
HR – Clockwise acceleration ramp	P303 (factory setting = 10.00 s)	[G20.2]
AR – Clockwise deceleration ramp	P304 (factory setting = 10.00 s)	[G20.3]
HL – Anticlockwise acceleration ramp	P303 (factory setting = 10.00 s)	[G20.2]
AL – Anticlockwise deceleration ramp	P304 (factory setting = 10.00 s)	[G20.3]
VR – n controller gain	P225 (factory setting = 3.00)	[G24.5]
ND – Speed monitoring normalization	P388 (factory setting = 5.00 %)	[G43.6]
ST – Setpoint in controlled range)	U628 (factory setting = 55.0 %)	[G26.6]
BR – Standstill monitoring	P370 (factory setting = 5.00 %)	[G43.6]
S1 – Switching logic rotor contactor stage 1	U630 (factory setting = - 1.0 %)	[G11.2]
S2 – Switching logic rotor contactor stage 2	U634 (factory setting = 50.0 %)	[G11.6]
S3 – Switching logic rotor contactor stage 3	U636 (factory setting = 75.0 %)	[G11.6]
S4 – Switching logic rotor contactor stage 4	U638 (factory setting = 90.0 %)	[G11.6]

*) If the ramp-up and ramp-down functions for clockwise and anti-clockwise rotation are to be set separately, the function data set must be switched over.

Microswitch on SIMOTRAS HE (6GA4625 series)	Corresponding parameter on SIMOTRAS HD (6SG70 series)
S1 – Override of ramp-function generator in controlled range	No such setting, as the “zero delay angle” function is implemented in a different way.
S2 – Speed monitoring	Speed monitoring inactive if P590 = P591
S3 – Brake application time monitoring	This function must be implemented using free modules if required (similar to run-back monitoring on Page K15 in Section 8)
S4 – Controlled operation command	The “zero delay angle” command is inactive when U605 = 0.
S5 – Premature switchover of rotor contactor stage 1 to “Delay lowering” mode (counter-torque operation)	U630 (factory setting = -1.0 %) [G11.2]
S6 – I component of current controller	P154 (factory setting = 1) [G28.4]
S7 – I component of speed controller	P224 (factory setting = 1)
S8 – Selection of type of setpoint input	P700 (factory setting = 0) [G05.2]

Comments sheet

We have made every effort to critically edit these Operating Instructions. However, if you still come across printing errors, we would be grateful if you would let us know.

We would also be grateful if you could let us have your opinion of these Operating Instructions 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 6SG70 Operating Instructions, Edition

The following versions have appeared so far:

Ausgabe	Sachnummer
03	C98130-A7002-A1-03-7619

Version **03** consists of the following sections

Section	Pages	Date of edition
0 Contents	6	09.99
1 Safety information	4	09.99
2 Type spectrum	4	09.99
3 Description	14	09.99
4 Shipment, unpacking	2	09.99
5 Installation	14	09.99
6 Connections	38	09.99
7 Start-up	44	09.99
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