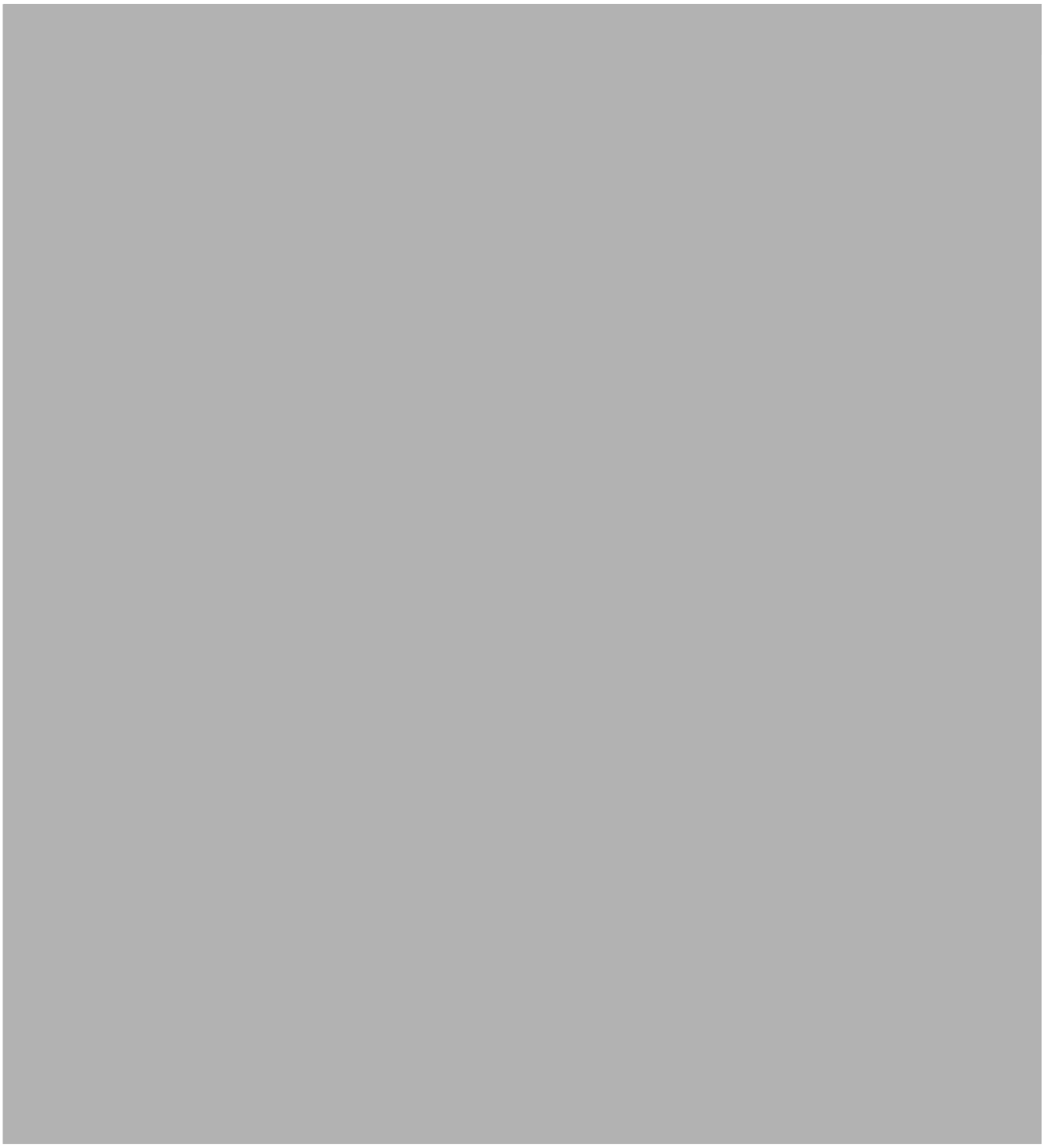
SIEMENS

SIMOVERT Master Drives
Rectifier/Regenerating Unit
Sizes C to K

Operating Instructions



Edition: **i**

Order No.: 6SE7087-6AK85-1AA0

These Operating Instructions are available in the following languages:

Language	German	French	Spanish	Italian
Order-No.: 6SE70 . .	. . 80-0AK85-1AA0	. . 87-7AK85-1AA0	. . 87-8AK85-1AA0	. . 87-2AK85-1AA0

Converter software version:

At the time these operating instructions was printed, the infeed and regenerative feedback units were supplied from the factory with software version **4.7**.

These operating instructions basically also apply to other software versions.

Older software versions: It is possible that some parameters might not exist (i.e. that the function they apply to does not exist) or that some parameters might have a restricted setting range. However, this is generally marked in the parameter list where it applies.

Newer software versions: It is possible that additional parameters might exist on the infeed and regenerative feedback units (i.e. that there are also additional functions that are not described in these operating instructions) or that some parameters might have an extended setting range. Leave such parameters in their factory setting and on no account set any values that are not described in these operating instructions!

You can order the latest software version (EPROM) under MLFB No.: 6SW1701-0DA14.

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0 Definitions

- **QUALIFIED PERSONNEL**

  within the meaning of these operating instructions or the warning information on the product itself, are persons who are entrusted with installation, assembly, commissioning and operation of the product and who avail of qualifications corresponding to their activities, e.g.:

  1. training or instruction or authorization to activate and deactivate, to earth and to mark circuits and equipment in accordance with the standards of safety engineering.
  2. training or instruction in accordance with the standards of safety engineering in the care and use of suitable safety equipment.
  3. training in First Aid

- ⚠ **DANGER**

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

- ⚠ **WARNING**

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

- ⚠ **CAUTION**

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

- **CAUTION**

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

- **NOTICE**

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

NOTE
For reasons of clarity, these operating instructions do not contain all details of all types of the product and can also not take into account every conceivable installation, operation or maintenance circumstances. You can consult your local Siemens branch if you should require further information or if particular problem occur that are not dealt with in adequate detail in the operating instructions. Attention is also drawn to the fact that the contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The sales contract, which also contains the complete and solely valid warranty stipulations, contains the entire obligations of Siemens. These contractual warranty stipulations are neither extended nor limited by the statements given in instructions and documentation.

CAUTION

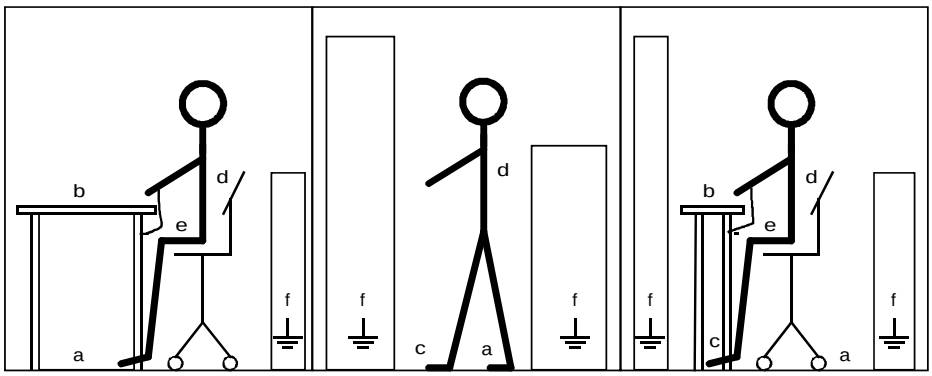
Electrostatically Sensitive Devices (ESDs)

The equipment contains electrostatically sensitive devices. These components may be destroyed very easily by improper handling. Please observe the following notes if you nevertheless have to work with electronic modules:

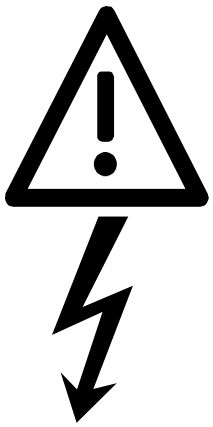
- Electronic modules should only be touched if absolutely necessary to carry out work on them.
- If modules nevertheless have to be touched, you must discharge your own body directly beforehand (this is best done by touching an earthed conductive object such as the PE contact of a socket).
- Modules must not come into contact with highly insulating materials – e.g. plastic films, insulating desktops or synthetic fibber clothing items.
- Modules must only be placed on conductive surfaces.
- When soldering modules, the tip of the soldering iron must be earthed.
- Modules and components must only be stored or dispatched in conductive packaging (e.g. metallized plastic boxes or metal tins).
- If packagings are not conductive, modules must be placed in a conductive envelopment prior to packaging. In this case, use can be made of conductive foam rubber or domestic aluminum foil, for example.

The necessary protective measures for ESDs are elucidated once again in the following figure:

a	=	conductive floor	d	=	ESD coat
b	=	ESD desk	e	=	ESD armband
c	=	ESD shoes	f	=	earthing terminal on cabinets



Sitting position Standing position Standing / Sitting position



WARNING

When operating electrical equipment, certain parts of such equipment are inevitably live.

Owing to the dc link capacitors, hazardous voltages are present on the equipment up to 5 min. after deenergization (power terminal and electronic power supply). This is why it is not permitted to open the housing until after waiting for 5 minutes.

Non-observance of warning notices can result in death, severe personal injury or considerable property damage.

Such personnel must be thoroughly acquainted with all warnings and maintenance activities.

Perfect and safe operation of the equipment requires proper transport, expert storage, installation and assembly and cautious operation and maintenance.

1 Description

1.1 Application

The rectifier/regenerating units of the SIMOVERT Master Drives 6SE70 series are power electronics devices for supplying the DC voltage to the SIMOVERT Master Drives 6SEE70 series of inverters. The rectifier/regenerating units convert the voltage of a three-phase system into a fixed DC voltage (depending on the operating mode and voltage tolerance). This voltage is kept constant within a specified range even when the inverter is feeding power back into the system. The following voltages are specified for the DC voltage output (DC link voltage):

DC	270V –10% to 310V +15%	at AC system input voltage	200V –10% to 230V +15%
DC	510V –15% to 650V +10%	at AC system input voltage	380V –15% to 480V +10%
DC	675V –15% to 810V +10%	at AC system input voltage	500V –15% to 600V +10%
DC	890V –15% to 930V +10%	at AC system input voltage	660V –15% to 690V +10%

The units with system input voltages of 208 to 230V are identical to the units with system input voltage of 380 to 460V. You only have to set the P071 to the corresponding system input voltage.

You can connect one or more inverters to the output. The total of the rated currents of the installed inverters may then exceed the rated current of the rectifier/regenerating unit. When planning your system, however, make sure that the aggregate DC load currents at no time exceed the rated DC current of the rectifier/regenerating unit

The output current can be increased by connecting power sections of size K in parallel. Up to 2 parallel units of the same rated current can be connected in parallel with one basic unit (see Section 3.7 for further details on parallel connection)

You can make technological adaptations and expansions over a defined interface in the control section.

Harmonic loading on the supply network can be reduced by coupling 2 units for "12-pulse mode" (for further details on "12-pulse mode", see Section 3.8).

1.2 Principle of operation

The power section of the rectifier/regenerating unit consists of two thyristor bridges connected in anti-parallel for supplying power to the inverter DC link and feeding power back from the DC link into the system. To avoid a voltage drop in the regenerative mode, you must increase the input voltage for the regenerating bridge by 20% . You can do this with an (auto) transformer or connecting the bridge to its own power system. If a higher voltage is not applied to the regenerative terminals, the DC link voltage must be decreased by phase angle control (permanently (permanent or by external control in regenerative mode only). The link voltage is automatically controlled by a digital microprocessor-based controller.

A 24 V external supply is required for operating the units (see Sections 3.5 and 9.3).

The rectifier/regenerating unit is suitable for connecting several inverters to a common DC bus. This permits the exchange of energy between motoring and generating drives, and thus saves energy.

Once the DC link capacitors have been precharged, the inverters are ready for operation.

The infeed and regenerative feedback unit is commissioned on an operator panel, for type C in the door of the device, on types E, H, and K on the electronics box. Operation is performed via the terminal strip or via a serial interface.

Optional interfaces and intelligent I/O modules are available in conjunction with programmable controllers and other automation equipment for controlling the rectifier/regenerating units.

2 Transport, Unpacking and Assembly

2.1 Transport and unpacking

The units are packed at the manufacturing works. A product packaging label is attached to the box.

Avoid extreme vibrations and hard impacts during transport, e.g. when lowering the unit.

Pay attention to the notes on the packaging relating to transport, storage and proper handling.

The converter can be installed after unpacking it and checking the consignment for completeness and damage.

The packaging consists of cardboard and corrugated cardboard for units of size C. The units of size E, H and K are bolted onto pallets with fixing pieces in their usual operating position and packed with cardboard. The packaging may be disposed of in accordance with local cardboard disposal regulations.

You should notify your freight forwarder immediately if you discover any transportation damage.

2.2 Storage

The units must be stored in clean dry rooms. Temperatures between –25 °C (–13 °F) and + 70 °C (158 °F) are permissible. Temperature fluctuations > 20 K per hour are not permissible.

2.3 Assembly

The following are required for securing size C:

- G rail conforming to EN50035 with screws for securing
- one M6 bolt
- dimension drawing (Figure 2.2 for size C)

The following are required for securing size E:

- four M8 bolts
- dimension drawing (Figure 2.3 for size E)

The following are required for securing size H:

- four M8 bolts
- dimension drawing (Figure 2.4 for size H)

The following are required for securing size K:

- six M8 bolts
- dimension drawing (Figure 2.5 for size K)

	WARNING
	For safe operation of the unit, it is presumed it will be assembled and commissioned by qualified personnel, paying attention to the warning notes given in these operating instructions. Particular note must be taken both of the general and national erection and safety regulations regarding work on power installations (e.g. VDE) and regulations regarding the proper use of tools and of personal protective equipment. Non-observance of warning notices can result in death, severe personal injury or considerable property damage. The unit must be protected against the ingress of foreign matter as otherwise proper functioning and safety will not be guaranteed.

Requirements for the installation site

Operating facilities must be dry and dust-free. Air fed in must not contain any gases, vapors or dusts that are electrically conductive or detrimental to functioning. Air containing dust must be filtered.

	WARNING
	Dimension cabinet ventilation according to the dissipated power! (Technical data in Chapter 14)

The unit's ambient climate in operating rooms must not exceed the values of code 3K3 as detailed in DIN IEC 721 Part 3-3 /04.90. A reduction of power as detailed in Chapters 14.1 and 14.2 is necessary in the event of temperatures > 40 °C (104 °F) and altitudes >1000m. The terminal voltage has to be reduced for altitudes > 2000m.

Carry out assembly in accordance with the dimension drawings in Section 2.4.

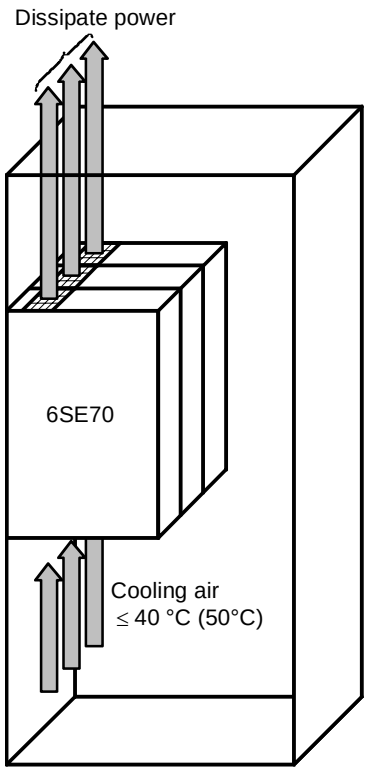


Figure 2.1 Installation in control cabinets

	WARNING
	In the case of units of size H and K, all plastic covers must be mounted to ensure correct air flow and cooling for the units.

2.4 Dimension drawings

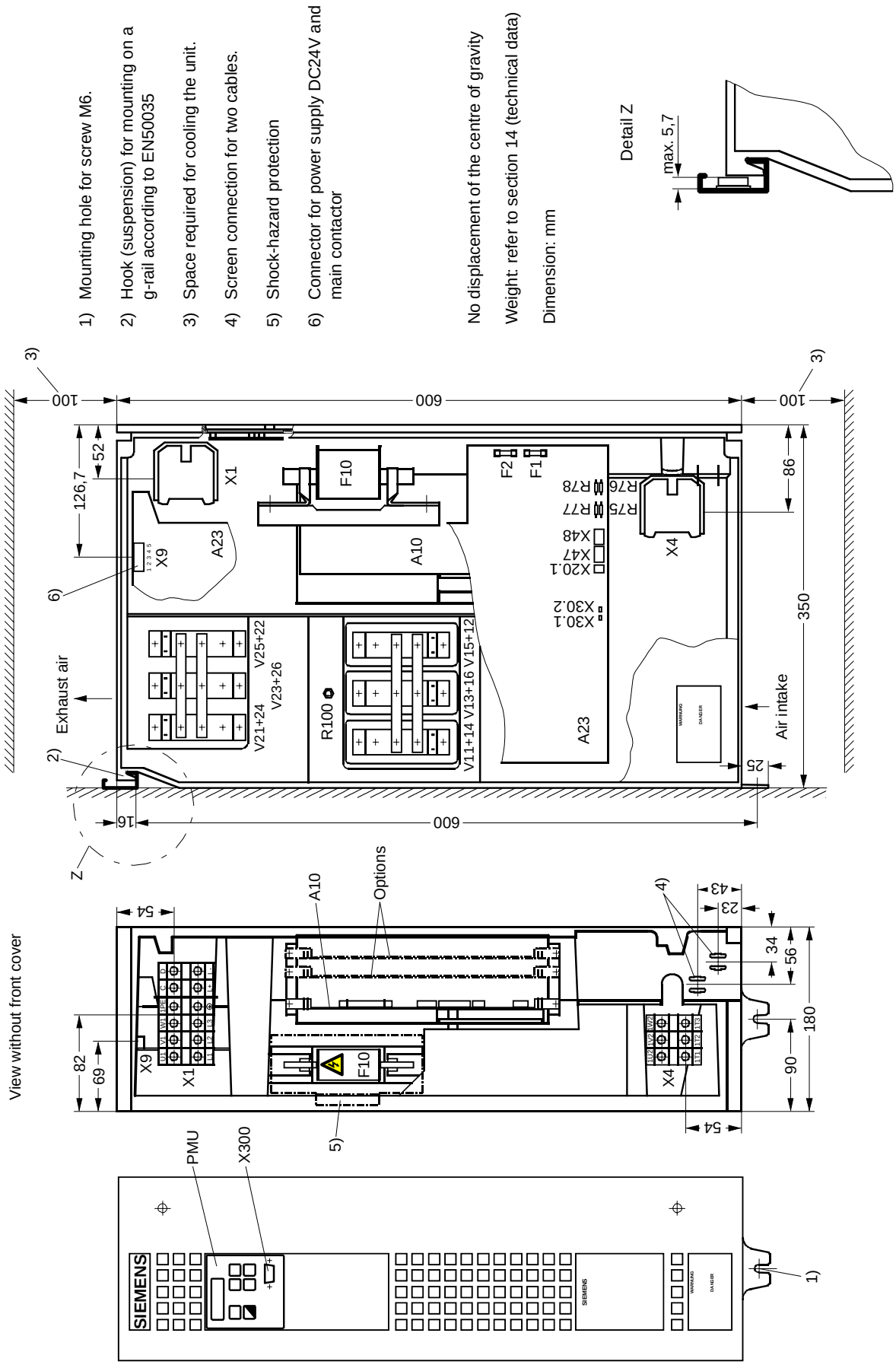


Figure 2.2 Dimension drawing, size C

1) Mounting hole for screw M8
2) Mounting hole for power connections:
   M16 for 6SE7036-1EE85-1AA0, 6SE7035-4FE85-1AA0
   6SE7034-2HE85-1AA0 and 6SE7035-3HE85-1AA0
   M12 for every other units
3) Connection for PE, mounted:
   M16 for 6SE7036-1EE85-1AA0, 6SE7035-4FE85-1AA0
   6SE7034-2HE85-1AA0 and 6SE7035-3HE85-1AA0
   M12 for every other units
4) Hole for crane hook ∅30mm
5) Front cover only for design IP20
6) Connector for power supply DC24V and main contactor
7) Fan-Customer connection (X19)
8) Screen connection for cables
9) Space required for connection and cooling the unit

Unit	Dimension a (mm)	Dimension b (mm)
6SE7031-7EE85-1AA0	400	300
6SE7032-2EE85-1AA0	400	300
6SE7033-1EE85-1AA0	450	350
6SE7033-8EE85-1AA0	500	400
6SE7034-6EE85-1AA0	500	400
6SE7036-1EE85-1AA0	600	500
6SE7031-5FE85-1AA0	400	300
6SE7032-4FE85-1AA0	450	350
6SE7032-7FE85-1AA0	450	350
6SE7033-5FE85-1AA0	500	400
6SE7034-2FE85-1AA0	500	400
6SE7035-4FE85-1AA0	600	500
6SE7031-4HE85-1AA0	400	300
6SE7032-2HE85-1AA0	400	300
6SE7032-7HE85-1AA0	400	300
6SE7034-2HE85-1AA0	500	400
6SE7035-3HE85-1AA0	600	500

10) Remove transport plates before start-up

No displacement of the centre of gravity
Weight: refer to section 14
Dimension: mm

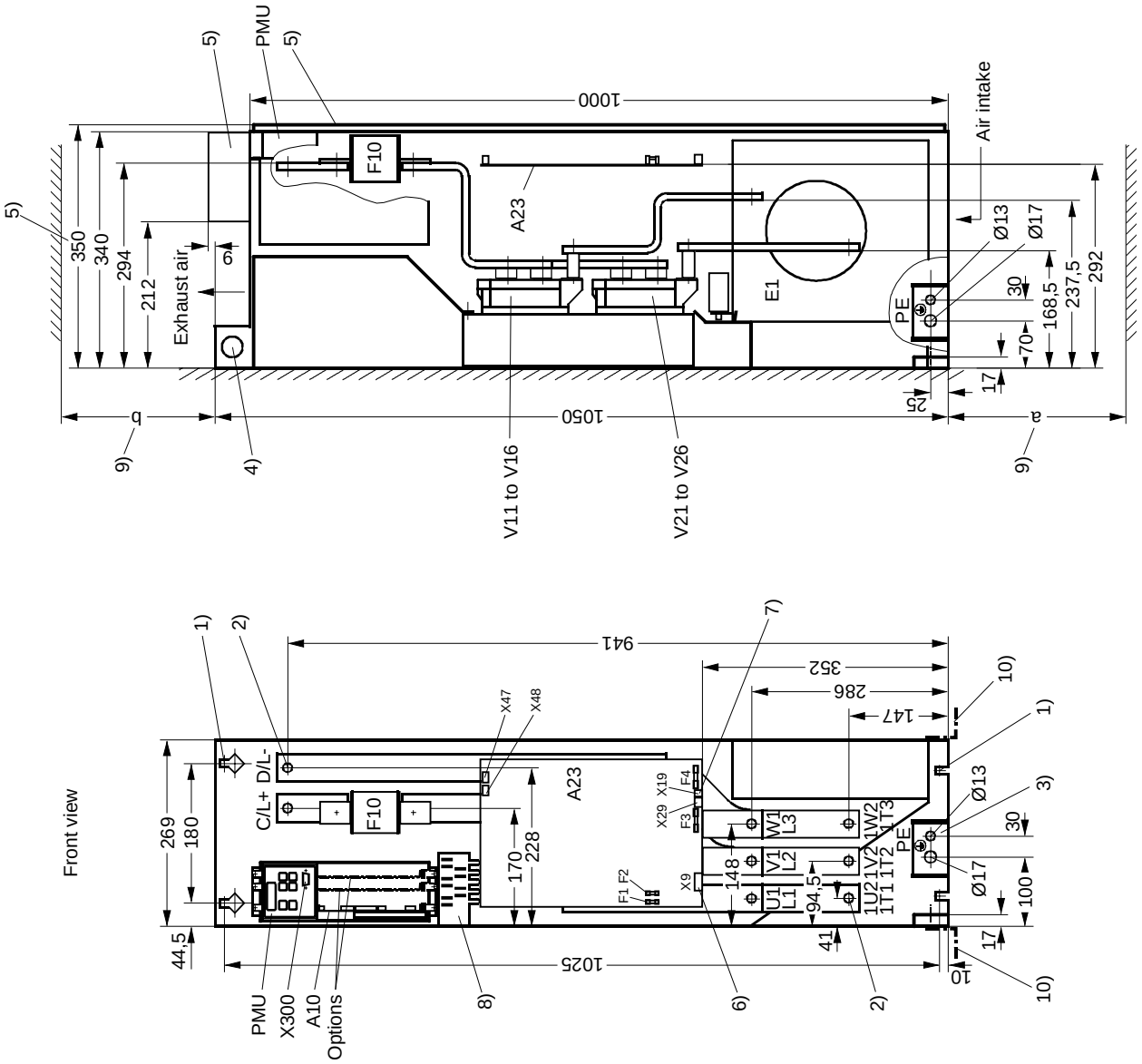


Figure 2.3 Dimension drawing, size E

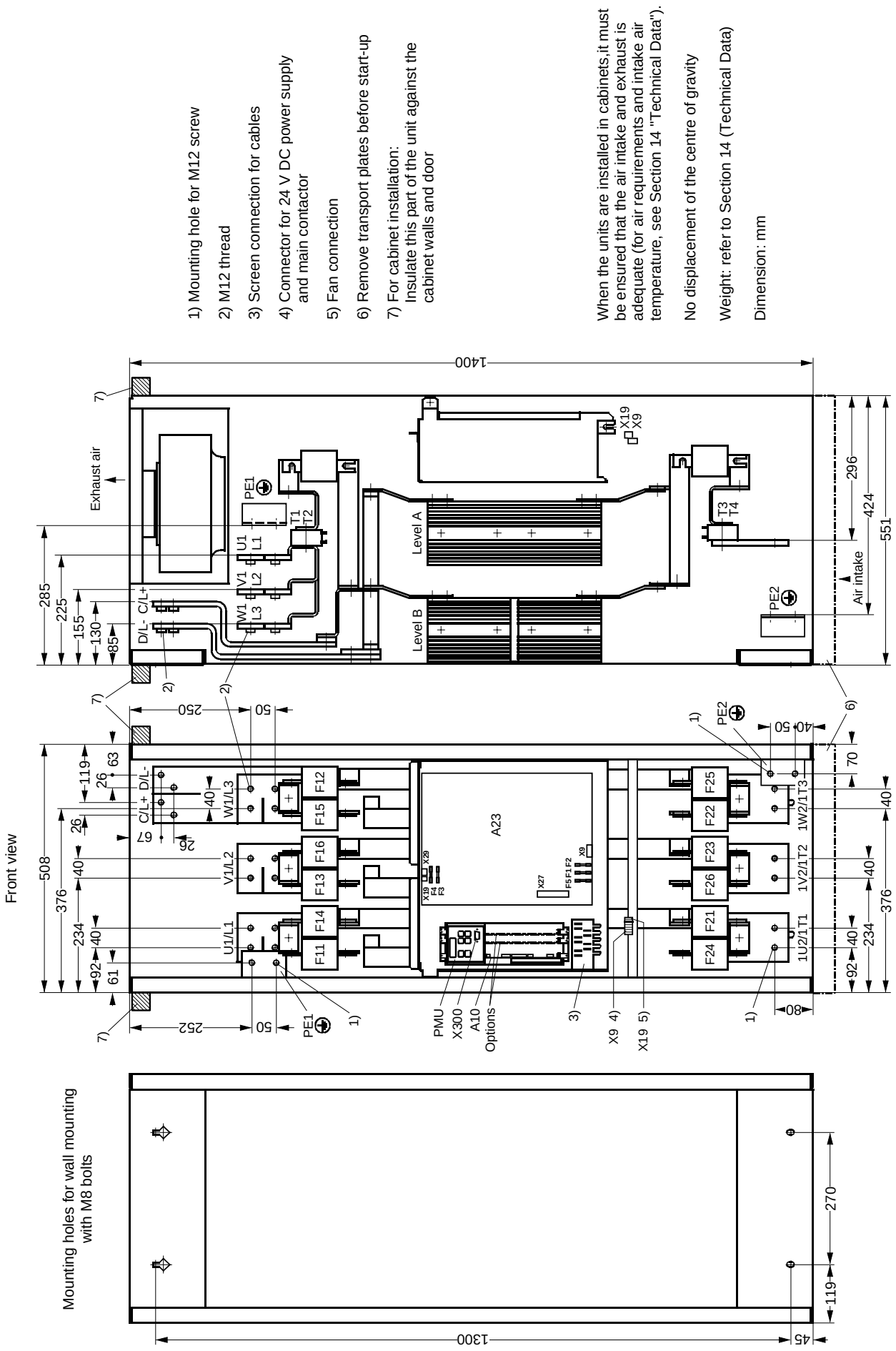


Figure 2.4 Dimension drawing, size H

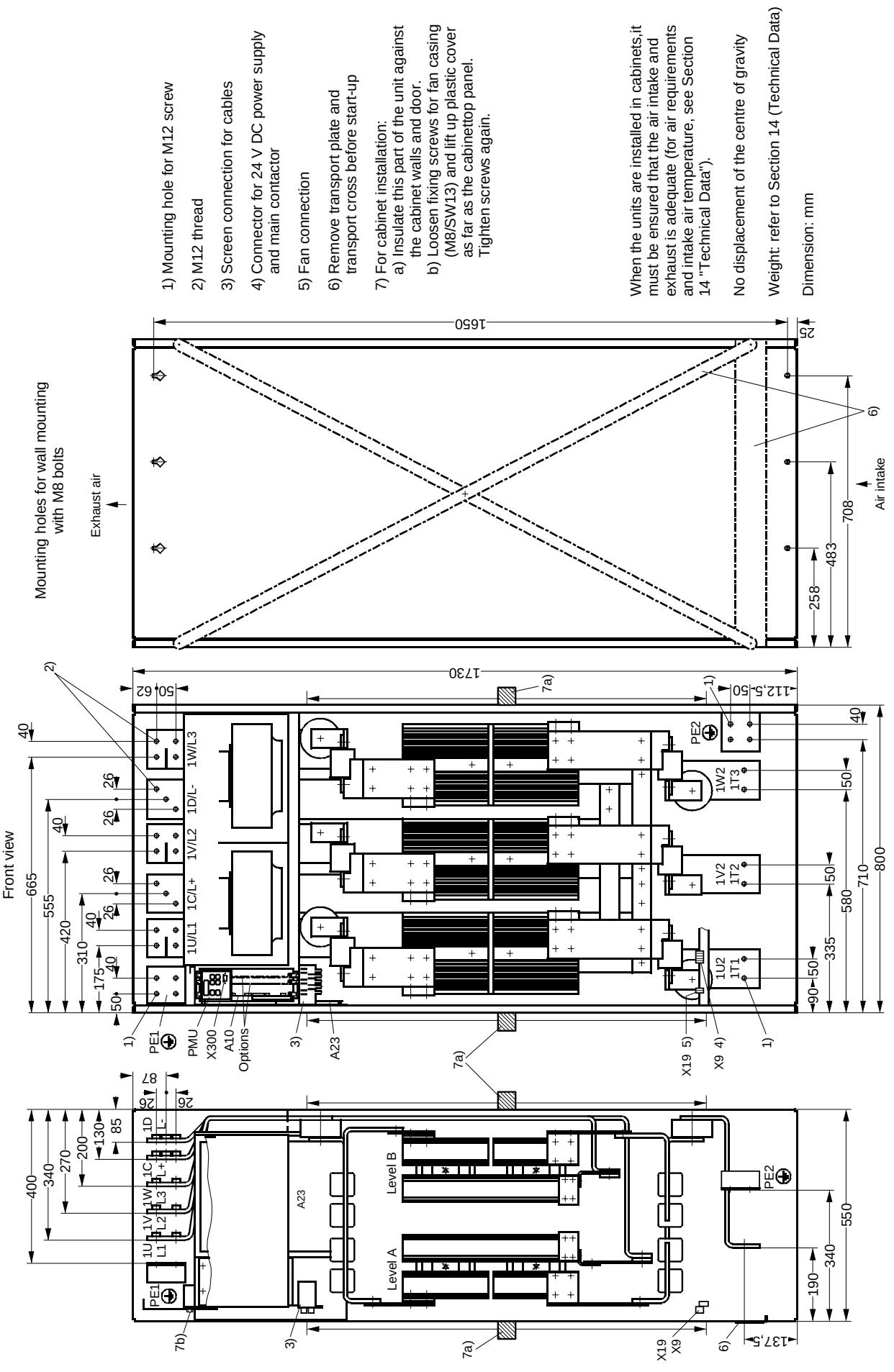


Figure 2.5 Dimension drawing, size K

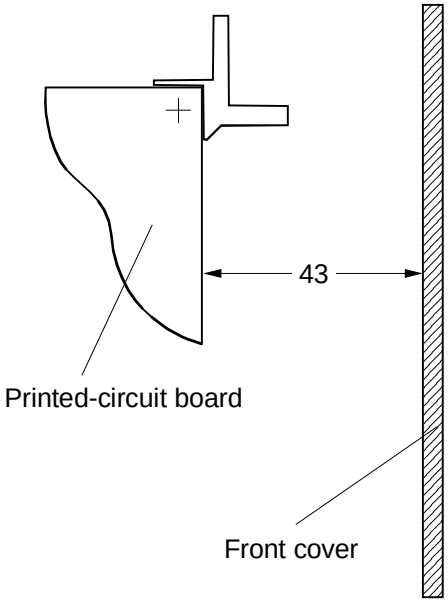


Figure 2.6 Clearance between PCBs and front cover (size C)

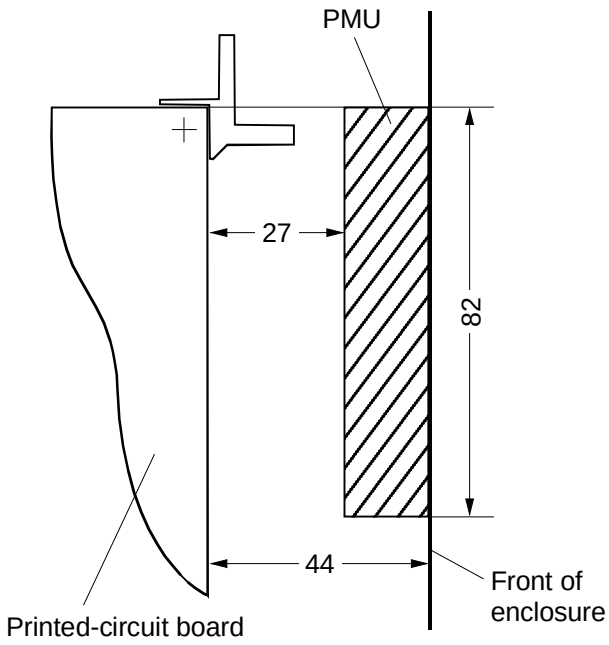


Figure 2.7 Clearance between PCBs and PMU (size E)

Line connection without autotransfomer (size E)
(For sizes C, H and K, these connections have to be made externally on the system side.

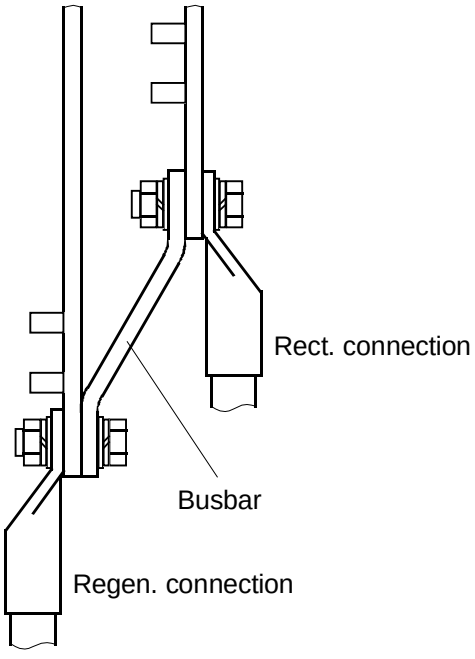
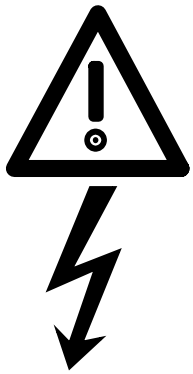


Figure 2.8 Line connection w/o autotransformer (size E)

Order No. for three busbars	Unit Order No.
6SE7032-7FE87-3AE0	6SE7031-7EE85-1AA0 6SE7032-2EE85-1AA0 6SE7033-1EE85-1AA0 6SE7031-5FE85-1AA0 6SE7032-4FE85-1AA0 6SE7032-7FE85-1AA0
6SE7032-7HE87-3AE0	6SE7033-8EE85-1AA0 6SE7034-6EE85-1AA0 6SE7033-5FE85-1AA0 6SE7034-2FE85-1AA0 6SE7031-4HE85-1AA0 6SE7032-2HE85-1AA0 6SE7032-7HE85-1AA0
6SE7034-2HE87-3AE0	6SE7036-1EE85-1AA0 6SE7035-4FE85-1AA0 6SE7034-2HE85-1AA0

3 Connection



WARNING
The units are operated at high voltages. Only carry out connection work after disconnecting the voltage! All work on the unit must only be carried out by qualified persons. Non-observance of warning notices can result in death, severe personal injury or considerable property damage. Damage or destruction can result if the unit is incorrectly connected.
As the result of the dc link capacitors in the connected SIMOVERT Master Drives, the unit still contains a hazardous voltage up to 5 min. after isolation. This is why it is only permitted to open the unit after observing an appropriate waiting time.
The power terminals and control terminals may carry a voltage even when the motor is at standstill.
When working on the open unit, pay attention to the fact that live parts are exposed. The unit may only be operated with the front covers attached.
The user is responsible for ensuring that the common rectifier, converter, motor and other units are installed and connected in accordance with the technical regulations recognized in the country of installation and other regionally valid regulations. In doing so, particular attention must be paid to cable dimensioning, fusing, earthing, deactivation, isolation and overcurrent protection.

CAUTION
The power cables must be fixed in position mechanically outside the unit.

NOTICE
An external 24 V power supply is required for operation of the units (see Chapters 3.5 and 9.3). Operational range of the unit: 20 V to 30 V.

3.1 Power connections

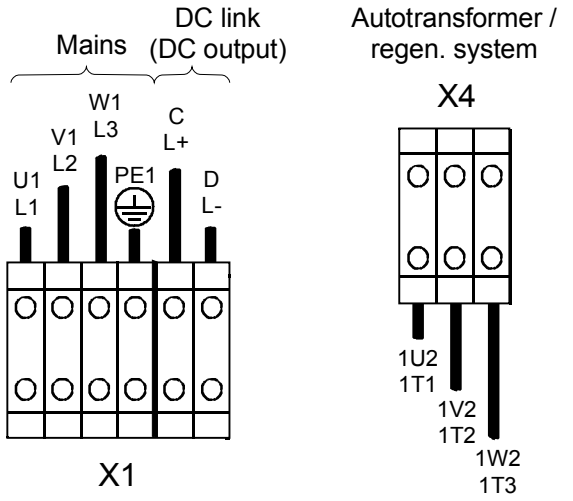


Figure 3.1 Mains connection size C

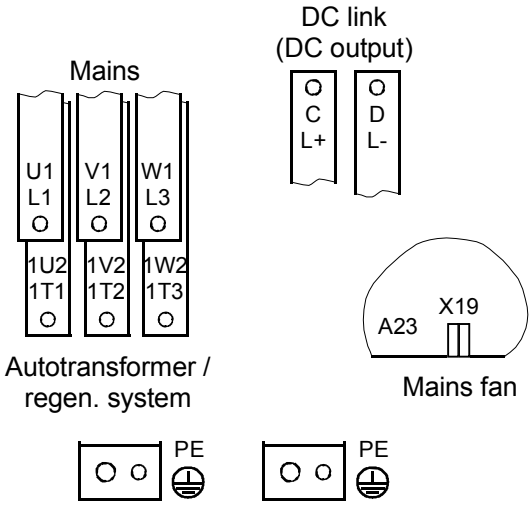


Figure 3.2 Mains connection size E

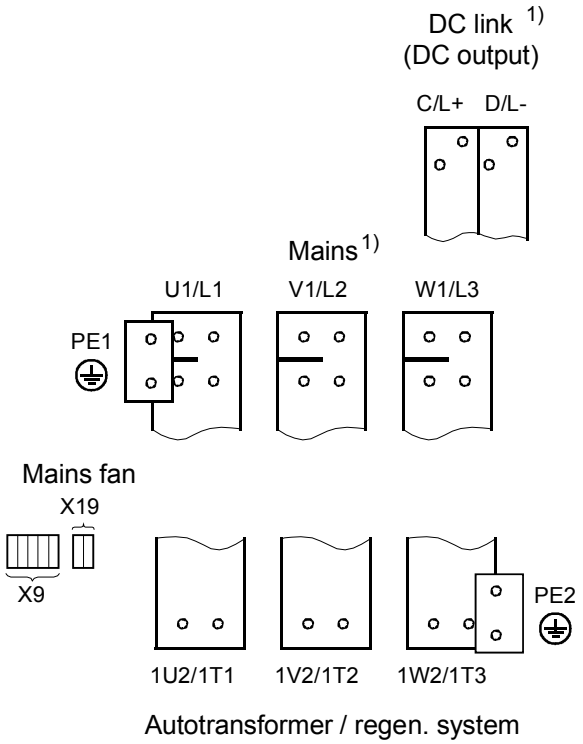


Figure 3.3 Mains connection size H

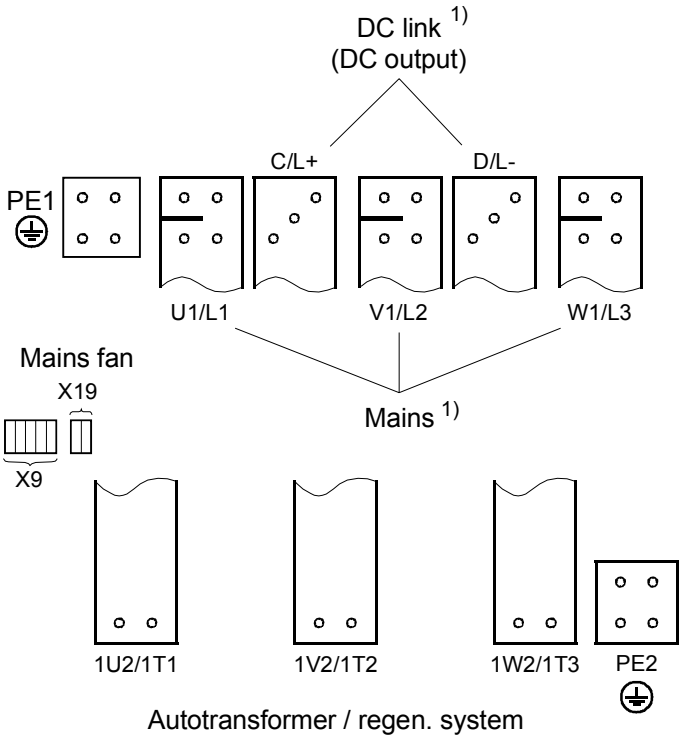


Figure 3.4 Mains connection size K

1) Due to the press-in nuts, cable lugs or DC rails can only be connected to the terminal rails from the front.

WARNING

The operating coils of contactors and relays that are connected to the same supply network as the unit or that are located in close proximity of the unit must be connected to overvoltage limiters, e.g. RC circuits.

An RCCB (residual-current-operated circuit-breaker) must not be used to protect the rectifier/regenerating unit (DIN VDE 0160).

Voltage is only permitted to be applied to the unit when SIMOVERT Master Drives are connected. Operation without a connected DC link capacitor is not permitted!

If the DC link terminals are connected incorrectly or short-circuited, the SIMOVERT Master Drives inverter will be destroyed!

To reduce mains pollution, limit harmonics and reduce current ripple, the total system inductance for the supply and feedback connection (incl. commutating reactor and, where applicable, autotransformer must result in a total relative short-circuit voltage u_k between 4% and 10%.

Connect the fan power supply to X19.
The fan continues to run for about four minutes or until a certain cooling element temperature threshold is undershot (provided its power supply is connected) after the unit has been switched off, following fault messages, on canceling the enable signal and after isolating the system supply connection.

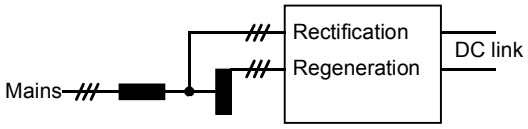
Despite switching the voltage off at the power terminals, a voltage may still exist on terminal X19 due to the external fan supply.

NOTES

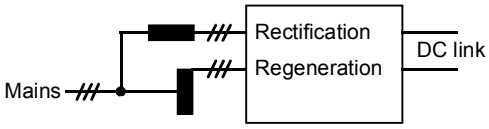
The supply voltages applied to the rectifier and regenerating power terminals (U1/L1, V1/L2, W1/L3 and 1U2/1T1, 1V2/1T2, 1W2/1T3) must have an identical phase angle and identical frequency.

Recommendation: The inductive components of the impedance drop u_k of the (auto) transformer should lie between 1.5 and 3% (see Table 3.4).

Commutating reactor: Selection of the reactors for 4 % u_k should be based on the rated current in regenerative mode on the line side (see Technical Data). In weak or low-power systems, the u_k of the commutating reactor must be decreased in order not to exceed the upper limit for the total u_k of 10%. A further measure in the case of extremely high u_k values for the supply network can be implemented by connecting the primary side of the autotransformer to the supply network directly (before the commutating reactors), to ensure that the total u_k value in the regenerating direction will not be too high.



Arrangement for high-power system



Arrangement for low-power system

For the selection of the commutating reactors, see Table 3.6 and Catalog DA93.1.
With an extremely high total u_k value in the regenerative direction, it may be necessary due to the increased thyristor current commutating time, to reduce the inverter step limit (parameter P776). This may mean it is necessary to reduce Ud.

Output reactors in the DC circuit are not permitted (even with the parallel connection of power sections or in 12-pulse mode), because the DC link voltage is measured at the unit output terminals.

Function	Terminal	Connected load / Description
Incoming supply terminals	X1-U1/L1 X1-V1/L2 X1-W1/L3	See Technical Data Chapter 14
Protective conductor	PE/GND	
Power feedback terminals autotransformer/system	X4-1U2/1T1 X4-1V2/1T2 X4-1W2/1T3	See Technical Data Chapter 14
Power terminals DC link voltage (inverter)	X1-C/L+ X1-D/L-	See Technical Data Chapter 14
Fan terminals Sizes E, H, K	X19-1 X19-2	Supply connection for fan 230V AC ±10%, 50 to 60 Hz ±5% Size E Current consumption: 0.84A Size H Current consumption: at 50 Hz: 2.6 A, at 60 Hz: 3.3 A Size K Current consumption: at 50 Hz: 5.2 A, at 60 Hz: 6.6 A

Table 3.1 Power connections

Sizes C and E

Terminal X19 fused with fuse (F3 and F4):

T2A/250V time-lag 6.3x32 mm (¼“ x 1¼“)
(19343-T2A/250V Messrs. Wickmann-Werke GmbH or 0034.5231 FST Messrs. Schurter)

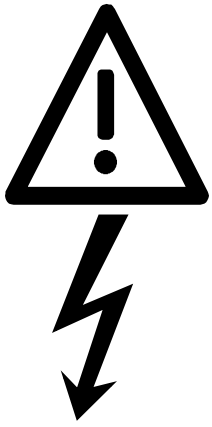
or

T2A/250V time-lag 5x20 mm
(19198-T2A/250V Messrs. Wickmann-Werke GmbH or 0034.3993 FSD Messrs. Schurter)

Sizes H and K

Terminal X19 fused with fuse (F3 and F4):

T2A/250V time-lag 6.3x32 mm (¼“ x 1¼“)
(19343-T7A/250V Messrs. Wickmann-Werke GmbH or 0034.5243 FST Messrs. Schurter)



WARNING

If the device is operated on a network in which a phase is grounded instead of the neutral, the plant operator must ensure that fans (terminals X19-1, X19-2) and the main contactor circuit (terminals X9-4, X9-5) are fed from this phase and the neutral.

If it is not possible to ensure this, the fans and main contactor circuit must be fed from an isolating transformer.

Moreover, the feed to terminals X19-1, X19-2, X9-4, X9-5 must be implemented via an isolating transformer if:

- The connection between the protective ground and electronic ground is interrupted (see Chapter 3.3.3 Terminals on the CUR Module).
- The rectifier/regenerating unit is operated in an ungrounded network.

The units are designed for permanent connection to the system in keeping with DIN VDE 0160 Section 6.5.2.1.
Protective conductor connection: Min. cross-sectional area 10 mm^2 (see Table 3.2).
The conductor cross-sectional areas listed in Table 3.2 are maximum connectable cross-sections. The data is given for multicore cable. The cross-sectional areas actually wired and the associated connection elements must be selected according to the currently valid standards - e.g. DIN VDE 100 Part 523, DIN VDE 0276 Part 1000, UL, CSA, ...

Unit Order No.			Mains		DC link		Protective conductor	
	Rated input		Conductor U1/L1, V1/L2,W1/L3 1U2/1T1, 1V2/1T2, 1W2/1T3		Conductor C/L+, D/L-		Conductor PE	
	voltage	current	max.	max.	max.	max.		
6SE70	(V)	(A)	mm^2 1)	AWG 2)	mm^2 1)	AWG 2)	mm^2 1)	AWG 2)
22-1EC85-1AA0	380 to 480	18	50 3)	1/0	50 3)	1/0	10	10
24-1EC85-1AA0	380 to 480	36	50 3)	1/0	50 3)	1/0	16	6
28-6EC85-1AA0	380 to 480	74	50 3)	1/0	50 3)	1/0	25	4
31-7EE85-1AA0	380 to 480	149	2x120	2x4/0	2x150	2x300	70	2/0
32-2EE85-1AA0	380 to 480	192	2x120	2x4/0	2x150	2x300	95	3/0
33-1EE85-1AA0	380 to 480	269	2x120	2x4/0	2x150	2x300	150	300
33-8EE85-1AA0	380 to 480	326	2x240	2x500	2x300	2x600	185	350
34-6EE85-1AA0	380 to 480	403	2x240	2x500	2x300	2x600	240	500
36-1EE85-1AA0	380 to 480	526	2x240	2x500	2x300	2x600	300	600
38-2EH85-1AA0	380 to 480	710	C 4x300 R 100x10	4x600	C 4x300 R 60x10	4x600	C 4x300 R 100x10	4x600
41-0EH85-1AA0	380 to 480	888	C 4x300 R 100x10	4x600	C 4x300 R 60x10	4x600	C 4x300 R 100x10	4x600
41-3EK85-1AA0	380 to 480	1156	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-3EK85-1AD0	380 to 480	1156	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-8EK85-1AA0	380 to 480	1542	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-8EK85-1AD0	380 to 480	1542	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
22-7FC85-1AA0	500 to 600	24	50 3)	1/0	50 3)	1/0	10	8
24-1FC85-1AA0	500 to 600	36	50 3)	1/0	50 3)	1/0	16	6
27-2FC85-1AA0	500 to 600	62	50 3)	1/0	50 3)	1/0	16	6
28-8FC85-1AA0	500 to 600	82	50 3)	1/0	50 3)	1/0	25	4
31-5FE85-1AA0	500 to 600	131	2x120	2x4/0	2x150	2x300	70	2/0
32-4FE85-1AA0	500 to 600	203	2x120	2x4/0	2x150	2x300	120	4/0
32-7FE85-1AA0	500 to 600	233	2x120	2x4/0	2x150	2x300	120	4/0
33-5FE85-1AA0	500 to 600	307	2x240	2x500	2x300	2x600	185	350
34-2FE85-1AA0	500 to 600	366	2x240	2x500	2x300	2x600	185	350

1) C=Cable, R=Rail

2) American Wire Gauge

3) Terminal connection area: Multicore10mm^2 to 50mm^2 AWG 8 to AWG 1/0
Stranded 3.5mm^2 to 35mm^2 AWG 12 to AWG 2

Unit Order No.	Rated input		Mains		DC link		Protective conductor	
			Conductor U1/L1, V1/L2,W1/L3 1U2/1T1, 1V2/1T2, 1W2/1T3		Conductor C/L+, D/L-		Conductor PE	
	voltage	current	max.	max.	max.	max.		
6SE70	(V)	(A)	mm2 1)	AWG 2)	mm2 1)	AWG 2)	mm2 1)	AWG 2)
35-4FE85-1AA0	500 to 600	465	2x240	2x500	2x300	2x600	300	600
37-7FH85-1AA0	500 to 600	671	C 4x300 R 100x10	4x600	C 4x300 R 60x10	4x600	C 4x300 R 100x10	4x600
41-0FH85-1AA0	500 to 600	888	C 4x300 R 100x10	4x600	C 4x300 R 60x10	4x600	C 4x300 R 100x10	4x600
41-3FK85-1AA0	500 to 600	1119	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-3FK85-1AD0	500 to 600	1119	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-5FK85-1AA0	500 to 600	1306	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-5FK85-1AD0	500 to 600	1306	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-8FK85-1AA0	500 to 600	1633	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-8FK85-1AD0	500 to 600	1633	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
31-4HE85-1AA0	660 to 690	123	2x120	2x4/0	2x150	2x300	70	2/0
32-2HE85-1AA0	660 to 690	193	2x120	2x4/0	2x150	2x300	95	3/0
32-7HE85-1AA0	660 to 690	234	2x120	2x4/0	2x150	2x300	120	4/0
34-2HE85-1AA0	660 to 690	366	2x240	2x500	2x300	2x600	185	350
35-3HE85-1AA0	660 to 690	465	2x240	2x500	2x300	2x600	300	600
37-7HH85-1AA0	660 to 690	671	C 4x300 R 100x10	4x600	C 4x300 R 60x10	4x600	C 4x300 R 100x10	4x600
41-0HH85-1AA0	660 to 690	898	C 4x300 R 100x10	4x600	C 4x300 R 60x10	4x600	C 4x300 R 100x10	4x600
41-3HK85-1AA0	660 to 690	1119	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-3HK85-1AD0	660 to 690	1119	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-5HK85-1AA0	660 to 690	1306	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-5HK85-1AD0	660 to 690	1306	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-8HK85-1AA0	660 to 690	1633	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600
41-8HK85-1AD0	660 to 690	1633	C 4x300 R 100x10	4x600	C 6x300 R 100x10	6x600	C 4x300 R 100x10	4x600

Table 3.2 Connection cross-sections

1) C=Cable, R=Rail

2) American Wire Gauge

Unit Order No.	Mains supply fuses			
	Column 1 Siemens (SITOR)		Column 2 Bussmann US standard	
6SE70	A	Type	A	Type
22-1EC85-1AA0	32	3NE4101	40	170M3608
24-1EC85-1AA0	63	3NE4118	63	170M3610
28-6EC85-1AA0	125	3NE4122	125	170M3613
31-7EE85-1AA0	250	3NE3227	250	170M3616
32-2EE85-1AA0	315	3NE3230-0B	315	170M3617
33-1EE85-1AA0	450	3NE3233	450	170M3620
33-8EE85-1AA0	450	3NE3333	550	170M3622
34-6EE85-1AA0	560	3NE3335	700	170M4617
36-1EE85-1AA0	800	3NE3338-8	900	170M5615
22-7FC85-1AA0	40	3NE4102	50	170M3688
24-1FC85-1AA0	63	3NE4118	63	170M3689
27-2FC85-1AA0	100	3NE4121	125	170M3692
28-8FC85-1AA0	125	3NE3222	160	170M3693
31-5FE85-1AA0	160	3NE3224		—
32-4FE85-1AA0	315	3NE3230-0B		—
32-7FE85-1AA0	350	3NE3231	400	170M4693
33-5FE85-1AA0	450	3NE3333	550	170M6693
34-2FE85-1AA0	500	3NE3334-0B		—
35-4FE85-1AA0	630	3NE3336	800	170M6696
31-4HE85-1AA0	160	3NE3224		—
32-2HE85-1AA0	315	3NE3230-0B	350	170M6689
32-7HE85-1AA0	350	3NE3231		—
34-2HE85-1AA0	560	3NE3335		—
35-3HE85-1AA0	630	3NE3336	800	170M6696

Table 3.3 Recommended mains fuses

Table 3.3: Semiconductor protection only, lines are not reliably protected

CAUTION

Devices of sizes C and E require semiconductor protection fuses in the network incoming line to protect the semiconductors according to Table 3.3. For devices with integrated arm-circuit fuses (sizes H and K – see Table 3.5), no semiconductor protection is required outside the device.

Line protection must be ensured for all device types by assigning a suitable line protection element (e.g. fuse, line protection circuit-breaker) to the line cross-sectional area as defined in the currently valid standards – e.g. DIN VDE 0100 Part 430.

Unit Order No.	Built-in F10 DC link fuse				
	Siemens SITOR		Bussmann US standard		
6SE70	A	Type	A	Type	
22-1EC85-1AA0	32	3NE4101	35	170L3832	1)
24-1EC85-1AA0	63	3NE4118	80	170L3836	1)
28-6EC85-1AA0	125	3NE4122		—	
31-7EE85-1AA0	250	3NE3227	315	170M3696	
32-2EE85-1AA0	250	3NE3227	350	170M3697	
33-1EE85-1AA0	450	3NE3233	500	170M4695	
33-8EE85-1AA0	500	3NE3334-0B	630	170M4697	
34-6EE85-1AA0	560	3NE3335	800	170M5698	
36-1EE85-1AA0	800	3NE3338-8	1000	170M5700	
22-7FC85-1AA0	40	3NE4102	50	170L3834	1)
24-1FC85-1AA0	63	3NE4118	80	170L3836	1)
27-2FC85-1AA0	100	3NE4121	125	170L3838	1)
28-8FC85-1AA0	160	3NE4124		—	
31-5FE85-1AA0	200	3NE3225	250	170M3695	
32-4FE85-1AA0	315	3NE3230-0B	400	170M4693	
32-7FE85-1AA0	350	3NE3231	450	170M4694	
33-5FE85-1AA0	450	3NE3333	550	170M4696	
34-2FE85-1AA0	500	3NE3334-0B	700	170M5697	
35-4FE85-1AA0	710	3NE3337-8	900	170M5699	
31-4HE85-1AA0	200	3NE3225	250	170M3695	
32-2HE85-1AA0	315	3NE3230-0B	400	170M4693	
32-7HE85-1AA0	350	3NE3231	450	170M4694	
34-2HE85-1AA0	560	3NE3335	700	170M5697	
35-3HE85-1AA0	710	3NE3337-8	900	170M5699	

Table 3.4 Built-in DC link fuse

1) Not a US standard

Unit Order No.	Built-in branch fuses F11 to F26			
	Siemens SITOR		Bussmann US standard	
6SE70	A	Type	A	Type
38-2EH85-1AA0	630	3NE3336	700	170M4717
41-0EH85-1AA0	800	3NE3338-8	900	170M5715
37-7FH85-1AA0	560	3NE3335	630	170M5696
41-0FH85-1AA0	800	3NE3338-8	900	170M5699
37-7HH85-1AA0	560	3NE3335	630	170M5696
41-0HH85-1AA0	800	3NE3338-8	900	170M5699
	Built-in branch fuses F111 to F262			
41-3EK85-1AA0	630	3NE3336		—
41-3EK85-1AD0	630	3NE3336		—
41-8EK85-1AA0	800	3NE3338-8		—
41-8EK85-1AD0	800	3NE3338-8		—
41-3FK85-1AA0	560	3NE3335	630	170M5696
41-3FK85-1AD0	560	3NE3335	630	170M5696
41-5FK85-1AA0	710	3NE3337-8	630	170M5696
41-5FK85-1AD0	710	3NE3337-8	630	170M5696
41-8FK85-1AA0	800	3NE3338-8	800	170M5698
41-8FK85-1AD0	800	3NE3338-8	800	170M5698
41-3HK85-1AA0	560	3NE3335	630	170M5696
41-3HK85-1AD0	560	3NE3335	630	170M5696
41-5HK85-1AA0	710	3NE3337-8	630	170M5696
41-5HK85-1AD0	710	3NE3337-8	630	170M5696
41-8HK85-1AA0	800	3NE3338-8	800	170M5698
41-8HK85-1AD0	800	3NE3338-8	800	170M5698

Table 3.5 Built-in branch fuses

3.1.1 Short-circuit withstand capability for sizes H and K

In the event of a line-side short-circuit in front of the super-fast built-in fuses, the power fed in from the supply depends on the protective devices provided on the system-side (NH fuses or circuit-breakers).

To ensure that the forces and temperatures that result from short-circuits of this type can be kept within acceptable limits for the units, the following values calculated in accordance with DIN VDE 0660 Part 500 must be complied with by the supply and by the fuses or circuit-breakers connected before the unit.

Size H:

Rated short-time withstand current: I_{cw} = 27.86 kA / 1s or I_{cw} = 88.1 kA / 0.1s

Rated surge withstand current: I_{pk} =85 kA

The power rails must be mechanically buffered to absorb the short-circuit forces directly in front of their entry point into the unit.

Size K:

Rated short-time withstand current: I_{cw} = 69,86 kA / 1s or I_{cw} = 220 kA / 0.1s

Rated surge withstand current: I_{pk} =85 kA

The power rails must be mechanically buffered to absorb the short-circuit forces directly in front of their entry point into the unit.

NOTE
Because the quick-tripping semiconductor fuses are external on devices up to and incl. size E, no data is given about short-circuit capability for these devices.

Unit Order No.	Rated input		Regen.-	Commutating reactor			
				Type	Voltage / Frequency		Rated
	voltage	curr.	current				current
6SE70	(V)	(A)	(A)		(V / Hz)	(V / Hz)	(A)
22-1EC85-1AA0	380 to 480	18	20	4EP3700-7UK	400 / 50	460 / 60	18
24-1EC85-1AA0	380 to 480	36	40	4EP3900-5UK	400 / 50	460 / 60	35,5
28-6EC85-1AA0	380 to 480	74	82	4EU2451-4UA00	400 / 50	460 / 60	80
31-7EE85-1AA0	380 to 480	149	165	4EU2751-1UB00	400 / 50	460 / 60	160
32-2EE85-1AA0	380 to 480	192	212	4EU2751-2UB00	400 / 50	460 / 60	200
33-1EE85-1AA0	380 to 480	269	297	4EU3051-7UA00	400 / 50	460 / 60	280
33-8EE85-1AA0	380 to 480	326	360	4EU3051-8UA00	400 / 50	460 / 60	355
34-6EE85-1AA0	380 to 480	403	444	4EU3651-3UB00	400 / 50	460 / 60	400
36-1EE85-1AA0	380 to 480	526	581	4EU3651-4UB00	400 / 50	460 / 60	560
38-2EH85-1AA0	380 to 480	710	784	4EU3951-6UA00	400 / 50	460 / 60	710
41-0EH85-1AA0	380 to 480	888	980	4EU3951-1UB00	400 / 50	460 / 60	910
41-3EK85-1AA0	380 to 480	1156	1276	4EU4351-3UA00	400 / 50	460 / 60	1120
41-3EK85-1AD0	380 to 480	1156	1276	4EU4351-3UA00	400 / 50	460 / 60	1120
41-8EK85-1AA0	380 to 480	1542	1702	4EU4351-7UA00	400 / 50	460 / 60	1600
41-8EK85-1AD0	380 to 480	1542	1702	4EU4351-7UA00	400 / 50	460 / 60	1600
22-7FC85-1AA0	500 to 600	24	26	4EP3800-8UK	500 / 50		22,4
24-1FC85-1AA0	500 to 600	36	40	4EP4001-0UK	500 / 50		35,5
27-2FC85-1AA0	500 to 600	62	69	4EU2451-5UA00	500 / 50		63
28-8FC85-1AA0	500 to 600	82	90	4EU2551-1UB00	500 / 50		80
31-5FE85-1AA0	500 to 600	131	145	4EU2751-3UB00	500 / 50		140
32-4FE85-1AA0	500 to 600	203	224	4EU3051-0UB00	500 / 50		200
32-7FE85-1AA0	500 to 600	233	257	4EU3051-1UB00	500 / 50		250
33-5FE85-1AA0	500 to 600	307	339	4EU3651-5UB00	500 / 50		315
34-2FE85-1AA0	500 to 600	366	404	4EU3651-6UB00	500 / 50		400
35-4FE85-1AA0	500 to 600	465	514	4EU3651-7UB00	500 / 50		500
37-7FH85-1AA0	500 to 600	671	741	4EU3951-7UA00	500 / 50		710
41-0FH85-1AA0	500 to 600	888	980	4EU4351-5UA00	500 / 50		910
41-3FK85-1AA0	500 to 600	1119	1235	4EU4551-1UA00	500 / 50		1120

Unit Order No.	Rated input		Regen.-	Commutating reactor			
				Type	Voltage / Frequency		Rated
	voltage	curr.	current				current
6SE70	(V)	(A)	(A)		(V / Hz)	(V / Hz)	(A)
41-3FK85-1AD0	500 to 600	1119	1235	4EU4551-1UA00	500 / 50		1120
41-5FK85-1AA0	500 to 600	1306	1442	4EU4551-2UA00	500 / 50		1250
41-5FK85-1AD0	500 to 600	1306	1442	4EU4551-2UA00	500 / 50		1250
41-8FK85-1AA0	500 to 600	1633	1803	4EU4751-0UA00	500 / 50		1600
41-8FK85-1AD0	500 to 600	1633	1803	4EU4751-0UA00	500 / 50		1600
31-4HE85-1AA0	660 to 690	123	136	4EU2751-4UB00	690 / 50		125
32-2HE85-1AA0	660 to 690	193	213	4EU3051-2UB00	690 / 50		180
32-7HE85-1AA0	660 to 690	234	258	4EU3651-8UB00	690 / 50		224
34-2HE85-1AA0	660 to 690	366	404	4EU3951-8UA00	690 / 50		400
35-3HE85-1AA0	660 to 690	465	514	4EU3951-0UB00	690 / 50		500
37-7HH85-1AA0	660 to 690	671	741	4EU4351-6UA00	690 / 50		710
41-0HH85-1AA0	660 to 690	888	980	4EU4551-3UA00	690 / 50		910
41-3HK85-1AA0	660 to 690	1119	1235	4EU4751-1UA00	690 / 50		1120
41-3HK85-1AD0	660 to 690	1119	1235	4EU4751-1UA00	690 / 50		1120
41-5HK85-1AA0	660 to 690	1306	1442	4EU5051-0UA00	690 / 50		1250
41-5HK85-1AD0	660 to 690	1306	1442	4EU5051-0UA00	690 / 50		1250
41-8HK85-1AA0	660 to 690	1633	1803	4EU5251-0UA00	690 / 50		1600
41-8HK85-1AD0	660 bi 690	1633	1803	4EU5251-0UA00	690 / 50		1600

Table 3.6 Recommended commutating reactor

Unit Order No.	Rated input current	Feed-back current	Line voltage range ±15%		Autotransformer Duty factor	Autotransformer Duty factor
			Volt.	Freq..	100%	25%
6SE70	(A)	(A)	(V)	(Hz)		
22-1EC85-1AA0	18	20	380-415	50/60	4AP2795-0UA11-8A	4AP2595-0UA11-8A
			440-480	60	4AP2795-0UA21-8A	4AP2595-0UA21-8A
24-1EC85-1AA0	36	40	380-415	50/60	4AP3095-0UA11-8A	4AP2795-0UA01-8A
			440-480	60	4AP3095-0UA21-8A	4AP2795-0UA51-8A
28-6EC85-1AA0	74	82	380-415	50/60	4AU3995-0UA01-8A	4AP3095-0UA01-8A
			440-480	60	4AU3995-0UA11-8A	4AP3095-0UA71-8A
31-7EE85-1AA0	149	165	380-415	50/60	4BU4595-0UA01-8A	4AU3995-0UA51-8A
			440-480	60	4BU4395-0UA01-8A	4AU3695-0UA21-8A
32-2EE85-1AA0	192	212	380-415	50/60	4BU4595-0UA11-8A	4AU3995-0UA61-8A
			440-480	60	4BU4595-0UA21-8A	4AU3995-0UB01-8A
33-1EE85-1AA0	269	297	380-415	50/60	4BU4795-0UA01-8A	4BU4395-0UA41-8A
			440-480	60	4BU4795-0UA11-8A	4BU4395-0UA51-8A
33-8EE85-1AA0	326	360	380-415	50/60	4BU5295-0UA01-8A	4BU4595-0UA61-8A
			440-480	60	4BU5195-0UA01-8A	4BU4595-0UA71-8A

Unit Order No.	Rated input current	Feed-back current	Line voltage range ±15%		Autotransformer Duty factor	Autotransformer Duty factor
			Volt.	Freq..	100%	25%
6SE70	(A)	(A)	(V)	(Hz)		
34-6EE85-1AA0	403	444	380-415	50/60	4BU5395-0UA01-8A	4BU4795-0UA61-8A
			440-480	60	4BU5395-0UA11-8A	4BU4795-0UA71-8A
36-1EE85-1AA0	526	581	380-415	50/60	4BU5495-0UA11-8A	4BU5195-0UA31-8A
			440-480	60	4BU5495-0UA01-8A	4BU5195-0UA41-8A
38-2EH85-1AA0	710	784	380-415	50/60	4BU5695-0UA01-8A	4BU5395-0UA61-8A
			440-480	60	4BU5695-0UA11-8A	4BU5295-0UA41-8A
41-0EH85-1AA0	888	980	380-415	50/60	4BU5895-0UA01-8A	4BU5495-0UA21-8A
			440-480	60	4BU5895-0UA11-8A	4BU5495-0UA31-8A
41-3EK85-1AA0	1156	1276	380-415	50/60	4BU6095-0UA01-8A	4BU5695-0UA41-8A
			440-480	60	4BU5995-0UA01-8A	4BU5595-0UA31-8A
41-3EK85-1AD0	1156	1276	380-415	50/60	4BU6095-0UA01-8A	4BU5695-0UA41-8A
			440-480	60	4BU5995-0UA01-8A	4BU5595-0UA31-8A
41-8EK85-1AA0	1542	1702	380-415	50/60	4BU6295-0UA01-8A	4BU5895-0UA51-8A
			440-480	60	4BU6295-0UA71-8A	4BU5695-0UA51-8A
41-8EK85-1AD0	1542	1702	380-415	50/60	4BU6295-0UA01-8A	4BU5895-0UA51-8A
			440-480	60	4BU6295-0UA71-8A	4BU5695-0UA51-8A
22-7FC85-1AA0	24	26	500	50/60	4AP3095-0UA31-8A	4AP2795-0UA61-8A
			600	60	4AP3095-0UA51-8A	4AP2595-0UA01-8A
24-1FC85-1AA0	36	40	500	50/60	4AU3695-0UA41-8A	4AP2795-0UA71-8A
			600	60	4AP3695-0UA01-8A	4AP2795-0UA31-8A
27-2FC85-1AA0	62	69	500	50/60	4AU3995-0UA21-8A	4AP3095-0UA81-8A
			600	60	4AP3695-0UA11-8A	4AP3095-0UA61-8A
28-8FC85-1AA0	82	90	500	50/60	4AU3995-0UA31-8A	4AU3695-0UA31-8A
			600	60	4AU3995-0UA71-8A	4AU3095-0UA01-8A
31-5FE85-1AA0	131	145	500	50/60	4BU4595-0UA31-8A	4AU3995-0UB11-8A
			600	60	4BU4595-0UB11-8A	4UA3995-0UA41-8A
32-4FE85-1AA0	203	224	500	50/60	4BU4795-0UA21-8A	4BU4395-0UA61-8A
			600	60	4BU4795-0UB01-8A	4BU4395-0UA11-8A
32-7FE85-1AA0	233	257	500	50/60	4BU5195-0UA11-8A	4BU4595-0UA81-8A
			600	60	4BU5195-0UA61-8A	4BU4395-0UA21-8A
33-5FE85-1AA0	307	339	500	50/60	4BU5295-0UA11-8A	4BU4595-0UB01-8A
			600	60	4BU5295-0UA51-8A	4BU4595-0UA41-8A
34-2FE85-1AA0	366	404	500	50/60	4BU5395-0UA21-8A	4BU4795-0UA81-8A
			600	60	4BU5495-0UA51-8A	4BU4795-0UA41-8A
35-4FE85-1AA0	465	514	500	50/60	4BU5595-0UA01-8A	4BU5195-0UA51-8A
			600	60	4BU5595-0UA51-8A	4BU5195-0UA21-8A
37-7FH85-1AA0	671	741	500	50/60	4BU5895-0UA21-8A	4BU5495-0UA41-8A
			600	60	4BU5895-0UA71-8A	4BU5395-0UA41-8A
41-0FH85-1AA0	888	980	500	50/60	4BU6095-0UA11-8A	4BU5595-0UA41-8A
			600	60	4BU5995-0UA31-8A	4BU5595-0UA21-8A

Unit Order No.	Rated input current	Feed-back current	Line voltage range ±15%		Autotransformer Duty factor	Autotransformer Duty factor
			Volt.	Freq..	100%	25%
6SE70	(A)	(A)	(V)	(Hz)		
41-3FK85-1AA0	1119	1235	500	50/60	4BU6295-0UA11-8A	4BU5695-0UA61-8A
			600	60	4BU6295-0UA51-8A	4BU5695-0UA21-8A
41-3FK85-1AD0	1119	1235	500	50/60	4BU6295-0UA11-8A	4BU5695-0UA61-8A
			600	60	4BU6295-0UA51-8A	4BU5695-0UA21-8A
41-5FK85-1AA0	1306	1442	500	50/60	4BU6295-0UA21-8A	4BU5895-0UA61-8A
			600	60	4BU6295-0UA61-8A	4BU5895-0UA81-8A
41-5FK85-1AD0	1306	1442	500	50/60	4BU6295-0UA21-8A	4BU5895-0UA61-8A
			600	60	4BU6295-0UA61-8A	4BU5895-0UA81-8A
41-8FK85-1AA0	1633	1803	500	50/60	4BU6495-0UA01-8A	4BU5995-0UA21-8A
			600	60	4BU6395-0UA11-8A	4BU5995-0UA41-8A
41-8FK85-1AD0	1633	1803	500	50/60	4BU6495-0UA01-8A	4BU5995-0UA21-8A
			600	60	4BU6395-0UA11-8A	4BU5995-0UA41-8A
31-4HE85-1AA0	123	136	660-690	50/60	4BU4795-0UA31-8A	4BU4395-0UA31-8A
32-2HE85-1AA0	193	213	660-690	50/60	4BU5295-0UA21-8A	4BU4595-0UA51-8A
32-7HE85-1AA0	234	258	660-690	50/60	4BU5395-0UA31-8A	4BU4795-0UA51-8A
34-2HE85-1AA0	366	404	660-690	50/60	4BU5595-0UA11-8A	4BU5295-0UA31-8A
35-3HE85-1AA0	465	514	660-690	50/60	4BU5895-0UA31-8A	4BU5395-0UA51-8A
37-7HH85-1AA0	671	741	660-690	50/60	4BU6095-0UA21-8A	4BU5695-0UA31-8A
41-0HH85-1AA0	898	992	660-690	50/60	4BU6295-0UA31-8A	4BU5895-0UA41-8A
41-3HK85-1AA0	1119	1235	660-690	50/60	4BU6395-0UA01-8A	4BU5995-0UA11-8A
41-3HK85-1AD0	1119	1235	660-690	50/60	4BU6395-0UA01-8A	4BU5995-0UA11-8A
41-5HK85-1AA0	1306	1442	660-690	50/60	4BU6495-0UA11-8A	4BU6095-0UA31-8A
41-5HK85-1AD0	1306	1442	660-690	50/60	4BU6495-0UA11-8A	4BU6095-0UA31-8A
41-8HK85-1AA0	1633	1803	660-690	50/60	4BU6595-0UA01-8A	4BU6295-0UA41-8A
41-8HK85-1AD0	1633	1803	660-690	50/60	4BU6595-0UA01-8A	4BU6295-0UA41-8A

Table 3.7 Recommended autotransformers

3.2 Power supply and main contactor

The power supply and main contactor control circuit are connected through five-pin connector X9 (sizes C and E: on module A23, sizes H and K: at the bottom-left of the unit)

Single-core cables with conductor cross-sections of 0.2 to 2.5 mm^2 (AWG: 24 to 14) can be connected to X9 (finely stranded 1.5 mm^2 with core end ferrules).

The main contactor is driven over isolated contacts X9.4 and X9.5.

Technical specifications of main contact control circuit: 230V~
Size C: max. 3A~ at p.f.≥0.4; max. making capacity 1500VA; with switching voltage of 30 V DC, max 5A DC
Size E, H, K: max. 5A~ at p.f.≥0.4; max. making capacity 3000VA; with switching voltage of 30 V DC, max 8A DC

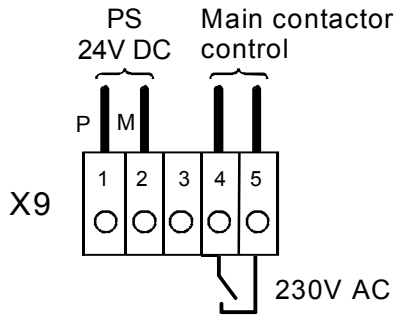


Figure 3.3 24 V DC and main contactor control connections

Terminal	Function description
X9-1	DC +24V (tolerance range 20V - 30V) max. current consumption 2A at +24V max. current consumption without options: 1A for basic unit (master) 0.3A for parallel unit (slave)
X9-2	Reference potential for DC X9-1
X9-3	not connected (N.C.)
X9-4	Main contactor control circuit
X9-5	Main contactor control circuit

Table 3.8 Connector X9 pin assignments for auxiliary power supply and main contactor control

Terminal X9.1 fused with fuse (F1) T2A/250V time-lag 5x20mm
(19198-T2A/250V Messrs. Wickmann-Werke GmbH or 0034.3993 FSD Messrs. Schurter)

and for parallel unit via connector x27 (for size K):

fused with fuse (F5) T2A/250V time-lag 5x20mm
(19198-T2A/250V Messrs. Wickmann-Werke GmbH or 0034.3993 FSD Messrs. Schurter)

Terminal X9.2 Sizes C and E:
fused with fuse (F2) T3.2A/250V time-lag 5x20mm
(19198-T3,2A/250V Messrs. Wickmann-Werke GmbH or 0034.3998 FSD Messrs. Schurter)

Sizes H and K:
fused with fuse (F2) T7A/250V time-lag 6.3x32mm (¼“ x 1¼“)
(19343-T7A/250V Messrs. Wickmann-Werke GmbH and/or 0034.5243 FST Messrs. Schurter)

NOTICE
The main contactor’s operating coil must be protected, for example, by RC elements (Chapter 9). See also Warnings in Chapter 3.1 after Table 3.1 with regard to isolating transformer feed-in.

3.3 Control terminal block and serial interface

WARNING

The rectifier/regenerating unit must be isolated before connecting the control leads to the CUR.

You can control the rectifier/regenerating unit over the following interfaces:

- Control terminal block on the CUR electronic module
- RS 485 serial interface on the CUR electronic module
- Operator panel OP1S (see Chapter 9 Options)
- RS485 and RS232 serial interface on the PMU X300

CAUTION

The CUR incorporates ESD-endangered components that may be destroyed if improperly handled.

See also under the measures recommended to protect ESD-endangered components in the introductory chapter entitled "General".

3.3.1 Connectors for the control terminal block

Conductors with cross-sectional areas of 0.14 to 1.5 mm^2 (AWG: 26 to 16), or 1 mm^2 (AWG: 18), finely stranded with core end ferrules, can be connected to the connectors (Recommended: 0.5 mm^2 (AWG: 20)).

3.3.2 Connecting the control leads

NOTICE

When installed, control leads must be shielded and isolated from the power cables, laying them at a minimum spacing of 20 cm. The shield must be connected at both ends. On the unit's housing, the shield is connected with shield clamps. Handling of these clamps is shown in Figure 3.6.

If they intersect, control and power cables must be run at an angle of 90° to each other.

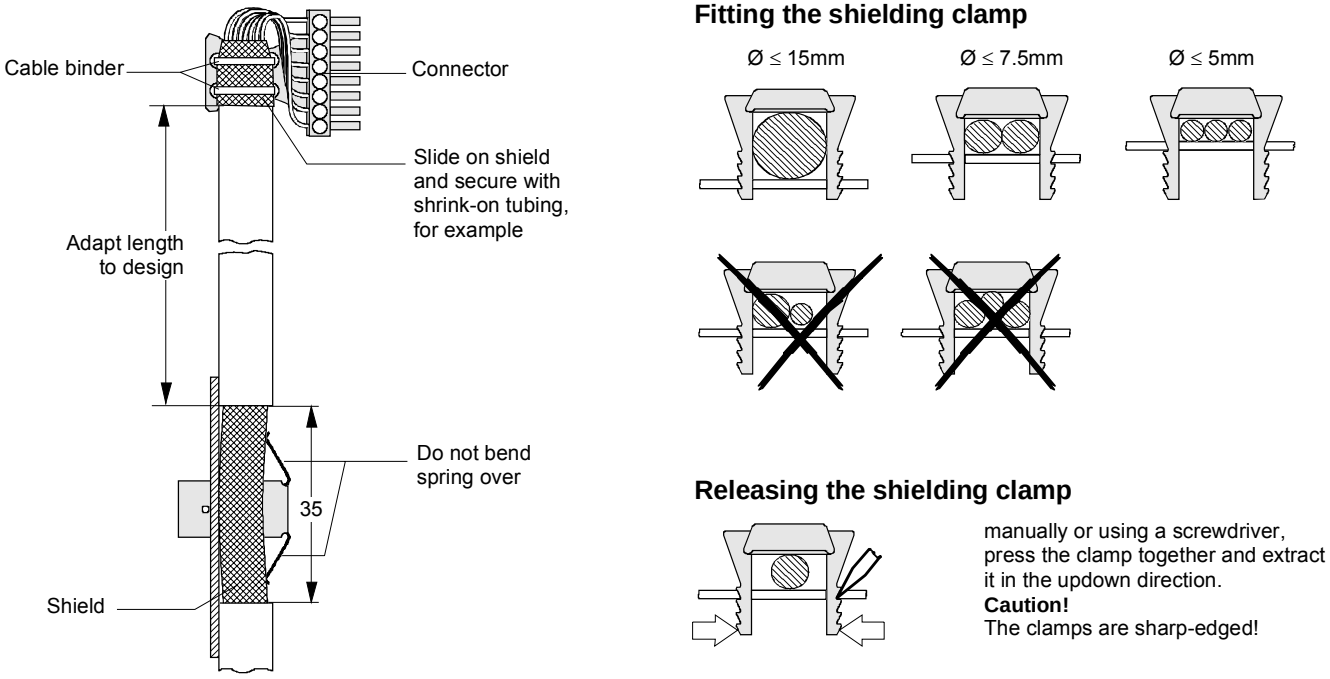


Figure 3.6 Connecting the control leads and handling the shielding clamps

If two shielding clamps cannot cope with the number of control leads on the Size C unit, the "EMC shielding enclosure" option should be used.

Order number:

- Size C 6SE7090-0XC87-3CA0

3.3.3 Terminals and setting elements on the CUR (A10) module

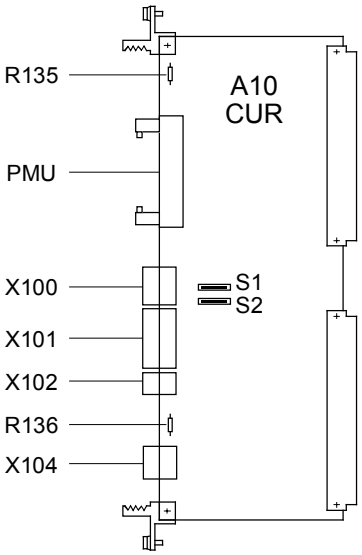


Figure 3.7 Control terminals and setting elements on the CUR

Setting elements:

- DIP switches S1, S2: Both open: No bus termination for the RS485 interface (terminals X100-1 to X100-4)
  Both closed: Bus termination for the RS485 interface active (1500Ω between RS485P and RS485N, 3900Ω from RS485P to +5V supply, 390Ω from RS485N to earth)
  Note: Application: When using the optional operator panel OP1S at the basic device interface SST1 (X100 or X300), DIP switches S1 and S2 must be closed.
- R135 and R136: 0Ω resistances as earth-frame (M) connection
  M is connected to earth when the unit is supplied. Remove these resistances only to avoid faults due to earth loops, i.e. if the electronics frame is connected in some other way to earth (e.g. through signal leads or the frame terminal of the power supply unit). If option modules are used, a further earth-frame (M) connection may have to be removed. (please refer to the description of these modules).

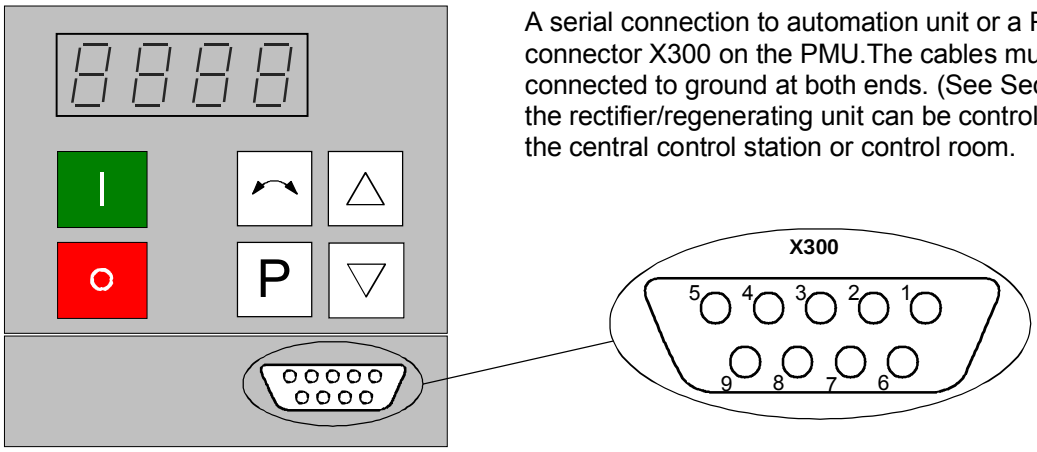
Electronics terminals:

Function	Terminal	Connected loads/Description
Serial interface RS485 (Bus)	X100-1 X100-2 X100-3 X100-4 X100-5	RS485P Plus line } Send and receive- RS485N Minus line } line RS485P Plus line } (difference input/output) RS485N Minus line } Signal frame For functions see Section 4.3.6.1
Binary inputs	X101-6 X101-7 X101-8 X101-9 X101-10 X101-11 X101-12 X101-13	P24S +24V power supply for external contacts, max. load 100mA Frame for binary signals Frame for binary signals Binary input 1 Binary input 2 Binary input 3 Binary input 4 Binary input 5 Low level: -0.6V - 3V or floating terminals High level: 13V - 33V Input current at 24V: ca. 10mA For functions see Section 4.3.2
Analog outputs	X102-14 X102-15 X102-16	Analog output resolution ±8 bits, For functions see Section 4.3.5 Frame for analog outputs Actual current value: 0V - ±5V corresponds to 0A - ± rated DC current Display range: 0 - ±10V, max. 5mA load, current limited

Function	Terminal	Connected loads/Description
Binary outputs	X104-17 X104-18 X104-19 X104-20	Binary output 1, pin 1 Binary output 1, pin 2 Binary output 2, pin 1 Binary output 2, pin 2 The binary outputs are normally-open relay contacts At 50V AC max. switching voltage, the following applies: Max. switching current 1A~ at p.f. =1 Max. switching current 0.12A AC at p.f. = 0.4 At max. 30V DC switching voltage, the following applies:: Max. switching current 0.8A (resistive loads) For functions see Section 4.3.3 and 4.3.1.2 (status word)

Table 3.9 Control terminal block

3.3.4 Connecting-up the parameterizing unit (PMU)



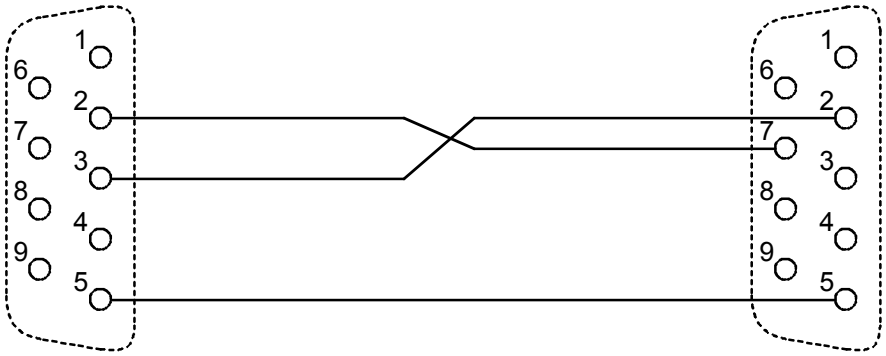
A serial connection to automation unit or a PC can be realized via connector X300 on the PMU.The cables must be shielded and connected to ground at both ends. (See Sec. 3.3.2). Thus, the rectifier/regenerating unit can be controlled and operated from the central control station or control room.

Figure 3.8 Parameterizing unit (PMU)

PMU -X300	Description
1	Housing ground
2	Receive line, RS232 standard (V.24)
3	Transmit- and receive line, RS485, two-wire, positive differential input/output
4	RTS (Request to send; for direction reversal in the case of interface converters
5	Ref. potential (ground)
6	5 V power supply for OP1S
7	Transmit line, RS232 standard (V.24)
8	Transmit- and receive line RS485, two-wire, negative differential input/output
9	Ref. potential for RS232 or RS485 interface

Table 3.10 Connector pin assignment for interface X300

Pin assignment for interface cable X300:



on PC, COMx: male
on cable: female

on 6SE70 device, X300: female
on cable: male

3.4 Measures for keeping to RFI suppression regulations

So that you can observe the radio interference regulations, you must note the following points:

- **Grounding**
  The converter necessarily generates radio interference as it functions. It is necessary to return them to source via a connection with as low resistance as possible (cross-sectional area of ground connection ≥ cross-sectional area of network connection).
  Use the best grounding opportunity when installing the rectifier/regenerating unit and optional radio interference suppression filters (e.g. mounting plate, grounding cable, ground bus). Interconnect all conductive housings with a large contact surface.
  For interference suppression not only the cross-sectional area (observe safety regulations in case of fault), but especially the contact surface is important because high-frequency interference currents do not flow through the entire cross-sectional area but mainly along the outside skin of a conductor.
- **Shielding**
  To reduce interference and observe the radio interference suppression levels,
  - shielded cable must be used between the converter output and the motor and
  - shielded control cables laid.

  The shield must be connected to ground potential at both ends.
- **Filters**
  The radio interference filters must be connected before the infeed unit. The housings must be interconnected conductively.

To observe the radio interference suppression regulations, A1 interference suppression filters are recommended.

NOTICE
Perform hipot tests on systems with radio interference suppression filters with direct voltage because of the filter capacitors! Control cables that are directly connected with the converter are always shielded so that the highest possible interference immunity is achieved. The shield must be grounded at both ends. To avoid coupled interference, control cables directly connected to the device must be routed separately from power cables. Minimum distance 20 cm. If converters are installed in systems by authorized workshops, interference immunity can be ensured by other suitable wiring practices. See also "SIMOVERT MASTERDRIVES Installation instructions for design of drives in conformance with EMC regulations“ under "Documentation" on the DriveMonitor CD-ROM of the inverter or converter "compendium" Chapter 3.

3.5 Single-line diagrams with suggested circuit arrangements

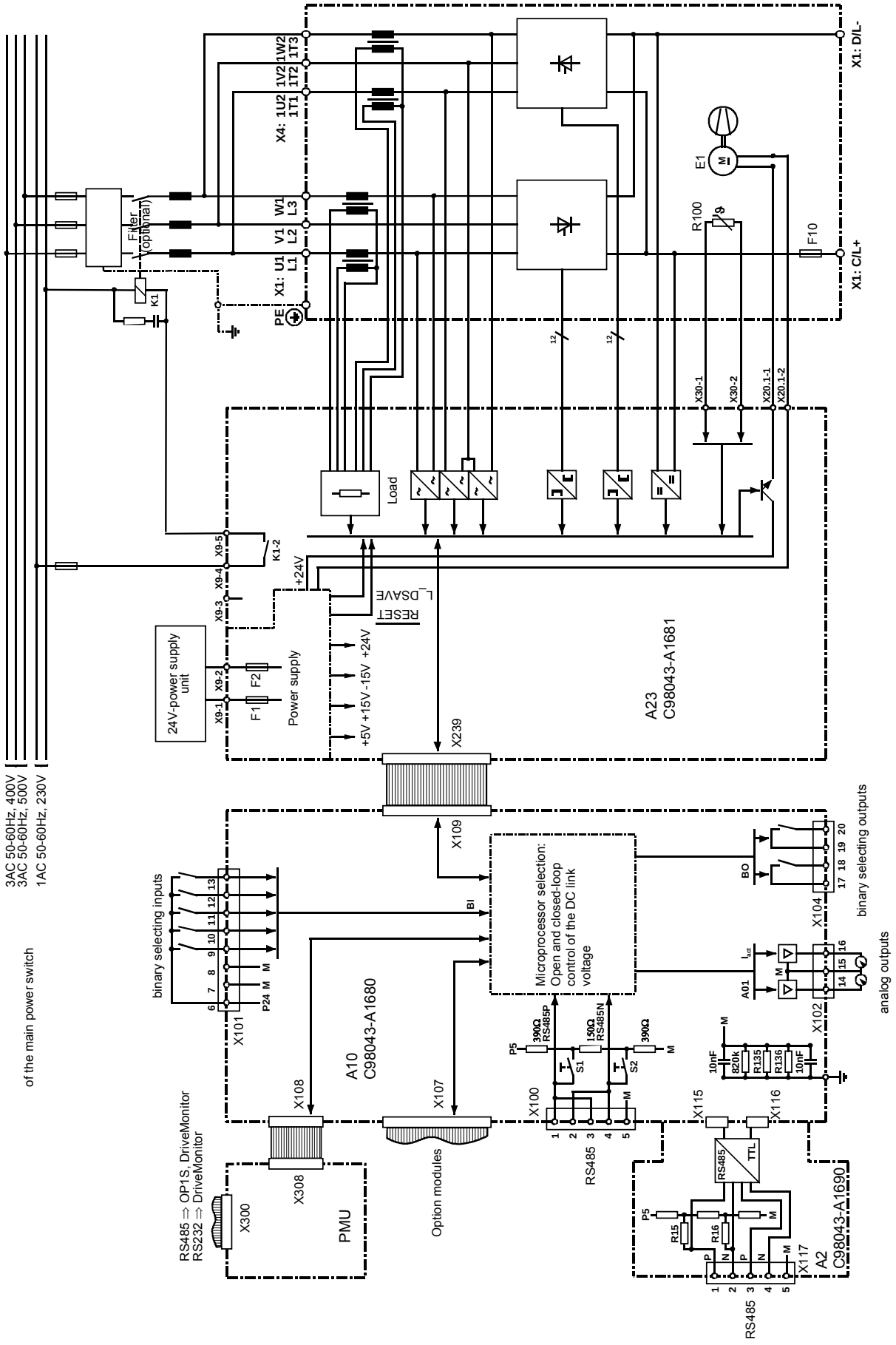


Figure 3.9 Single-line diagram with suggested circuit arrangement without autotransformer, Size C

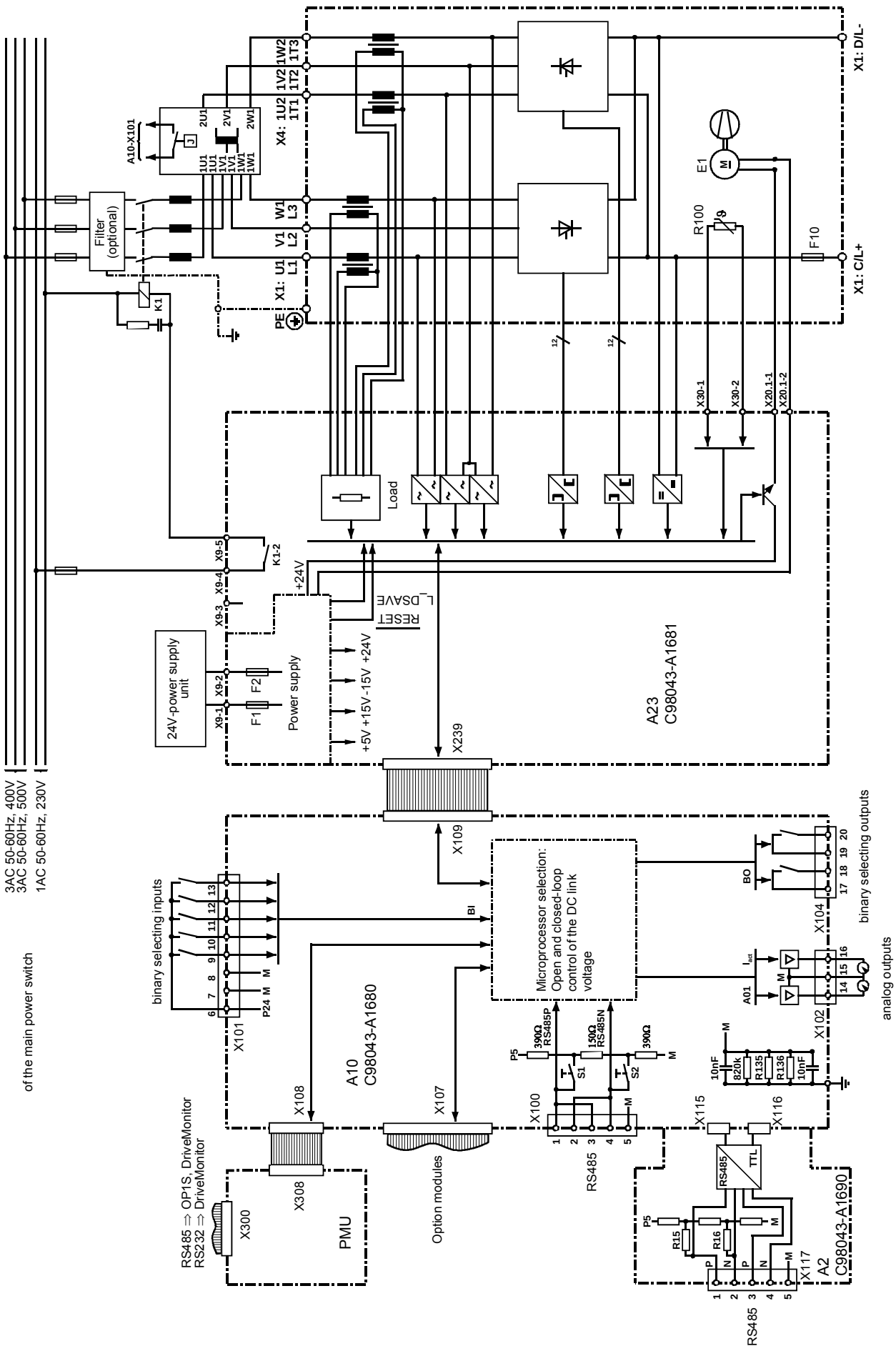


Figure 3.10 Single-line diagram with suggested circuit arrangement with autotransformer, Size C

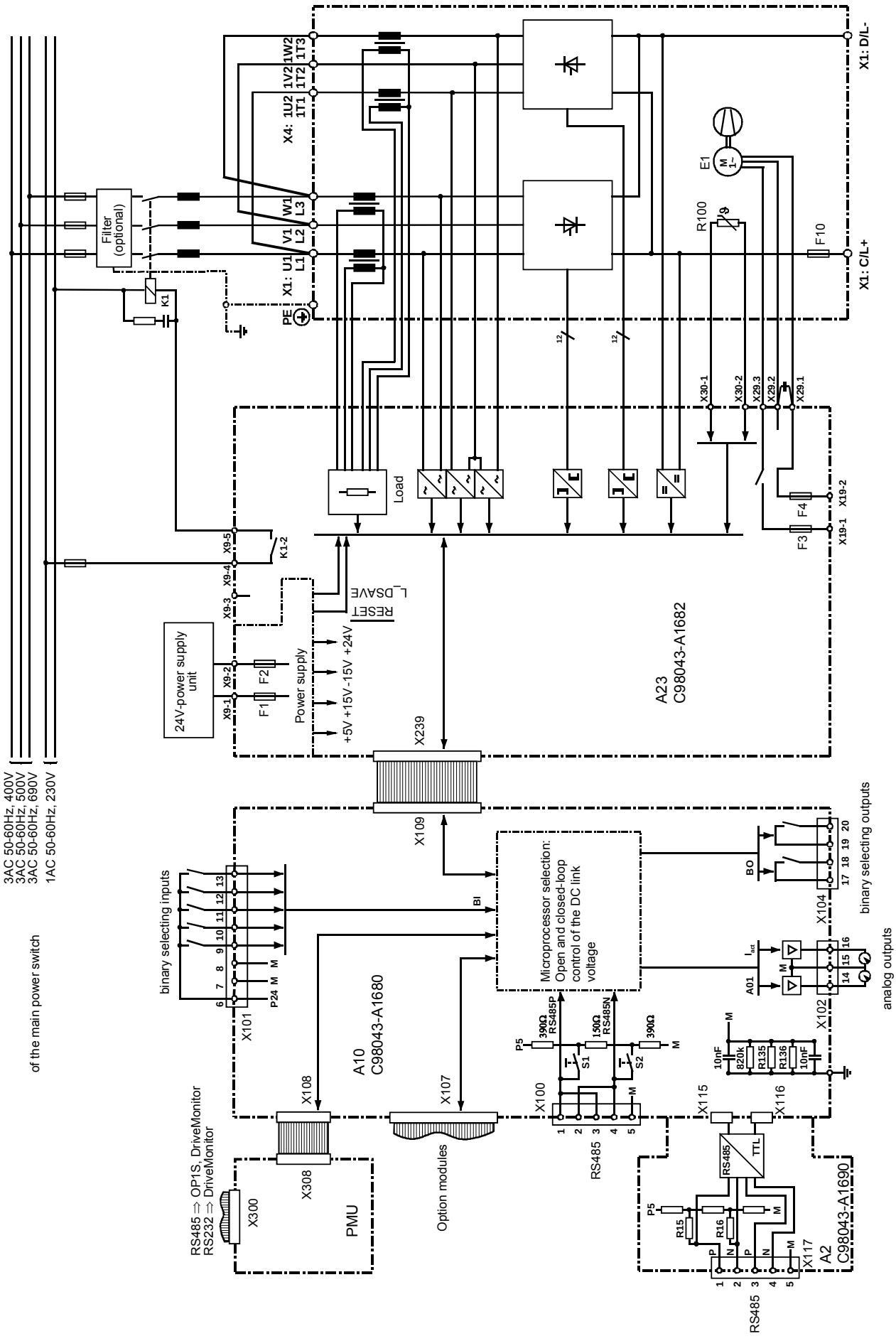


Figure 3.11 Single-line diagram with suggested circuit arrangement without autotransformer, Size E

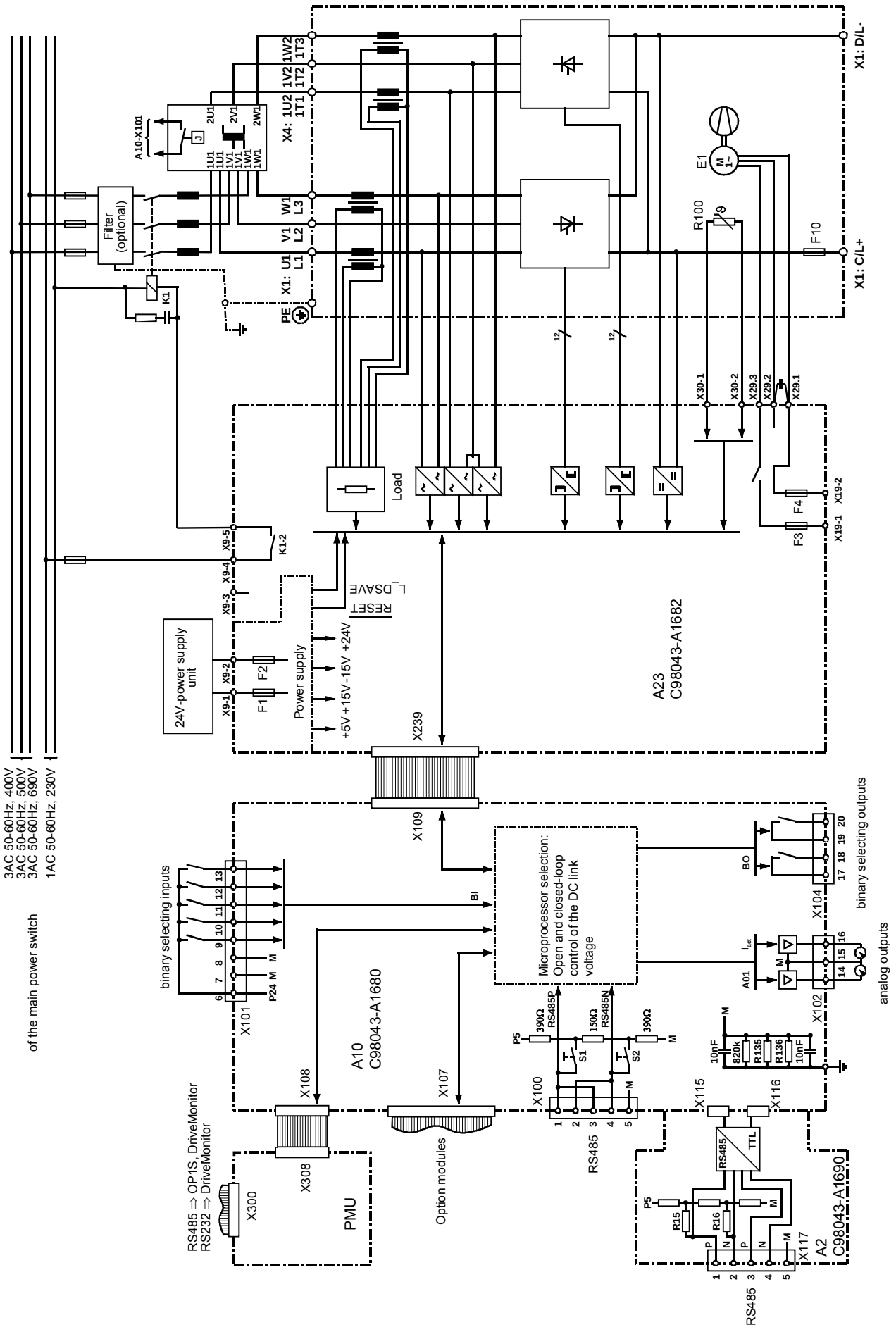


Figure 3.12 Single-line diagram with suggested circuit arrangement with autotransformer, Size E

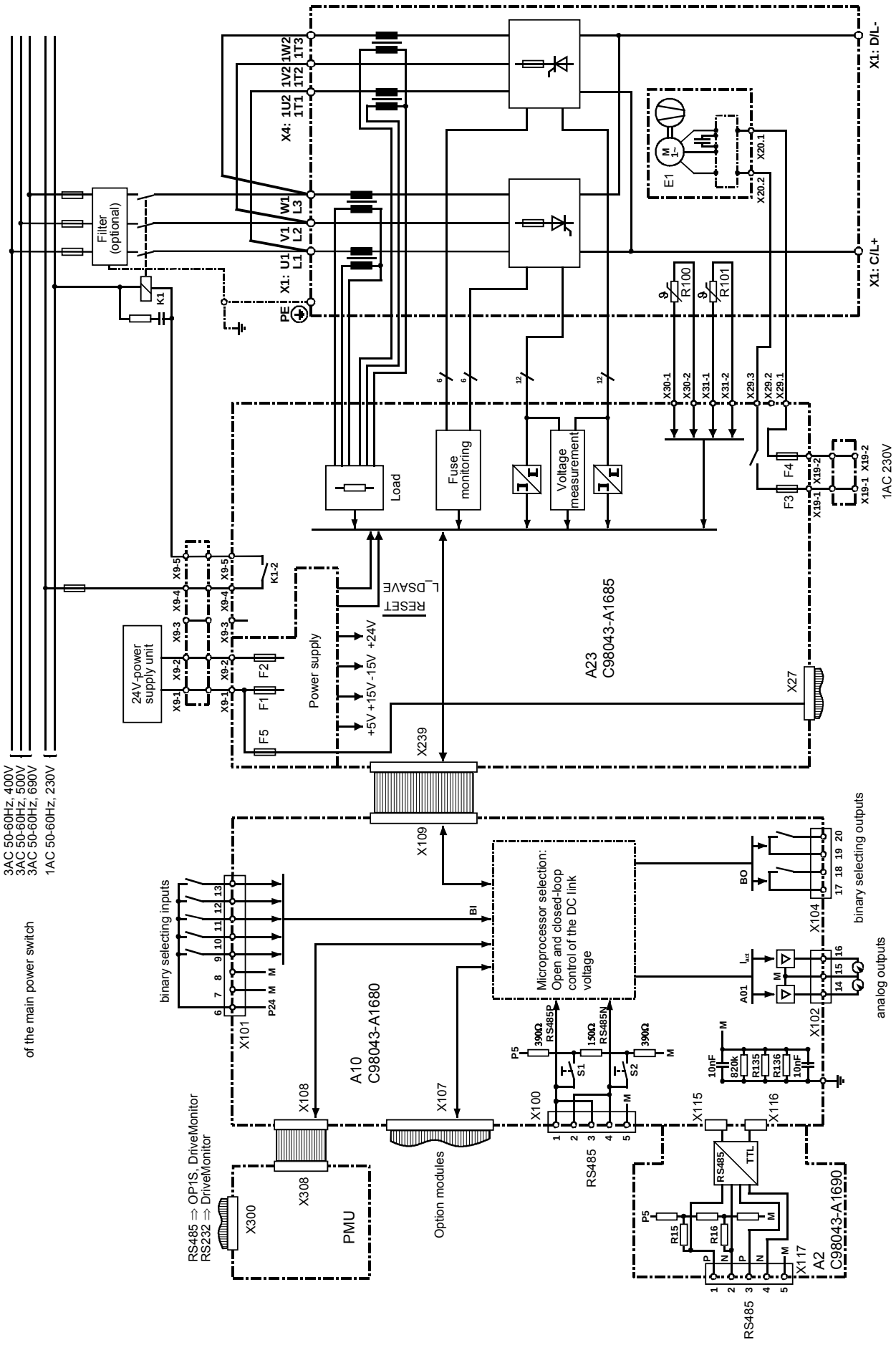


Figure 3.13 Single-line diagram with suggested circuit arrangement without autotransformer, Size H

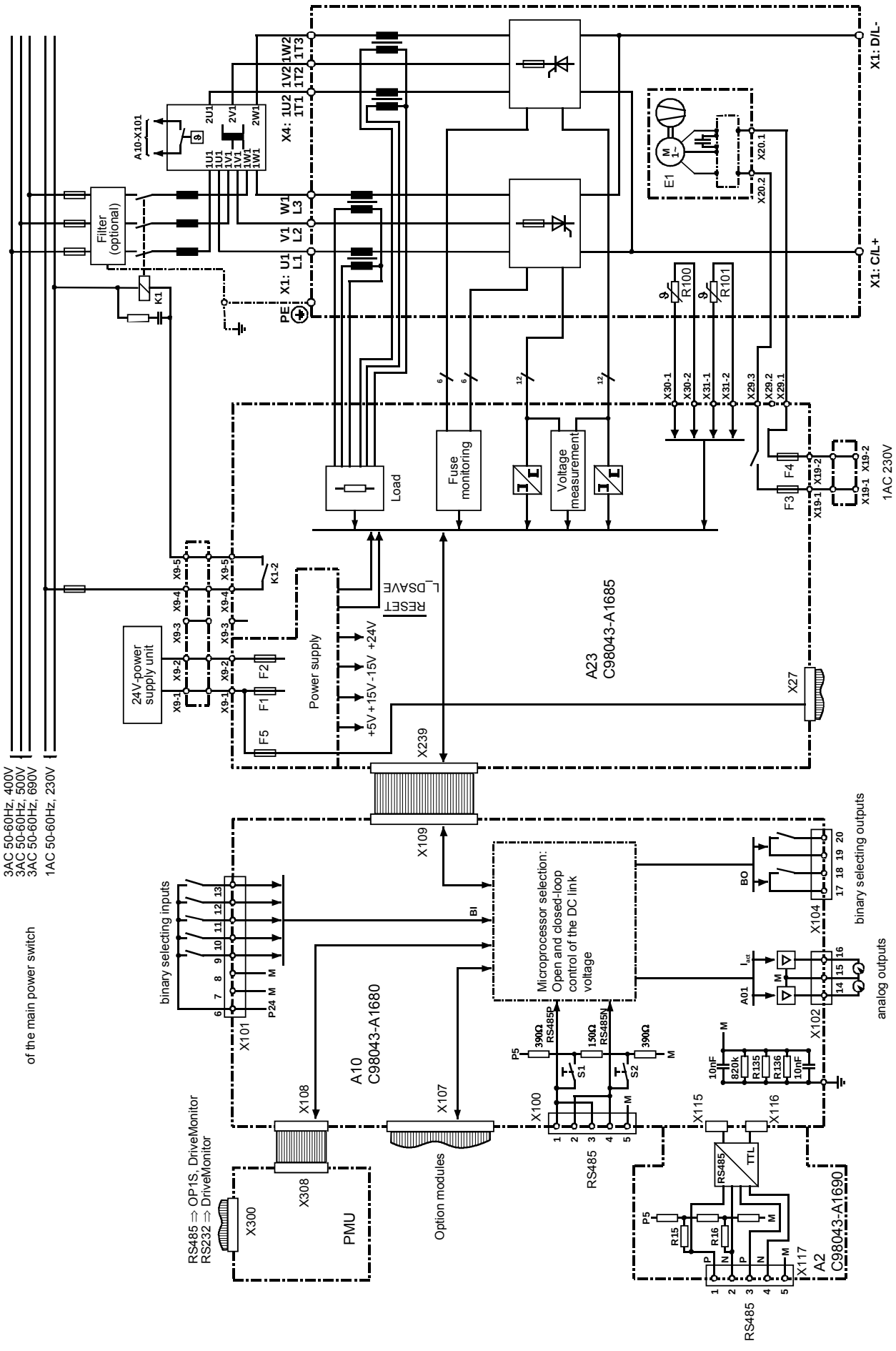


Figure 3.14 Single-line diagram with suggested circuit arrangement with autotransformer, Size H

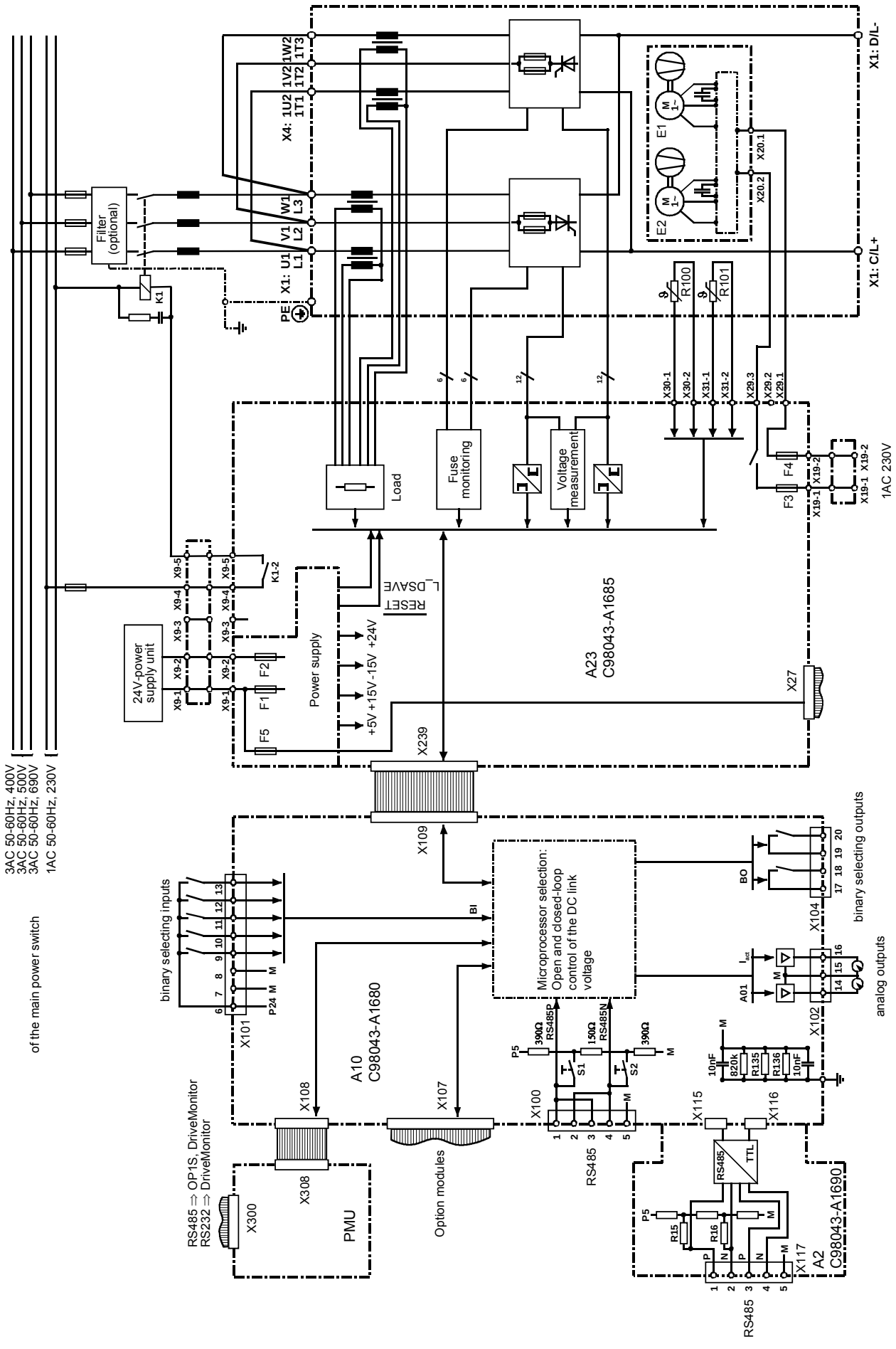


Figure 3.15 Single-line diagram with suggested circuit arrangement without autotransformer, Size K

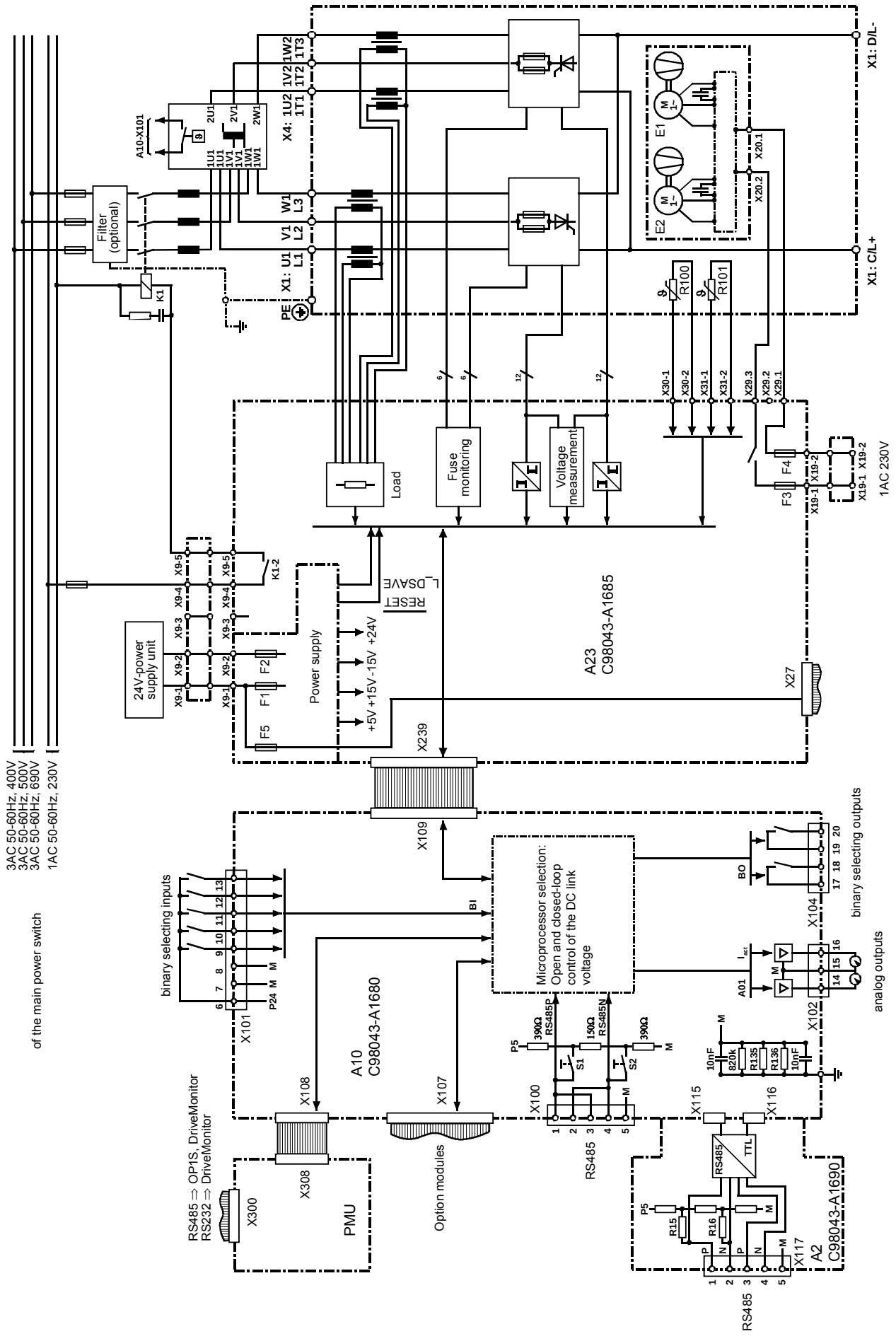


Figure 3.16 Single-line diagram with suggested circuit arrangement with autotransformer, Size K

3.6 Power sections

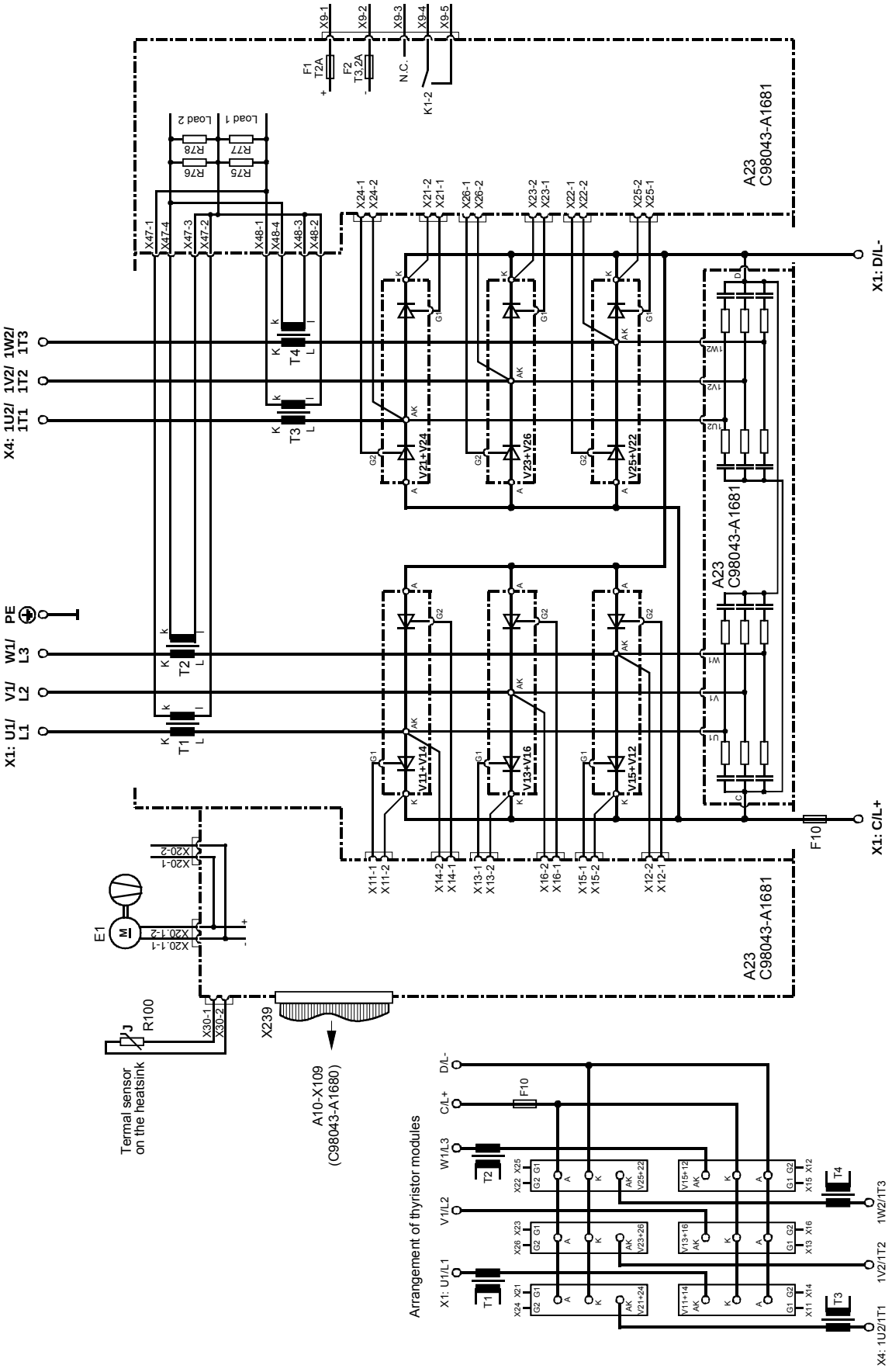


Figure 3.17 Power section, 6SE7022-1EC85-1AA0, 6SE7024-1EC85-1AA0 and 6SE7028-6EC85-1AA0,(380-480V / 21A, 41A and 86A)

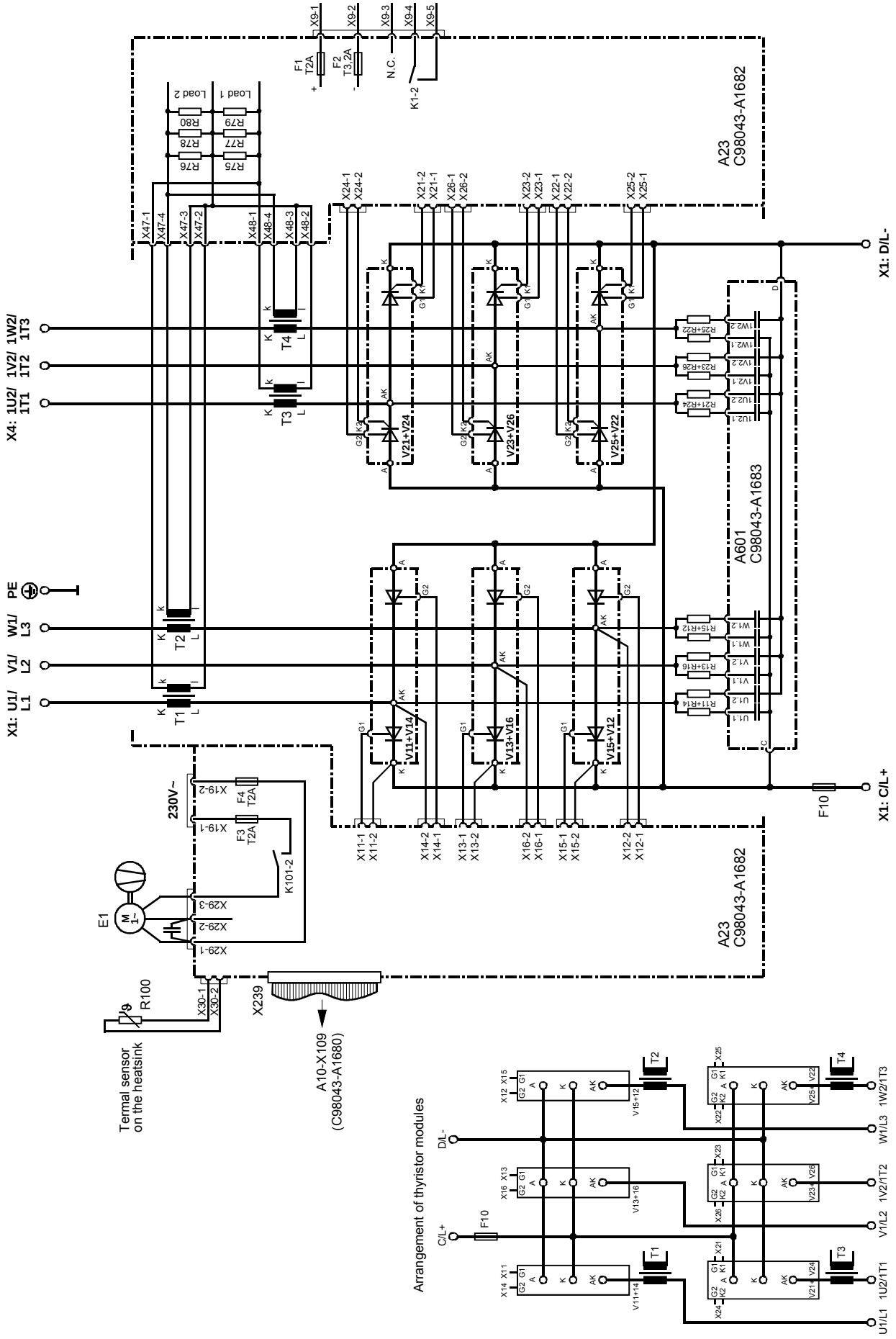


Figure 3.18 Power section, 6SE7031-7EE85-1AA0 (380-480V / 173A)

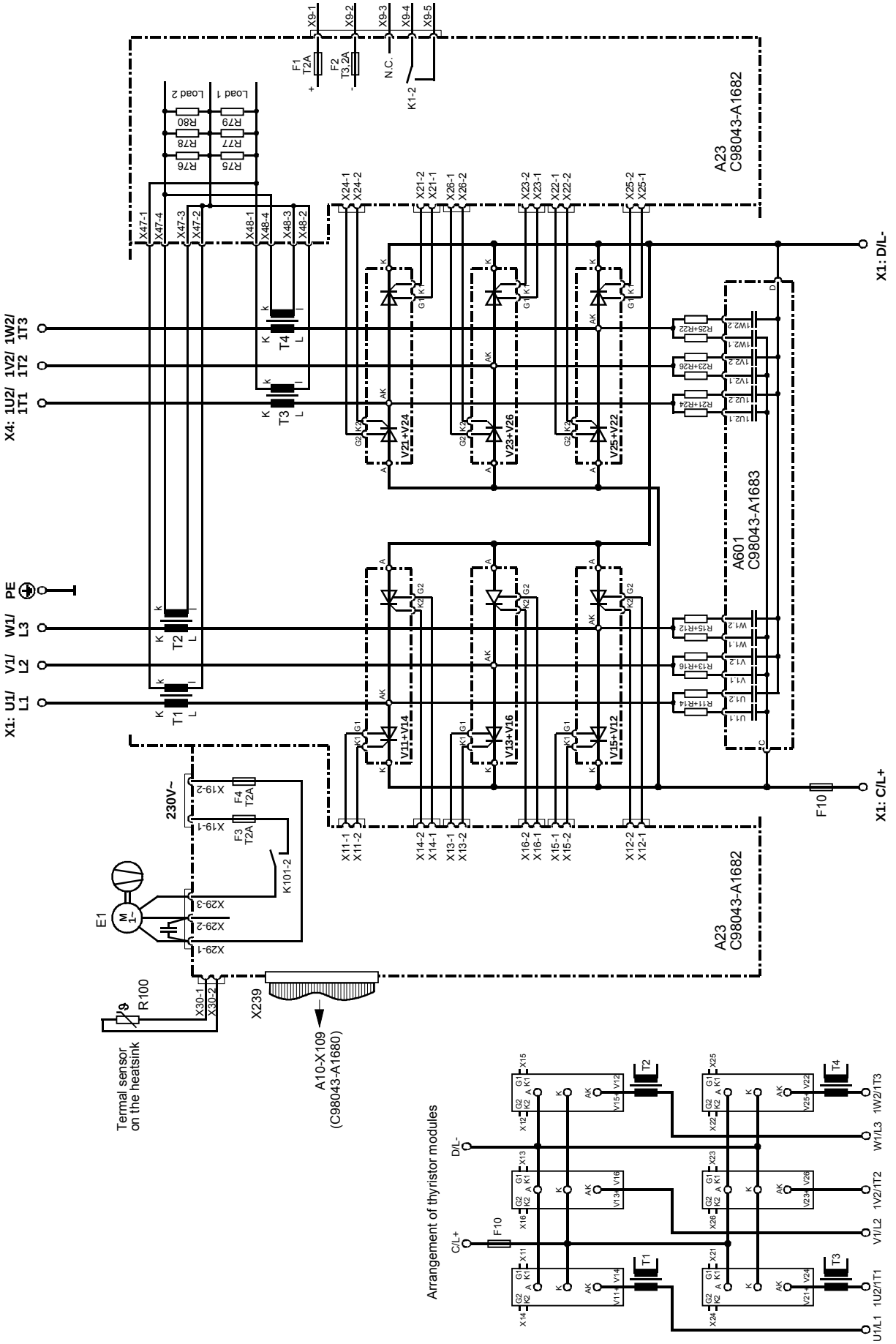


Figure 3.19 Power section, 6SE7032-2EE85-1AA0 (380-480V / 222A)

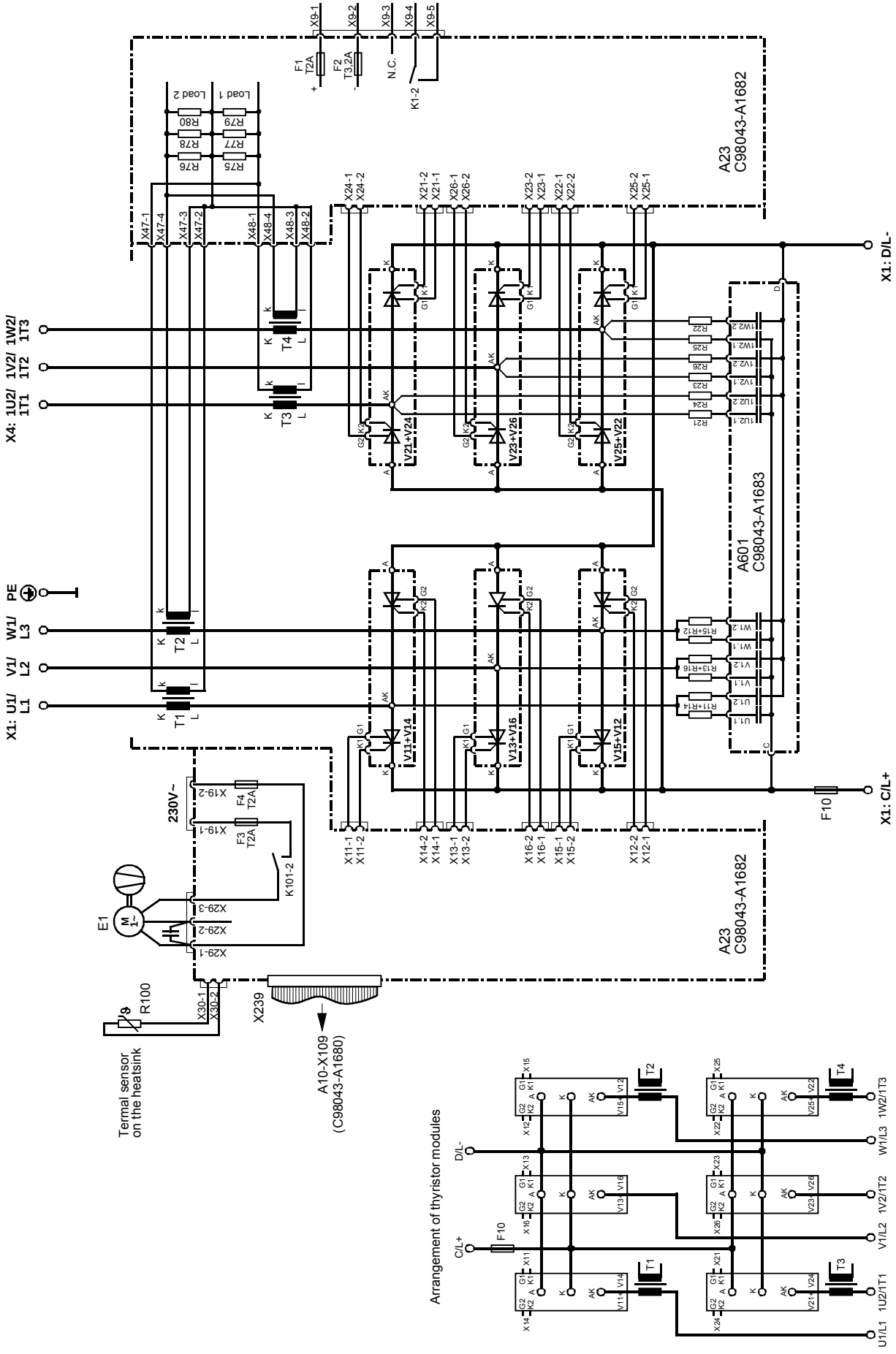


Figure 3.20 Power section, 6SE7033-1EE85-1AA0 (380-480V / 310A)

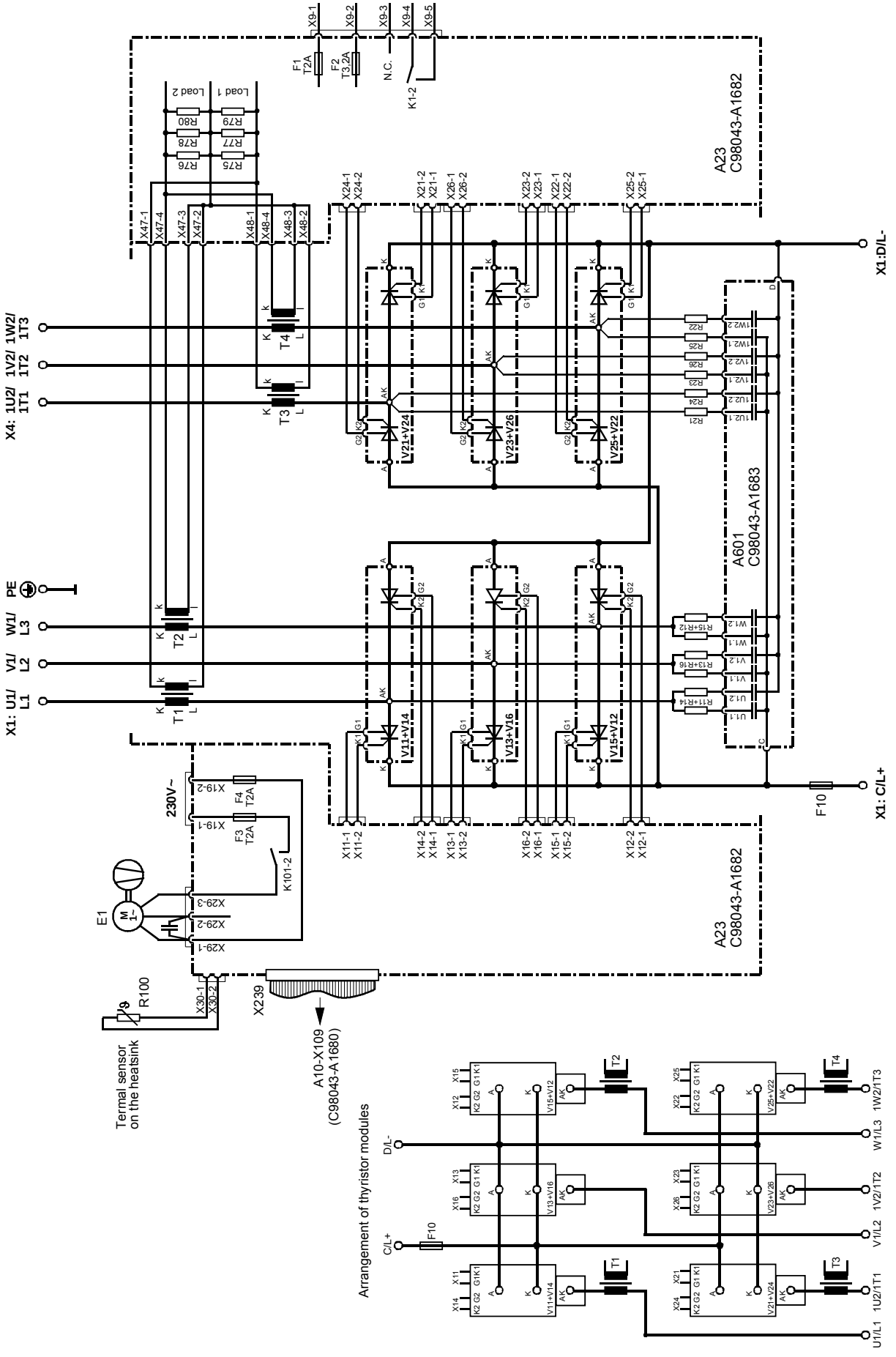


Figure 3.21 Power section, 6SE7033-8EE85-1AA0 and 6SE7034-6EE85-1AA0 (380-480V / 375A and 463A)

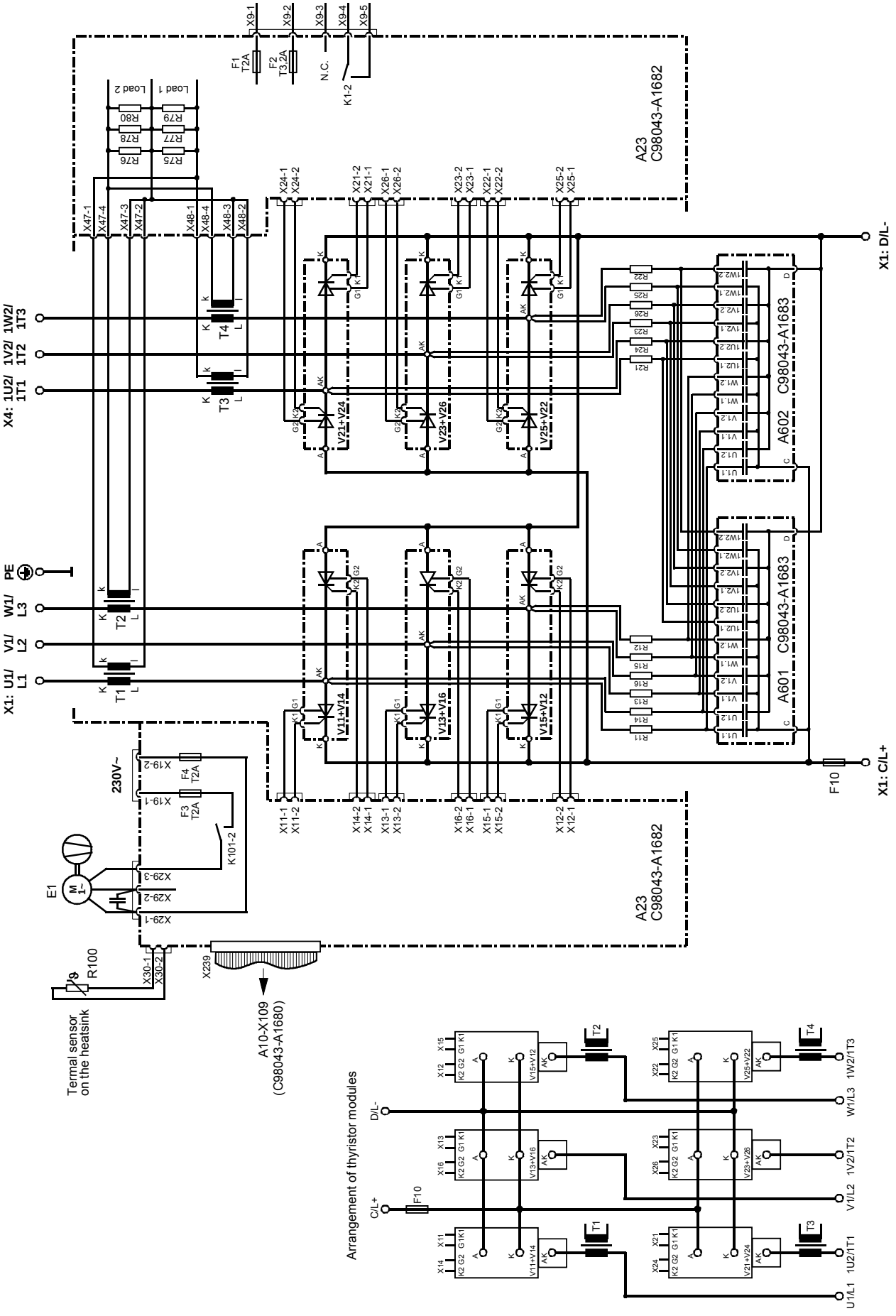


Figure 3.22 Power section, 6SE7036-1EE85-1AA0 (380-480V / 605A)

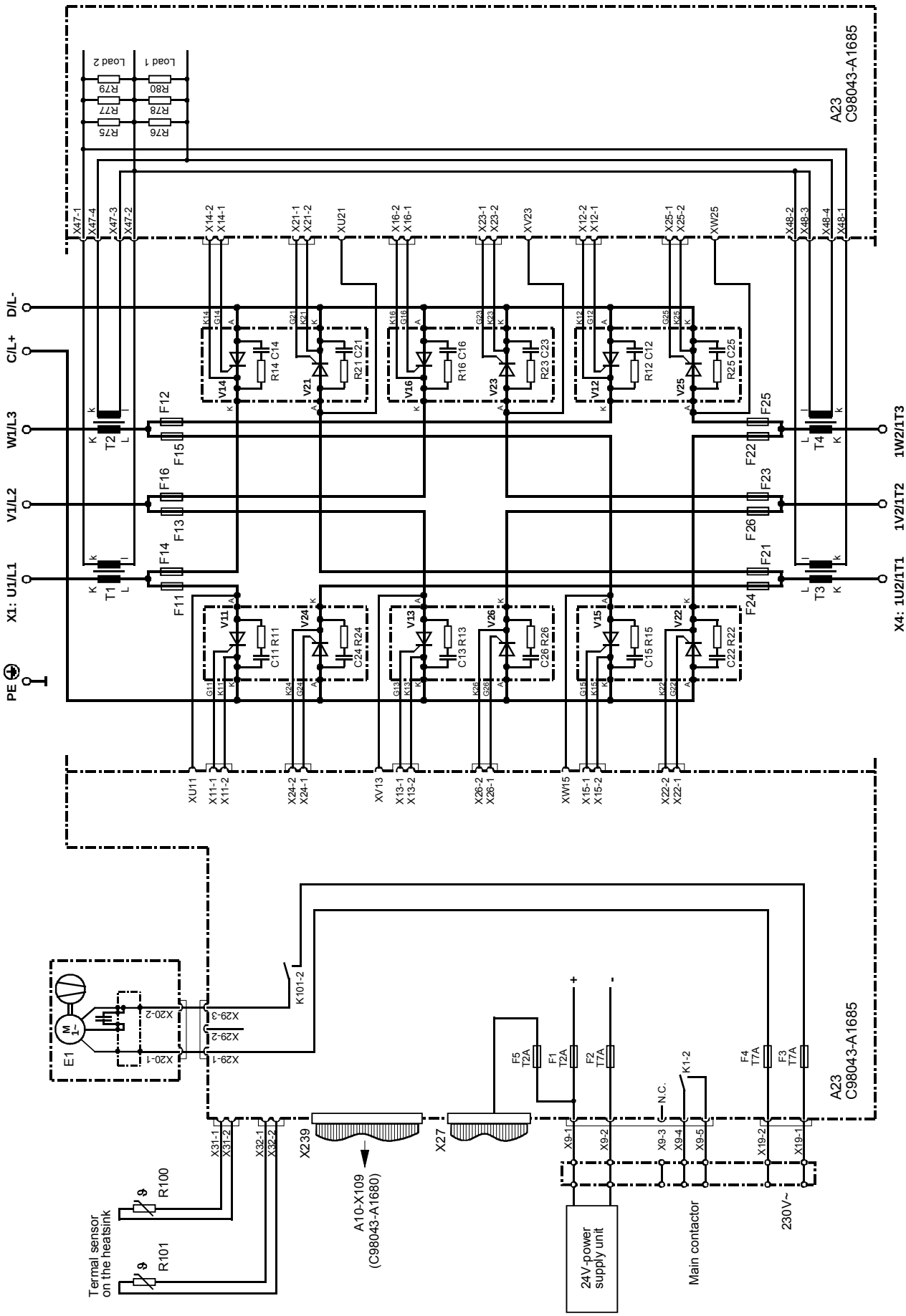


Figure 3.23 Power section, Size H

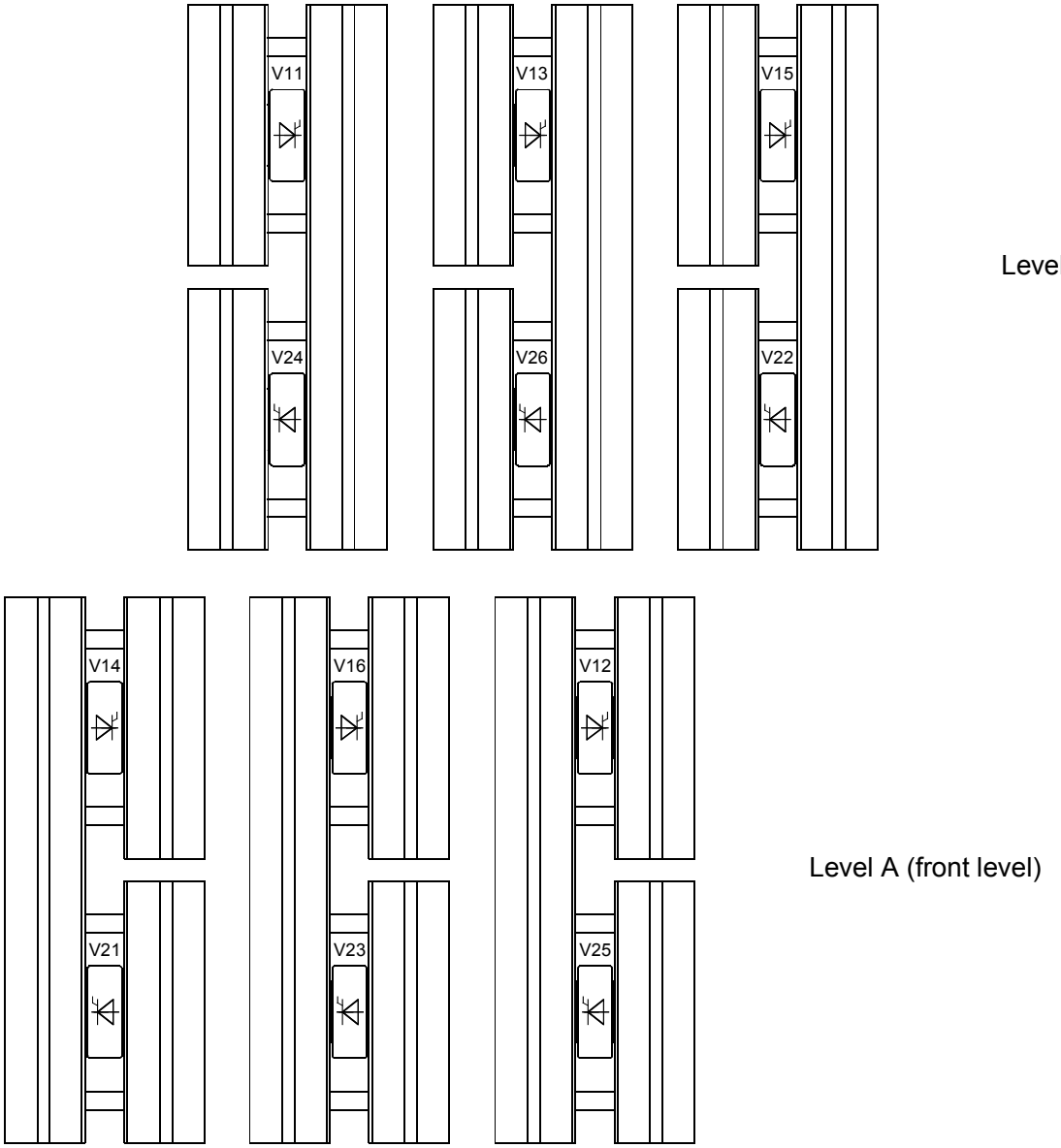


Figure 3.24 Arrangement of the thyristor blocks, Size H (see dimension drawing in Section 2.4)

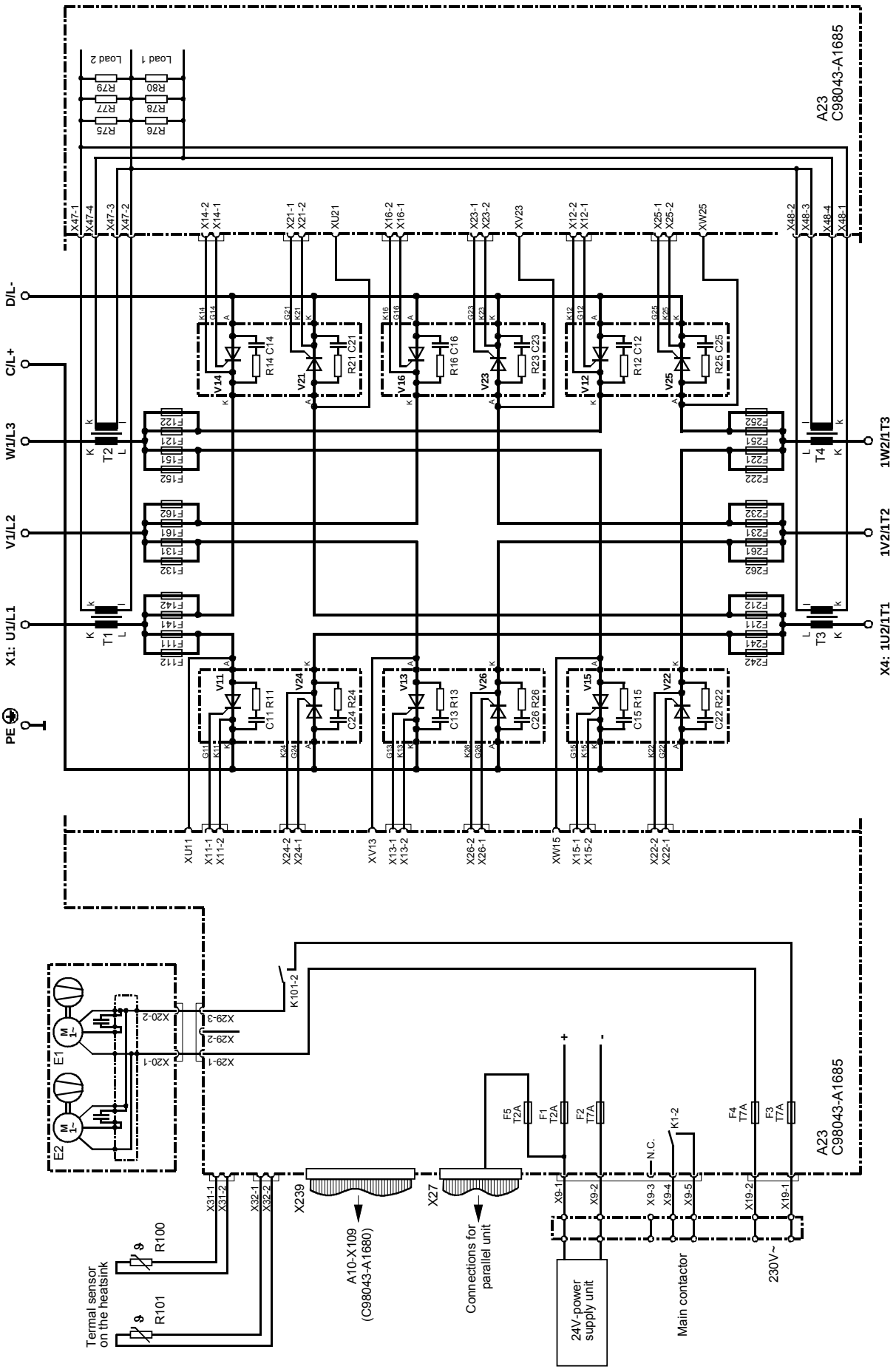


Figure 3.25 Power section, Size K

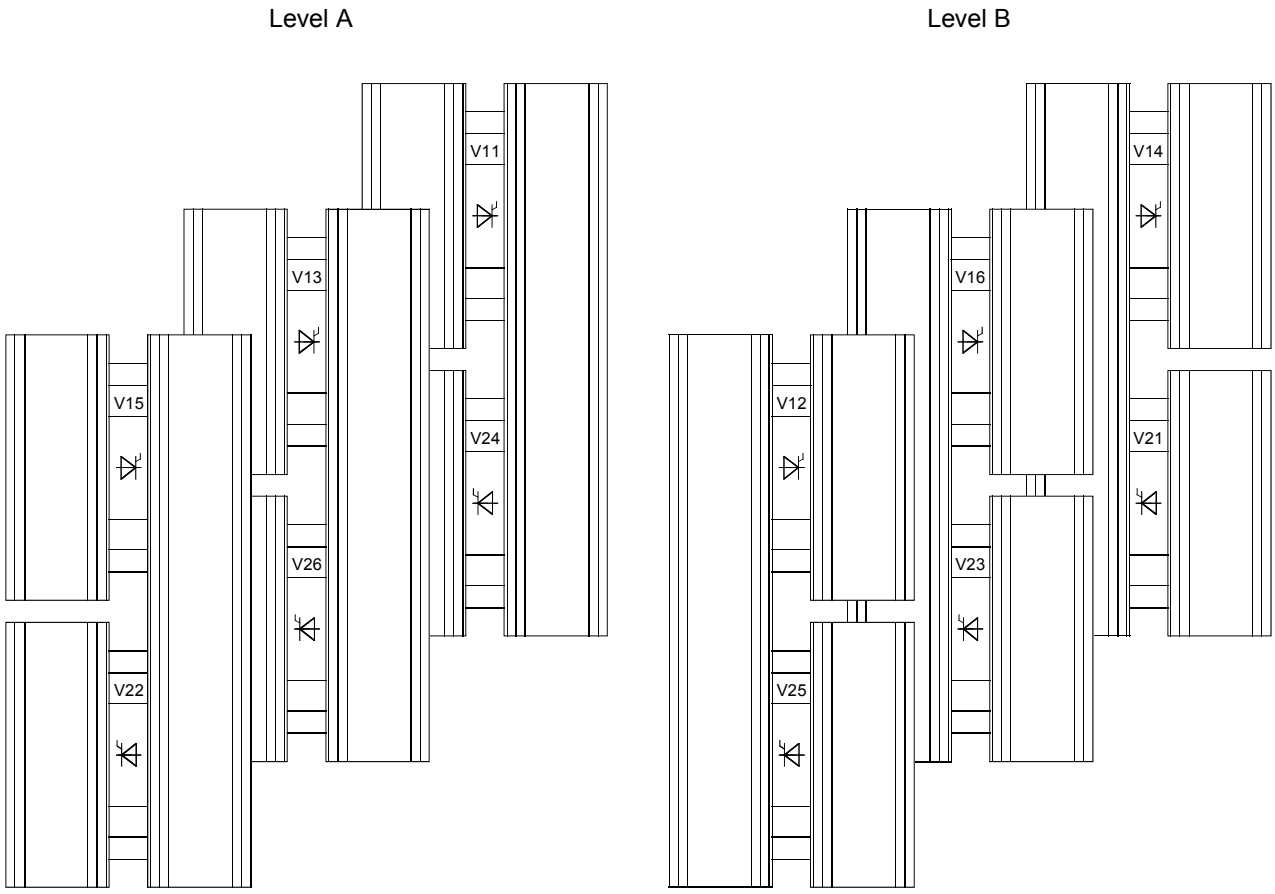


Figure 3.26 Arrangement of the thyristor blocks, view from right-hand side of unit, Size K (see dimension drawing in Section 2.4)

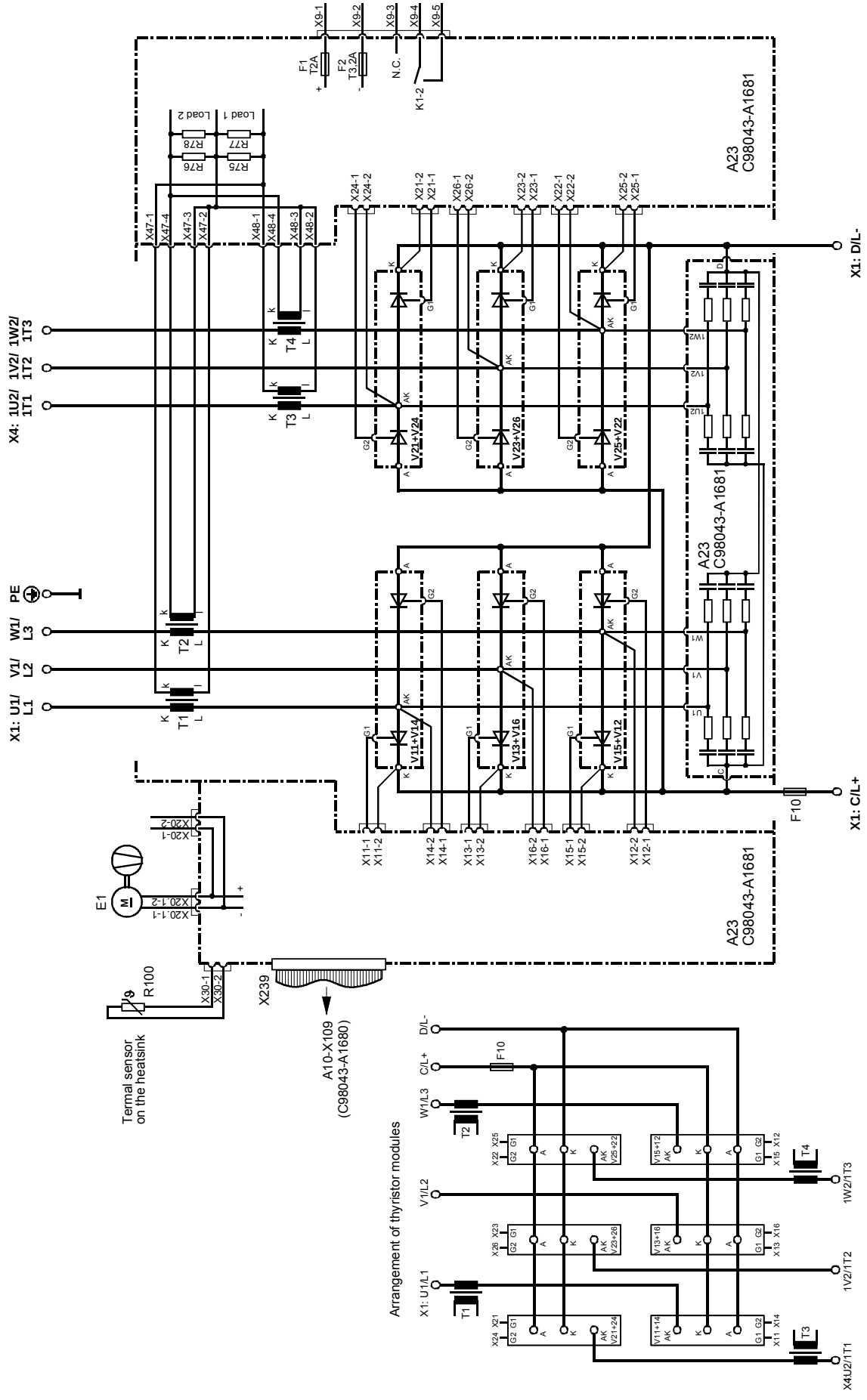


Figure 3.27 Power section, 6SE7022-7FC85-1AA0, 6SE7024-1FC85-1AA0, 6SE7027-2FC85-1AA0 and 6SE7028-8FC85-1AA0 (500-600V / 27A, 41A, 72A and 94A)

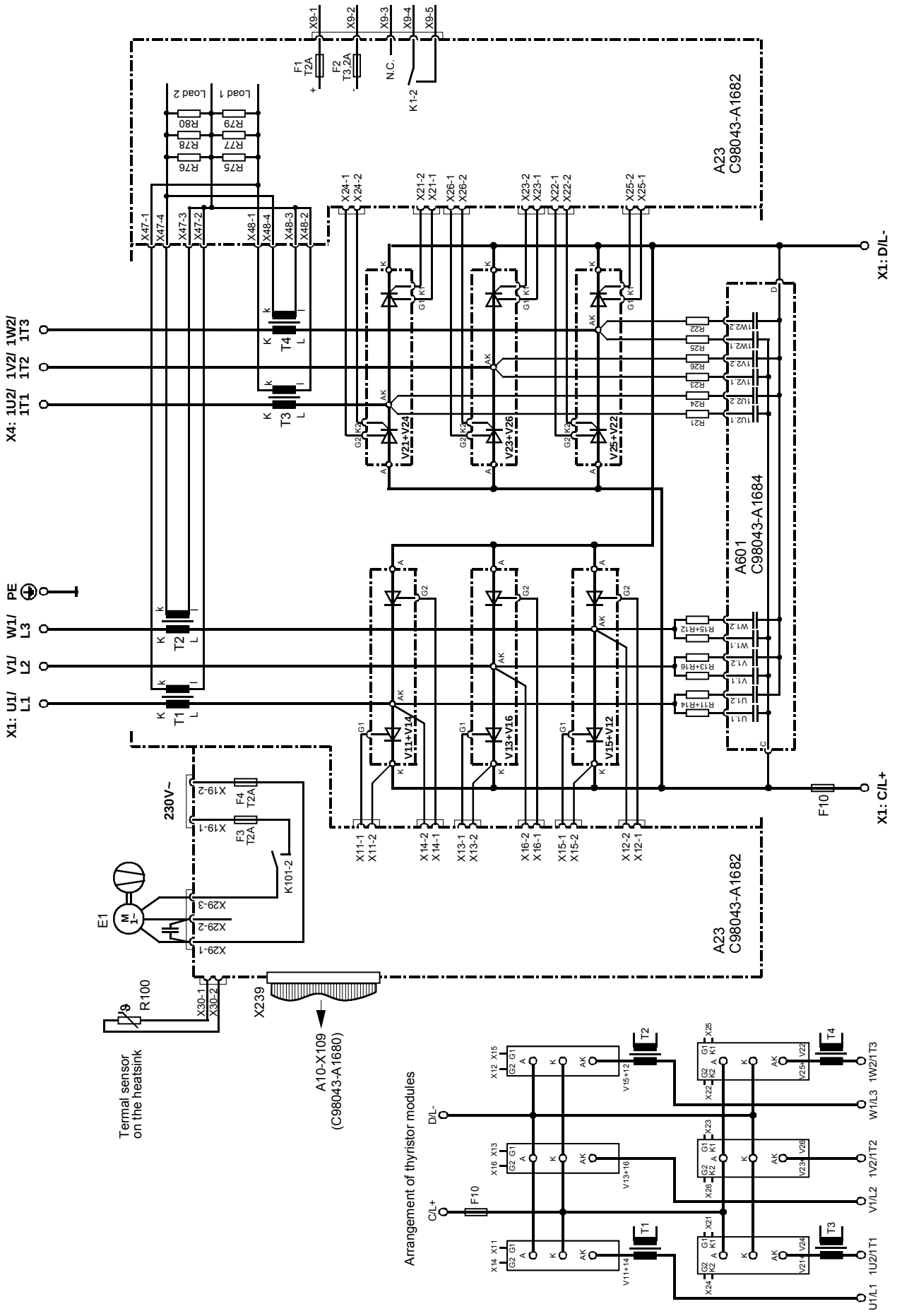


Figure 3.28 Power section, 6SE7031-5FE85-1AA0 (500-600V / 151A)

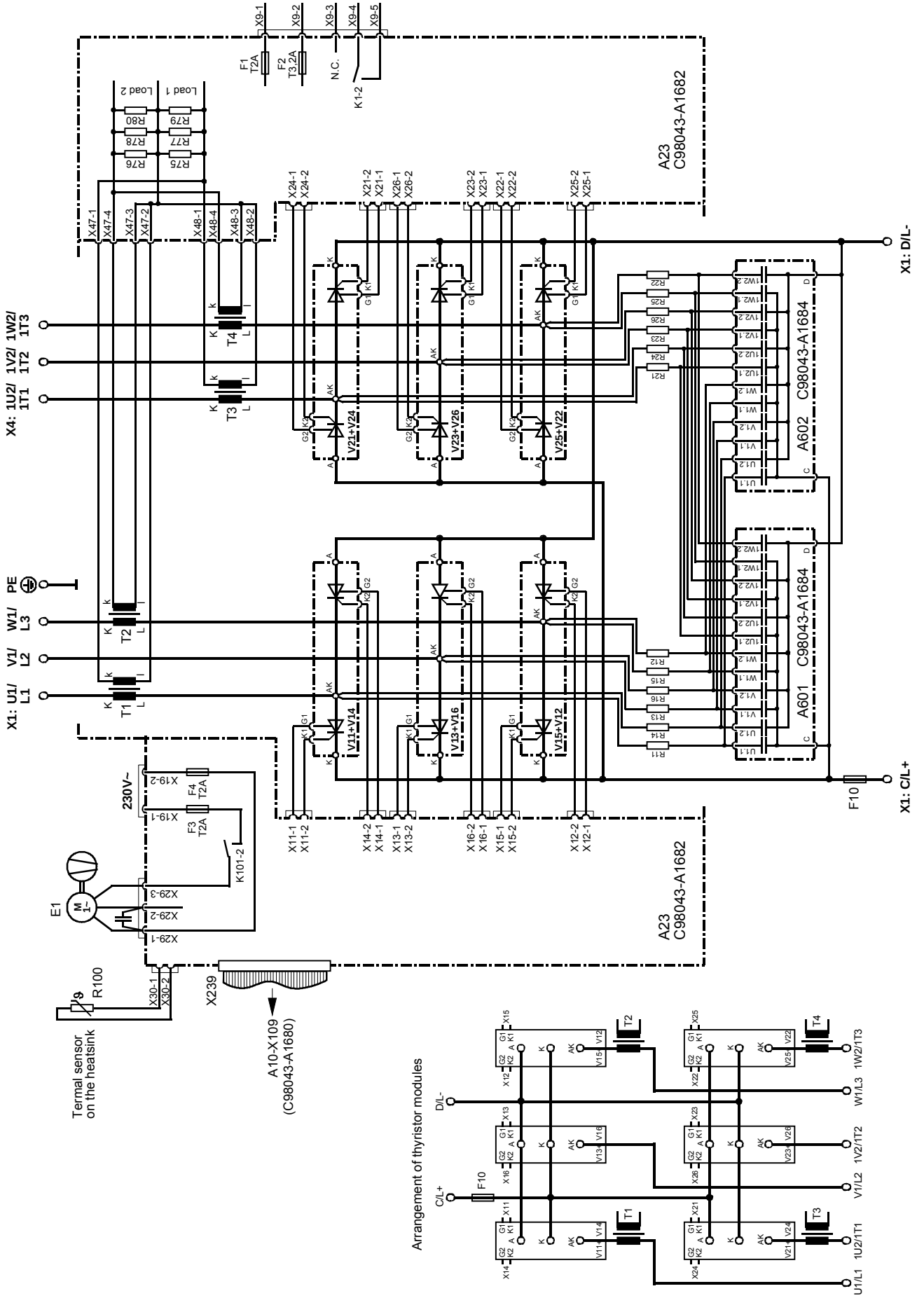


Figure 3.29 Power section, 6SE7032-4FE85-1AA0 (500-600V / 235A)

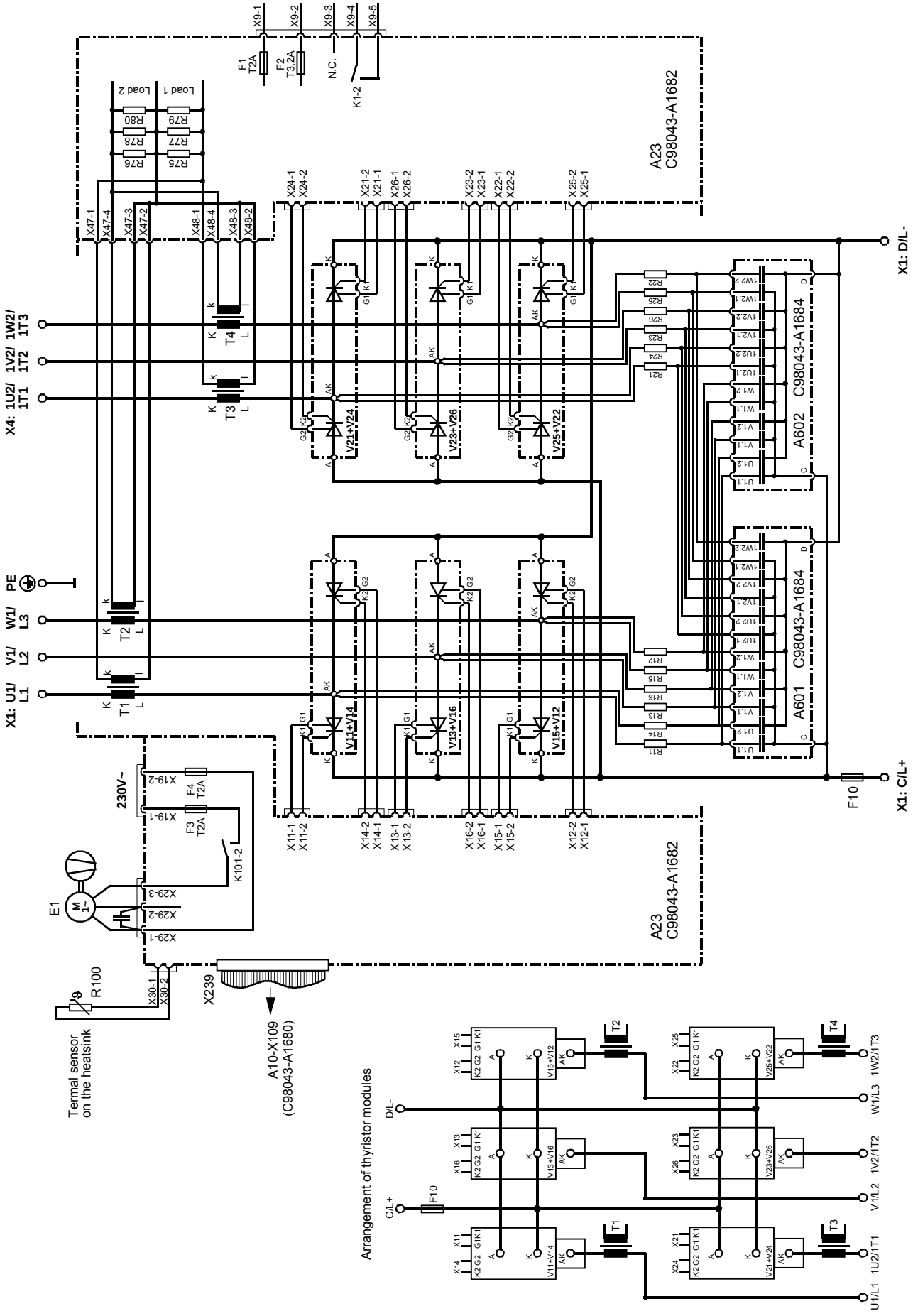


Figure 3.30 Power section, 6SE7032-7FE85-1AA0, 6SE7033-5FE85-1AA0, and 6SE7034-2FE85-1AA0 (500-600V / 270A, 354A and 420A)

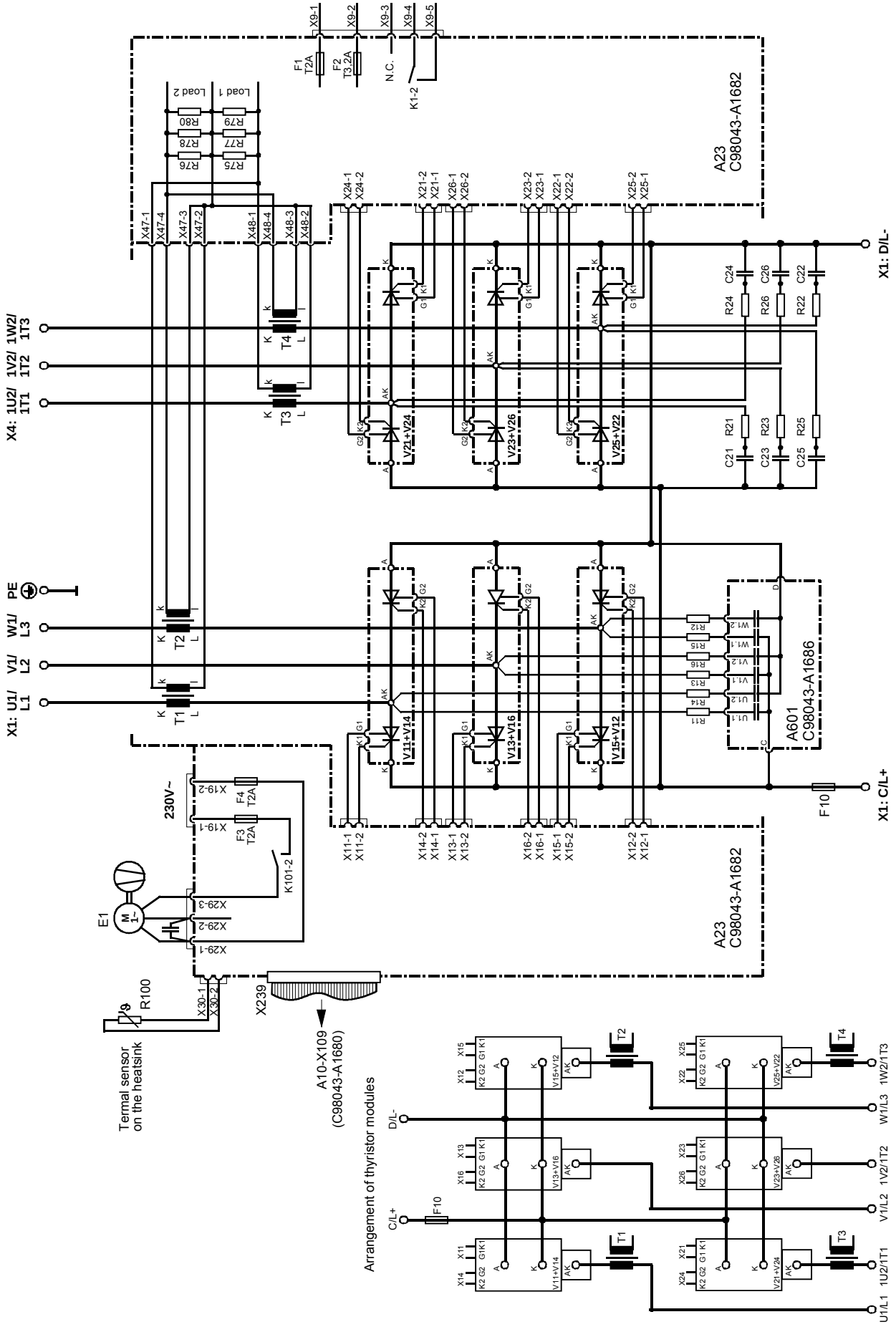


Figure 3.31 Power section, 6SE7035-4FE85-1AA0 (500-600V / 536A)

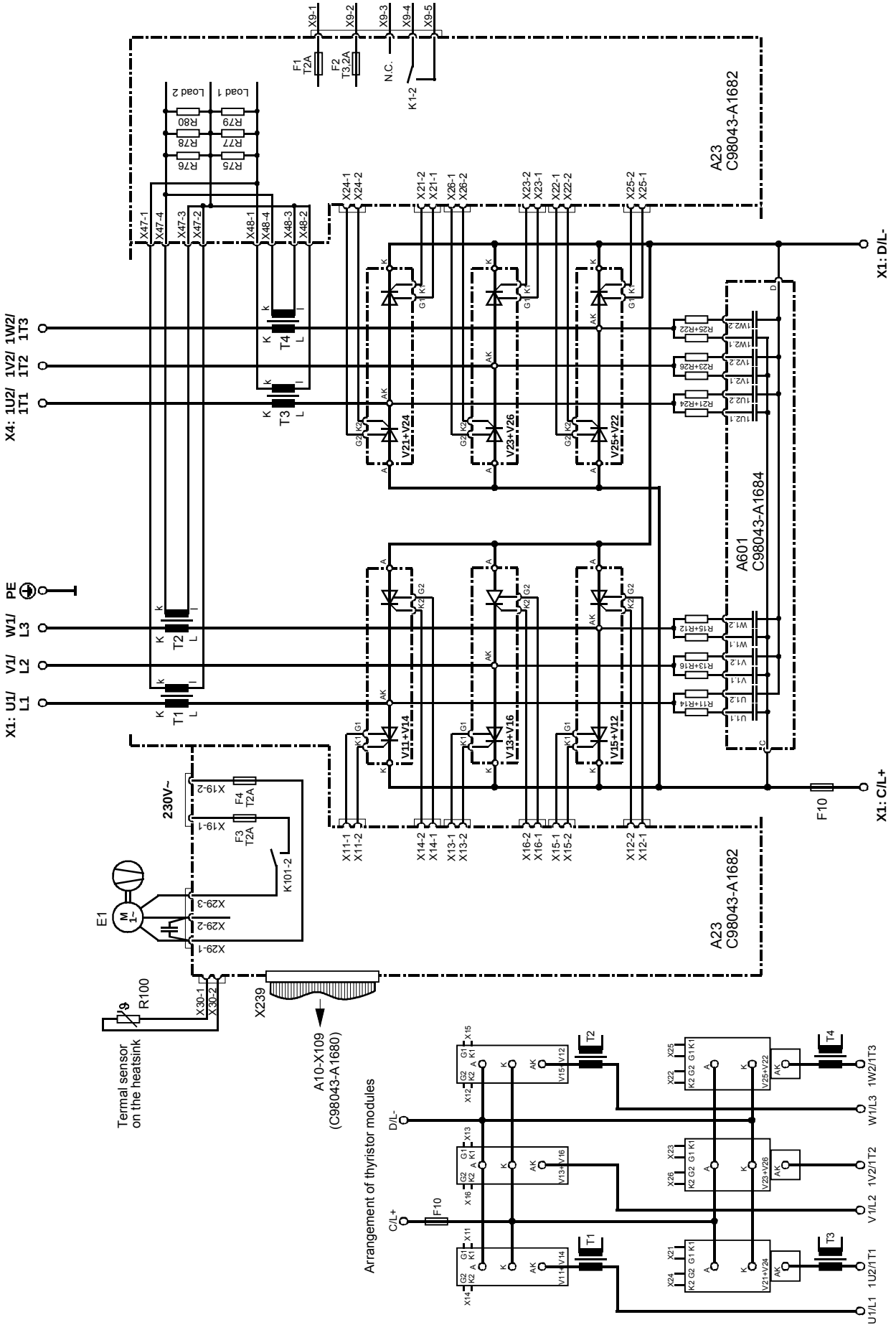


Figure 3.32 Power section, 6SE7031-4HE85-1AA0 (660-690V / 140A)

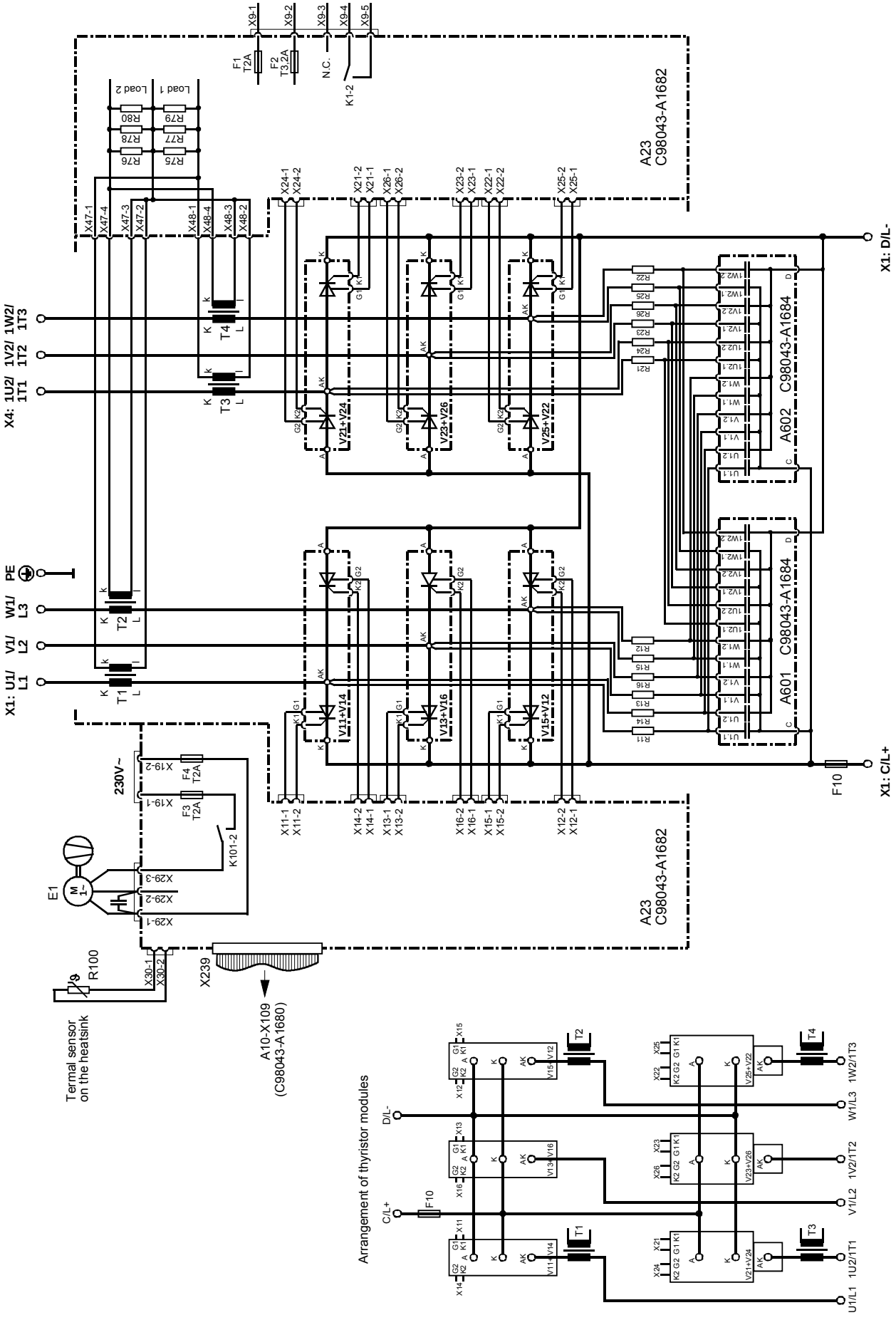


Figure 3.33 Power section, 6SE7032-2HE85-1AA0 (660-690V / 222A)

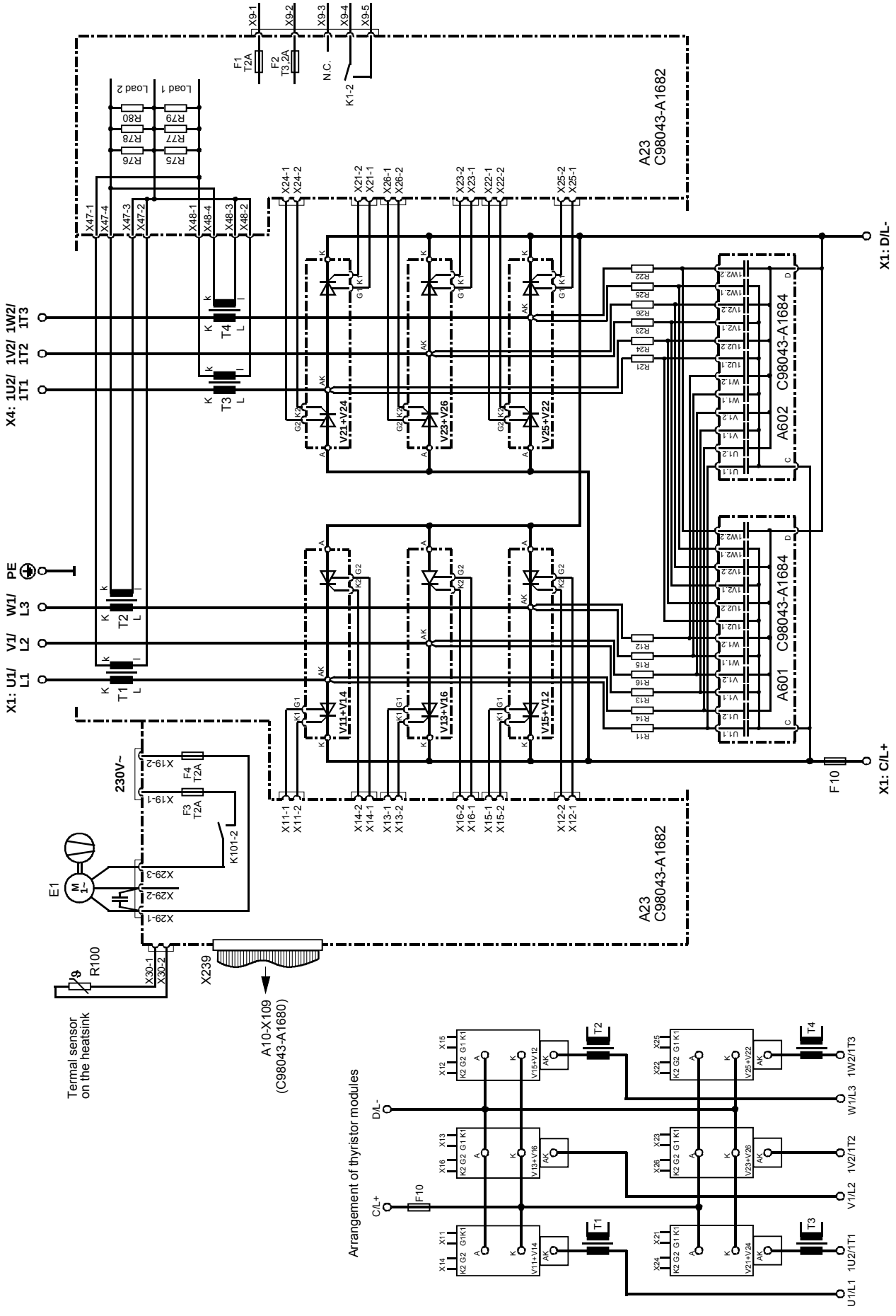


Figure 3.34 Power section, 6SE7032-7HE85-1AA0 and 6SE7034-2HE85-1AA0 (660-690V / 270A and 420A)

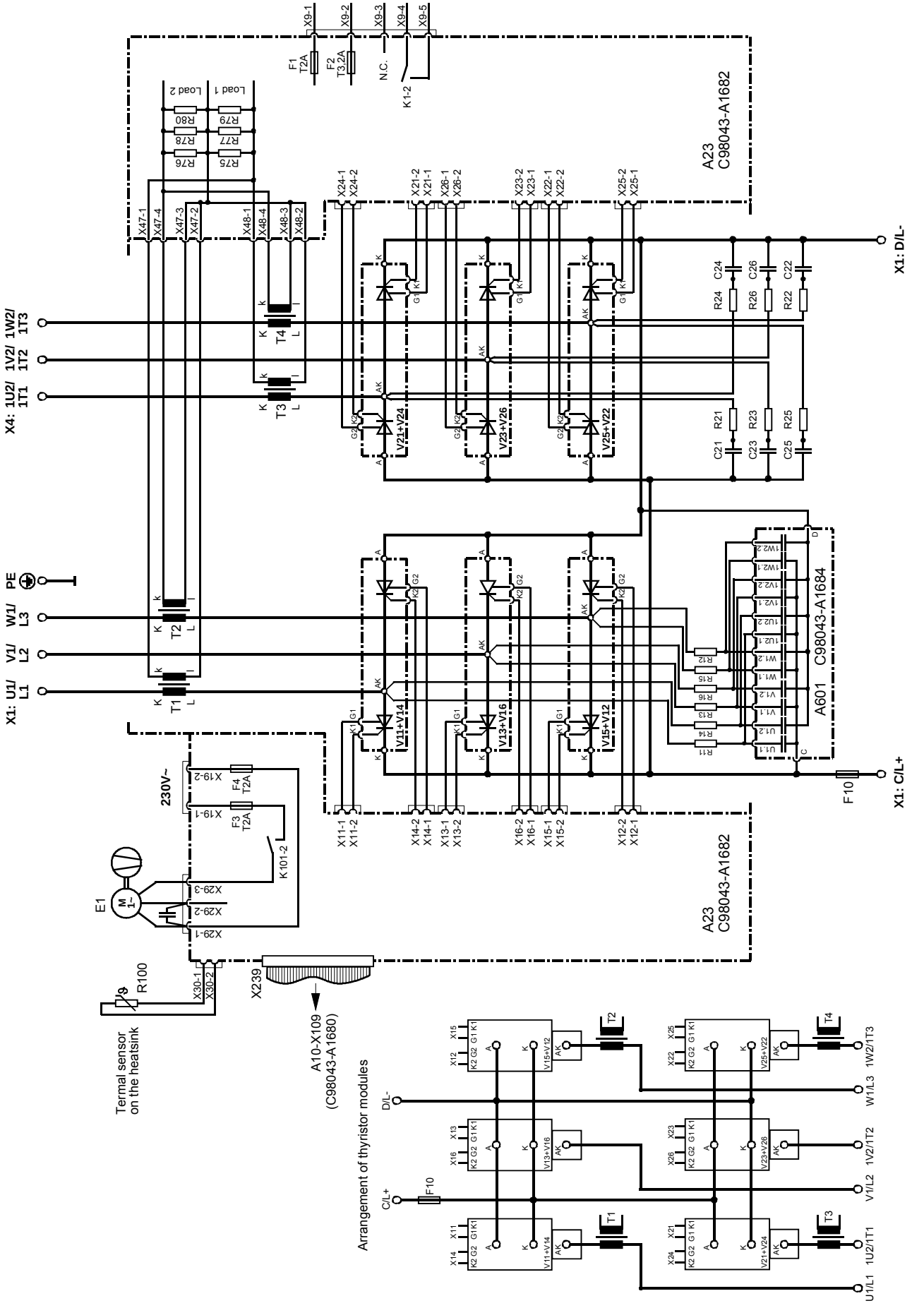


Figure 3.35 Power section, 6SE7035-3HE85-1AA0 (660-690V / 536A)

3.7 Parallel connection of parallel unit(s), size K

The output current can be increased by connecting up to 2 "parallel" units of identical rated current in parallel with the power section of a rectifier/regenerating unit of size K (basic unit).

If less power is required in the regenerative feedback direction than in the infeed direction, on Software Version 3.2 and higher of an IR unit it is possible to connect one or two infeed unit parallel unit(s) with the same rated current in parallel. (For permitted power section combinations, see Chapter 5, P076. See also Chapter 7, F061, interference value 7 and 8).

The following table shows for each basic unit order number, the order number for the corresponding parallel unit that can be connected in parallel.

Order No. for basic unit	Order No. IR parallel unit for parallel connection (infeed and regenerative feedback direction)	Order No. IR parallel unit for parallel connection (infeed direction only)
6SE7041-3EK85-1AA0	6SE7041-3EK85-1AD0	6SE7041-3EK85-0AD0
6SE7041-8EK85-1AA0	6SE7041-8EK85-1AD0	6SE7041-8EK85-0AD0
6SE7041-3FK85-1AA0	6SE7041-3FK85-1AD0	6SE7041-3FK85-0AD0
6SE7041-5FK85-1AA0	6SE7041-5FK85-1AD0	6SE7041-5FK85-0AD0
6SE7041-8FK85-1AA0	6SE7041-8FK85-1AD0	6SE7041-8FK85-0AD0
6SE7041-3HK85-1AA0	6SE7041-3HK85-1AD0	6SE7041-3HK85-0AD0
6SE7041-5HK85-1AA0	6SE7041-5HK85-1AD0	6SE7041-5HK85-0AD0
6SE7041-8HK85-1AA0	6SE7041-8HK85-1AD0	6SE7041-8HK85-0AD0

Table 3.11 Corresponding basic and parallel units

The parallel units have the same technical data as the corresponding basic units.
The parallel units do not include a CUR electronic module and are fitted with a C98043-A1695 (A23) Power Interface module instead of a C98043-A1685 (A23) Power Interface module.
The parallel units do not require a separate external 24V power supply (via X9). The contactor for the parallel unit(s) is controlled via X9 of the basic device. Please observe contact ratings (if not sufficient, use an auxiliary relay).

A 50-core ribbon cable is used to transfer firing pulse signals and monitoring signals. It also carries the power supply for the parallel units.

Parallel connection to a basic unit:
The female terminal strip X27 on module A23 of the basic unit is connected to the male terminal strip X28 on module A23 of the parallel unit via a 50-core ribbon cable.

Parallel connection of a second parallel unit:
The female terminal strip X27 on module A23 of the first parallel unit is connected to the male terminal strip X28 on module A23 of the second parallel unit via a 50-core ribbon cable.

The parallel unit(s) should be installed to the left of the basic unit (see Figure 3.36).

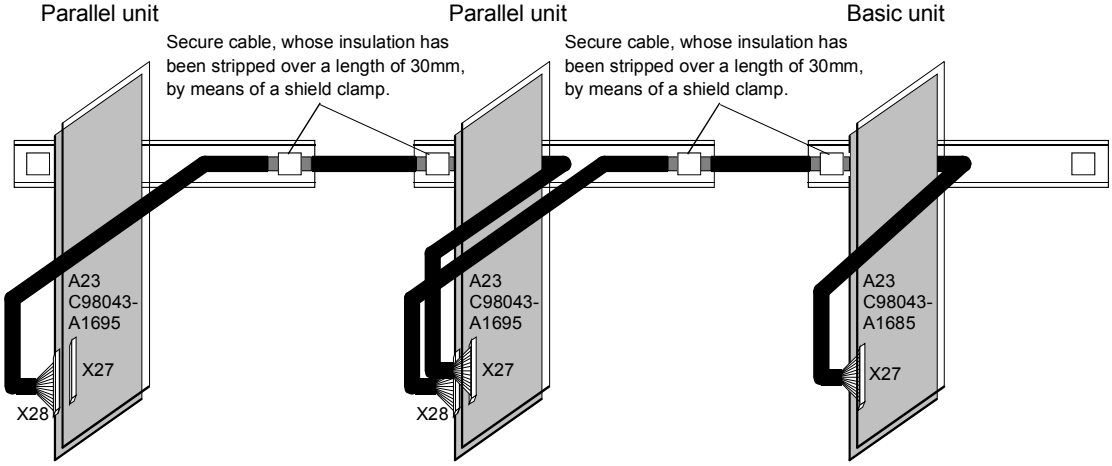


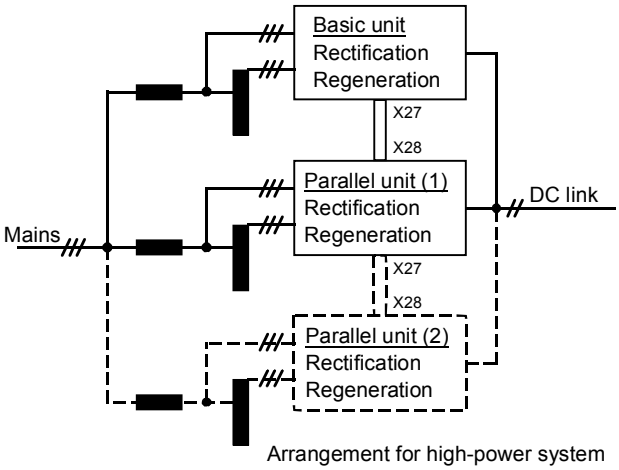
Figure 3.36 Connection of firing pulse signals and monitoring signals for the parallel units

NOTE

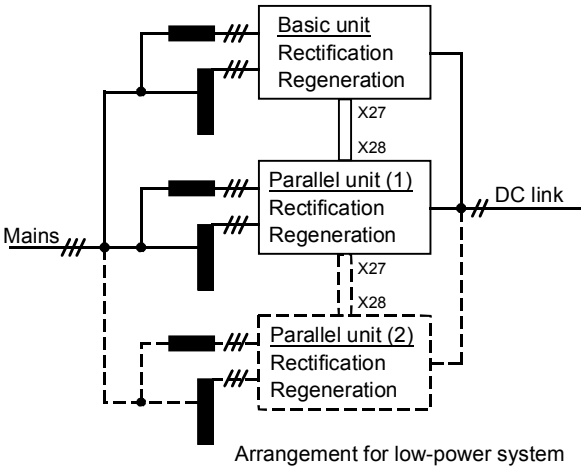
The permissible output current for a parallel arrangement is reduced (due to the current division between the power sections) by 10% as compared with the sum of the rated currents of the separate power sections.

The following is required to ensure even current distribution between the basic unit and parallel unit(s).

- Identical phases for the power section connections of the rectifier/regenerating units between the basic units and parallel unit(s)
- Use of identical power components (see above table for the corresponding parallel units and basic units)
- Commutating reactors and autotransformers specific for each basic and parallel unit with identical technical data. Each separate parallel path must have a minimum u_k value of 2%.
  In the case of extremely high u_k values for the mains supply (low-power system), the primary side of the autotransformer should be connected directly to the supply (before the commutating reactors), so that the total u_k value will not be too high in the regenerative direction.
  With an extremely high total u_k value in the regenerative direction, it may be necessary due to the increased thyristor current commutating time, to reduce the inverter step limit (parameter P776). This may mean it is necessary to reduce Ud.



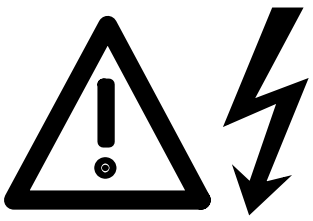
Arrangement for high-power system



Arrangement for low-power system

- Identical fuses for basic unit and parallel unit(s)
- Identical cable lengths leading to the power section connections of the basic and parallel units

Output reactors in the DC circuit are not permitted.



WARNING

Fault-free operation can only be guaranteed if the phases at the power section terminals (U1/L1, V1/L2, W1/L3, 1U2/1T1, 1V2/1T2, 1W2/1T3, C/L+ and D/L-) between the basic unit and parallel unit(s) are identical.

Non-compliance with this condition may result in destruction of the power sections of the basic and parallel units.

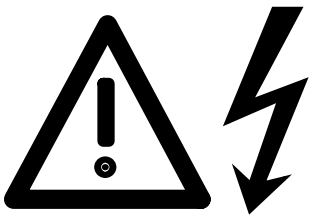
The maximum permissible total cable length between the basic unit and parallel unit 1 or parallel unit 2 (if present) is 15 m.

A 50-way shielded round cable with a length of 4 m is contained in the scope of supply of a parallel unit (spare parts order No.: 6SY7010-8AA00).

Order No. for one cable "10 m round, screened": 6QX5368 (other lengths on request):

On connecting this round, 50-core cable with a diameter of 14 mm, its screen has to be laid bare by cutting away the insulation and it must be connected to earth on both devices. To ensure the interference immunity of the system, it is recommended that the cable is laid in an earthed metal pipe of at least 50 mm in diameter (to allow the plug to be fed through).

The cable length within the unit from the connector on the A23 module (X27 or X28) to the top edge of the unit on the rear panel (cabinet wall) is 1m to the left and 1.8 m to the right. This includes the spare length required for removing the A23 module with its carrier board for service purposes.



WARNING

When the A23 module of a parallel unit is removed for servicing, the terminals of the current transformers are open. The parallel unit must not be operated, otherwise the current transformers of the parallel unit can be damaged by currents from the snubber RC network.

Non-compliance may result in the destruction of the current transformer of a parallel unit.

Parameterization:

Parameter P076 (configuration of the power section)

- P076 = 01x 1 common rectifier parallel unit is connected in parallel with the basic unit
- P076 = 02x 2 common rectifier parallel units are connected in parallel with the basic unit
- P076 = 11x 1 rectifier/regenerating parallel unit is connected in parallel with the basic unit
- P076 = 12x 1 common rectifier parallel unit and 1 rectifier/regenerating parallel unit are connected in parallel with the basic unit
- P076 = 22x 2 rectifier/regenerating parallel units are connected in parallel with the basic unit

NOTE

With the parameterization P076=00x, a connected parallel unit still receives firing pulses and carries current, it is only the monitoring for current asymmetry (over-current or under-current in the parallel power section as compared to the current in the basic unit, -F034) that is not active.

The results of the thyristor test (selected via P353) are only conditionally applicable when units are connected in parallel.

Start-up:

The start-up procedure is exactly the same as in the case of a single basic unit. The final cabling (parallel connection of the power sections and coupling via the 50-core ribbon cable) must however already exist because the parallel units also carry current during circuit identification.

Note: In the case of 1 or 2 parallel units connected in parallel, the value of parameter P144 (DC link capacitance) only represents a half or 1/3 of the actual DC link capacitance because parameter P075 for the basic unit contains the rated current for a single power section.

LED display on the A23 power interface module (C98043-A1695) of a parallel unit:

Green LED (H11) lit: The power supply on this parallel unit is operating.

Yellow LED (H12) lit: On this parallel unit, the highest temperature of any power section connected in parallel has been measured (this does not necessarily mean over-temperature). If the yellow H12 LED is not lit on any of the parallel units, the highest temperature is currently measured at the power section of the basic unit.

Red LED (H13) lit: A fuse has fused on this parallel unit.

CAUTION

On parallel connection the rating of the relay contact K1-2 (connection X9-4, X9-5) should be taken into account (refer to Chapter 3.2).

3.7.1 Single-line diagrams with suggested circuit arrangements for parallel connection

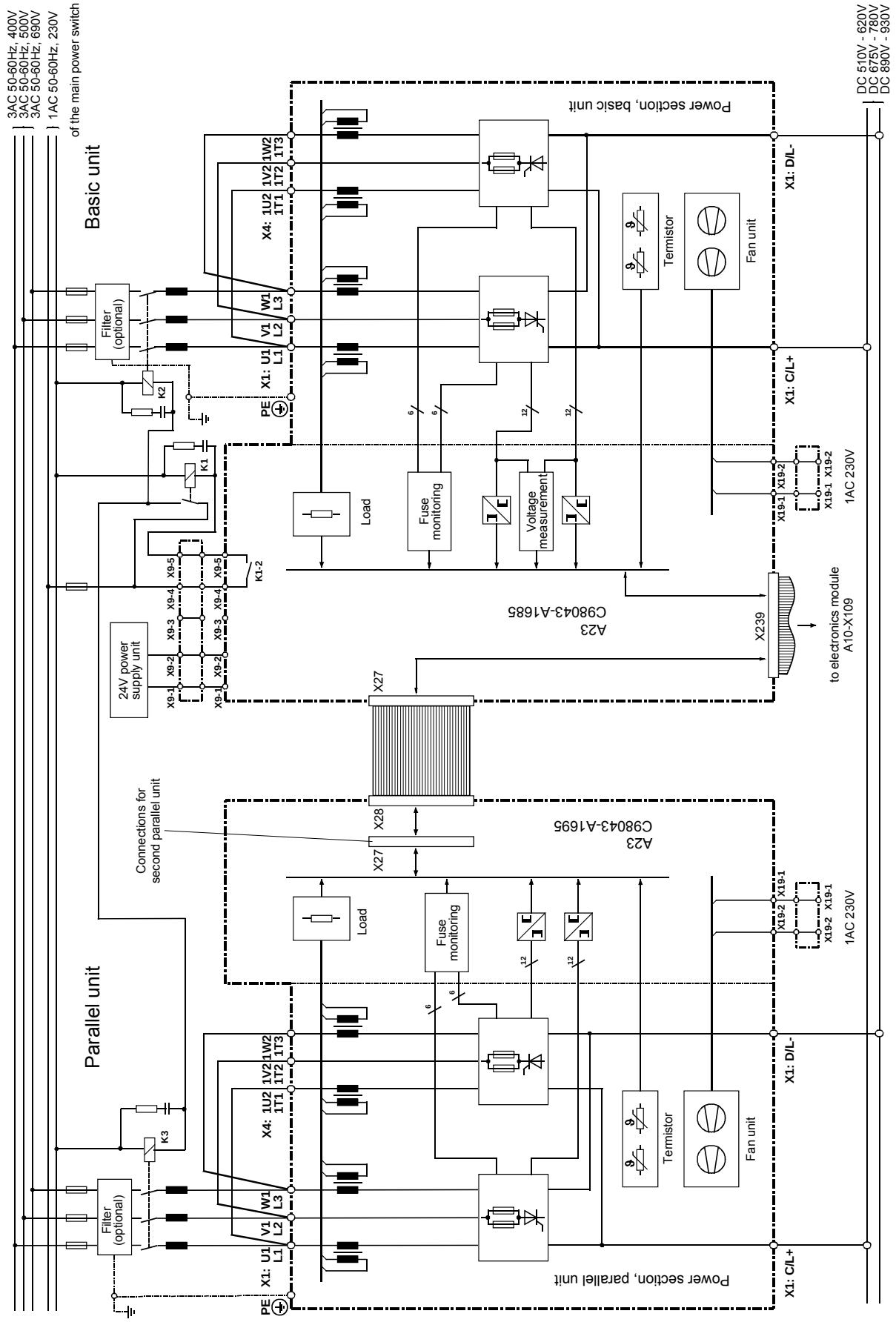


Figure 3.37 Single-line diagram with suggested circuit for parallel connection without autotransformer, size K

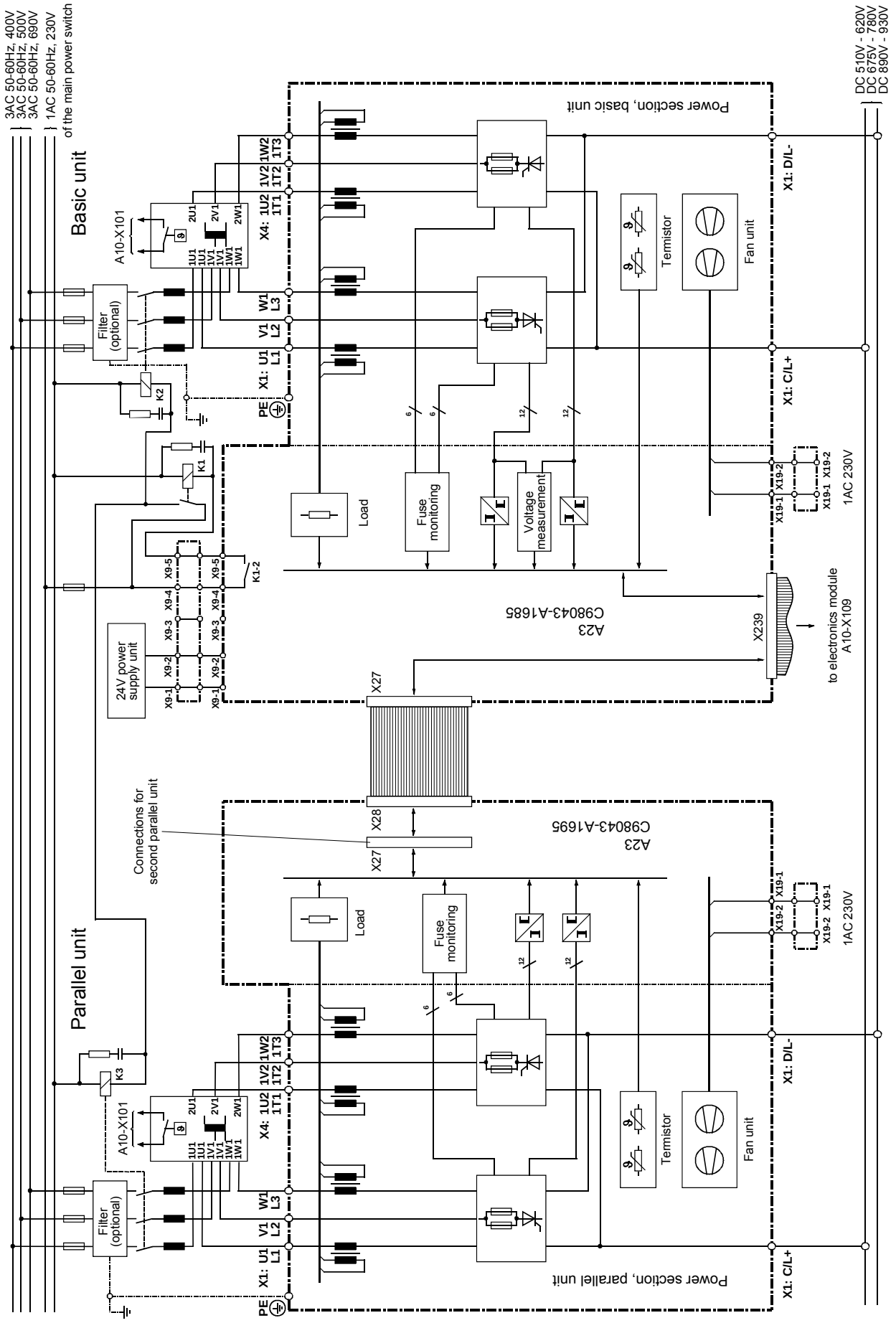


Figure 3.38 Single-line diagram with suggested circuit for parallel connection with autotransformer, size K

3.8 12-pulse mode (only possible with the optional RS485 interface)

3.8.1 General information on 12-pulse mode, application

12-pulse operation is only possible as of Software Version 3.0. 12-pulse mode is implemented to reduce the harmonic loading on the mains supply.

Two 6SE70 units (rectifier/regenerating units) are connected in parallel on the output side and supplied on the line side with two 3-phase AC supplies, galvanically isolated and with a phase offset of 30 degrees. One unit, the "12-pulse master", controls the DC link voltage and provides the setpoint current for the other unit, the "12-pulse slave".

On Software Version 3.2 and higher, 12-pulse operation of an IR unit is also possible as a 12-pulse master and 12-pulse operation of an infeed unit as a 12-pulse slave (infeed direction only).

Note: A unit described here as a "slave" is a completely normal rectifier/regenerating unit with a CUR electronic module and is only transformed into a "12-pulse slave" by the appropriate parameterization. The term "12-pulse slave" must not be confused with a "parallel unit" for the connection of power sections in parallel because the latter does not contain a CUR electronic module and has a different order No. (see Section 3.7).

The two 3-phase galvanically isolated AC supplies with a phase offset of 30 degrees are usually generated using a transformer with 2 different secondary systems (e.g. Y y6 d5, i.e. primary winding: star, secondary winding 1: star, secondary winding 2: delta). A transformer of this type will be referred to below as a "12-pulse transformer".

To implement 12-pulse mode, the two rectifier/regenerating units must be coupled via a fast serial link. The SST2 serial interface for the basic unit is used for this purpose which is however only available as an RS485 interface once the optional A2 submodule (C98043-A1690) has been plugged into the A10 CUR electronic module (C98043-A1680). See Sections 9.6 and 3.8.7).

The transmission protocol used for SST2 is the "Peer-to-Peer" protocol.

3.8.2 Hardware requirements, configuration of the power sections

The sub-currents of the 3-phase AC supplies are decoupled on the line side (line side with respect to the unit terminals) through inductances (due to the secondary leakage inductance of the 12-pulse transformer, commutating reactors and in the regenerative direction also due to the leakage inductance of the autotransformers, if present).

Note: A 12-pulse transformer alone is not always sufficient for decoupling because the two secondary windings of the transformer are magnetically coupled. When the "12-pulse master" and the "12-pulse slave" are directly supplied from a "high-power" 12-pulse transformer (i.e. without the intermediate connection of commutating reactors), the DC link currents (in non-pulsating operation) each comprise 30 degree current blocks because at intervals of 30 degrees, a commutating process takes place from secondary winding 1 to secondary winding 2 or vice-versa. Only if you use a 12-pulse transformer with sufficiently large secondary leakage inductances (or low magnetic coupling between secondary winding 1 and secondary winding 2) or if you use a " double-tier transformer", in which no magnetic coupling exists between the two secondary voltage systems, is it possible to dispense with additional commuting reactors.

The following points must be complied with:

- Supply of the power sections of the 12-pulse master and the 12-pulse slave from galvanically isolated 3-phase AC systems
- Decoupled infeeds - i.e. commuting reactors after the 12-pulse transformer or 12-pulse transformer with sufficiently large secondary leakage inductances (or low magnetic coupling between secondary winding 1 and secondary winding 2) or use of a "double-tier transformer".
- Identical inductances in the 12-pulse master and 12-pulse slave power section branches.
- Identical voltage levels at the 12-pulse master and 12-pulse slave, otherwise with a control angle of 0 degrees, this will cause unequal current division (with a control angle of 0 degrees, closed-loop control is not possible - the unit with the higher voltage level carries more current).
- With Ud reduction, current asymmetry (as a result of a control angle of 0 degrees and differing voltage levels) can be prevented or considerably reduced.
- An output reactor must not be used in the DC link.

Recommended power section configurations:

Note: It is of no consequence whether the "12-pulse master" or "12-pulse slave" is supplied by the delta winding of the 12-pulse transformer. It is only important that a phase offset of 30 degrees is present between the two galvanically isolated supplies. In contrast to the following configuration examples, the "12-pulse master" and "12-pulse slave" can also be exchanged with respect to their connection to the "12-pulse transformer".

a) Power section supply with autotransformers

With a small u_k value for the 12-pulse transformer and/or the autotransformer ("high-power supply"), the decoupling (commutating) reactors should be installed between the 12-pulse transformer outputs and the autotransformer inputs. With a large u_k value for the 12-pulse transformer ("low-power supply") they should be installed directly in the path of the rectifier bridge to ensure that the total u_k value in the regenerating direction is not too large (see note in Section 3.1).

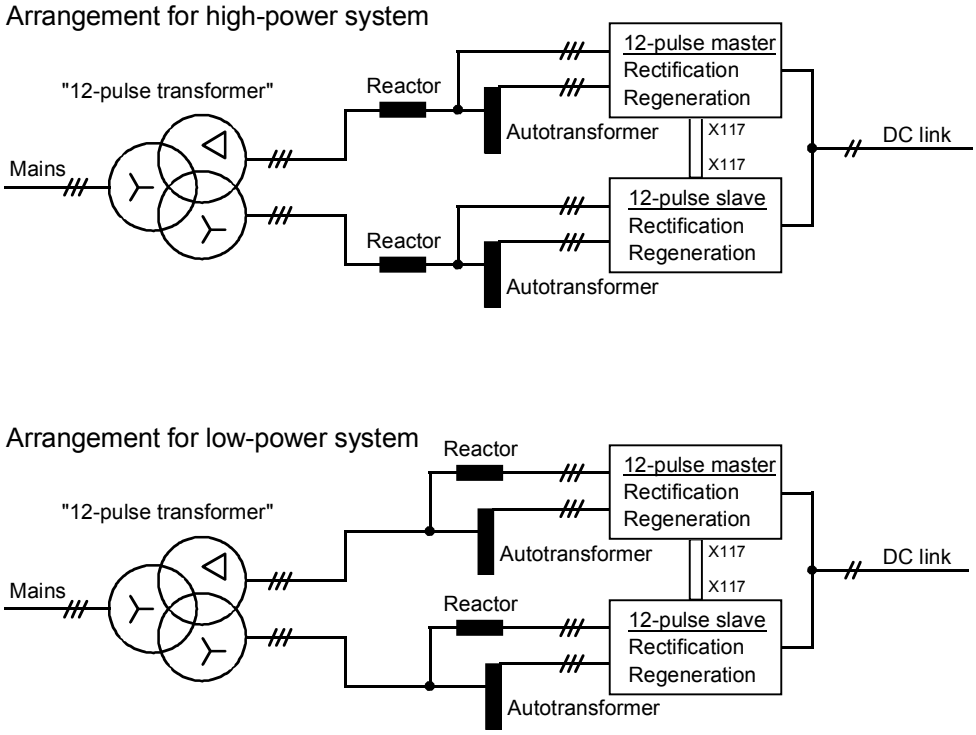


Figure 3.39 Power section supply with autotransformers

b) Power section supply without autotransformers, reduced DC link voltage

If an autotransformer for raising the regenerating voltage is not used, "Ud reduction" must be selected. By selecting a transformation ratio of, for example, ü = 1.25 at the 12-pulse transformer and by using rectifier/regenerating units of a higher voltage class (500 V unit instead of 400 V unit, 690 V unit instead of 500 V unit. Note: this is not possible for the 690 V unit) it is possible to obtain high DC link voltage with respect to the primary supply voltage of the 12-pulse transformer despite Ud reduction.
Disadvantage: Worse mains power factor λ due to the phases.

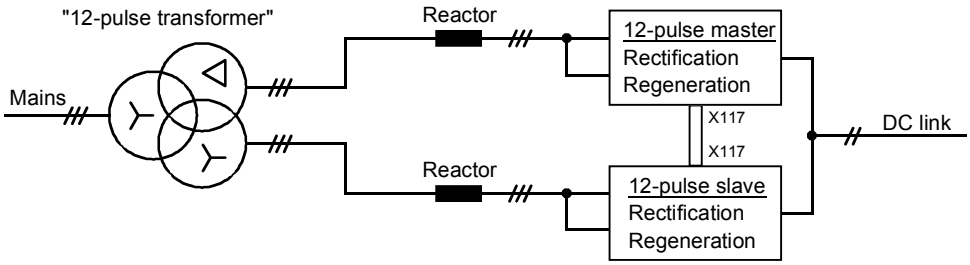


Figure 3.40 Power section supply with autotransformers, reduced DC link voltage

c) Example of a configuration for 12-pulse mode and parallel connection of units of size K to obtain the maximum output current

In the following example of a power section arrangement with autotransformers and a reactor arrangement for a "high-power supply", 2 groups of size K units operate in 12-pulse mode to obtain the maximum possible output current. The first group of units comprises a basic unit parameterized as a "12-pulse master" to which 2 parallel units (not containing a CUR electronic module, see Section 3.7) are connected in parallel. The second group of units comprises a basic unit parameterized as a "12-pulse slave" to which 2 parallel units are also connected in parallel.

Arrangement for high-power system

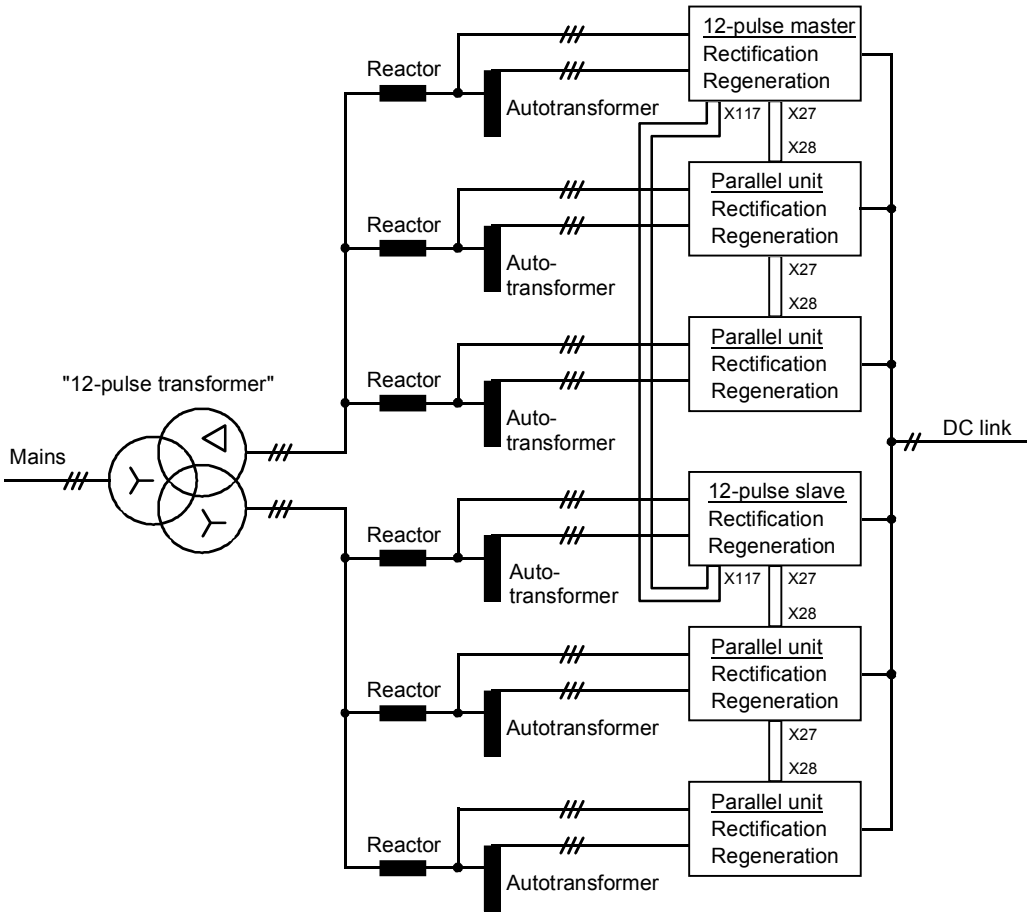


Figure 3.41 Example of a configuration for 12-pulse mode and parallel connection of units of size K to obtain the maximum output current

3.8.3 Parameterization for 12-pulse mode

In this application, **two 6SE70 units** (rectifier/regenerating units) are coupled via the SST2 serial interface (optional RS485 interface PTP1) using **"Peer-to-Peer"** protocol. One unit is parameterized as a 12-pulse master and one is parameterized as a 12-pulse slave.

Selection of the basic or reserve setting (index i001 or i002) of the appropriate "Source selection parameter“ (P554, P555, ...) is described in Section 4.1.2.

"12-pulse master"-6SE70 unit	"12 pulse slave"-6SE70 unit
Function: Controls the DC link voltage and provides the setpoint current for the 12-pulse slave unit via the SST2 interface and control commands (and receives control commands).	Function: In current control mode, receives the setpoint current and control commands via the SST2 interface from the 12-pulse master (and sends control commands).
P051= 3 (Access level: Expert mode)	**P051= 3** (Access level: Expert mode)
SST2 interface definition: **P688= 1** (protocol selection "Peer-to-Peer") **P684.i003= 13** (baudrate 187500 Bd) (factory setting) **P686.i003= 2** (2 process data words) (factory setting) **P687.i003= 1** ms (telegram failure time) (factory setting) (see Section 3.8.6)	SST2 interface definition: **P688= 1** (protocol selection "Peer-to-Peer") **P684.i003= 13** (baudrate 187500 Bd) (factory setting) **P686.i003= 2** (2 process data words) (factory setting) **P687.i003= 1** ms (telegram failure time) (factory setting) (see Section 3.8.6)
SST2 send channel: **P681.i001= 599** (1st process data item is control/status word for 12-pulse mode) (factory setting) **P681.i002= 34** (2nd process data item is the setpoint current) (factory setting)	SST2 send channel: **P681.i001= 599** (1st process data item is control/status word for 12-pulse mode) (factory setting)
Use of SST2 receive data: **P573.i001** (or i002) **= 6001** (1st receive data is source for "No external fault 3") (but should only be parameterized when the 12-pulse master is required to go into the "fault" state in the event of a 12-pulse slave fault - see Section 3.8.6)	Use of SST2 receive data: **P554.i001** (or i002) **= 6001** (ON/OFF1) **P555.i001** (or i002) **= 6001** (not OFF2) (with the "fault" state for the 12-pulse master or when "no 12-pulse mode" is selected on the 12-pulse master (see P583.i001 or i002), OFF2 is signaled) **P561.i001** (or i002) **= 6001** (Run enable) (the 12-pulse slave only receives the run enable when the 12-pulse master is in the "run" state) **P566.i001** (or i002) **= 6001** (RESET) (Source 2 for reset... this facilitates an external reset from the master) **P572.i001** (or i002) **= 6001** (REGEN. ENABLE) (to facilitate, e.g. Ud reduction) **P486.i001** (or i002) **= 6002** (2nd receive data item is the setpoint current)
Definition of the unit as a 12-pulse unit: **P583.i001** (or i002) **= 1** (12-pulse mode is selected)	Definition of the unit as a 12-pulse unit: **P583.i001** (or i002) **= 1** (12-pulse mode is selected)
Definition of the unit as a master or slave: **P587.i001** (or i002) **= 0** (master) (factory setting)	Definition of the unit as a master or slave: **P587.i001** (or i002) **= 1** (slave)
Special functions: **P354 = 0** (Earth short-circuit test deactivated when the unit is supplied by a non-earthed supply - e.g. from the delta winding of the 12-pulse transformer)	Special functions: **P354 = 0** (Earth short-circuit test deactivated when the unit is supplied by a non-earthed supply - e.g. from the delta winding of the 12-pulse transformer)

Table 12 Parameterization for 12-pulse mode

3.8.4 Control/status word for 12-pulse mode (r599) and control word 2, bit 23

The following table shows how the bits of the control/status word for 12-pulse mode (r599) are formed from the bits of control words 1 and 2 (r550, r551), the bits of status word 1 (r552), the bits of the first SST2 receive data (r599 sent from the Peer-to-Peer partner) and the internal unit status with Boolean arithmetic or how these bits are connected together (negation is represented with a slash) :

Control/status word for 12-pulse mode (r599)	
Bit	**Logical linking (or meaning in the high state):**
r599.0	r550.0 (ON or not OFF1) AND /r552.3 (no fault) AND r551.23 (12-pulse mode is selected)
r599.1	r550.1 (run condition or not OFF2) AND /r552.3 (no fault) AND r551.23 (12-pulse mode is selected)
r599.2	r550.2
r599.3	r552.2 (Message for RUN state)
r599.4	(for internal diagnostic purposes: 1, as long as trigger delay is running, as of Software Version 4.3)
r599.5	Message: Unit is a Rectifier/Regenarating Unit (P070 $\leq$ 100) (high state: Unit is a comon rectifier) (P070 $\geq$ 101)
r599.6	Message: DC link forming or current identification is being carried out
r599.7	r550.7 (fault reset)
r599.8	r550.8 (typing 1 ON) AND /r552.3 (no fault) AND r551.23 (12-pulse mode is selected)
r599.9	r550.9 (typing 2 ON) AND /r552.3 (no fault) AND r551.23 (12-pulse mode is selected)
r599.10	r550.10 (PLC control)
r599.11	r550.11 (Ud-reduction requested)
r599.12	r552.10 (Message: "Regenerating ready") or High when with 12-pulse mode selected (r551.23= 1), the unit is held in state r000 = "--" (because "circuit identification" or "forming" is taking place on the partner unit, or because the unit is waiting for the "run" state of the 12-pulse slave unit (while the slave unit is carrying out the earth short-circuit test and the maximum waiting time of 5 s in state r000 = "--" has not yet elapsed))
r599.13	r552.3 (Message: NO fault)
r599.14	r552.14 (Message: "Motoring" (Rectifier bridge is carrying current or is ready to carry current or neither rectifier nor regenerating bridge are carrying current))
r599.15	r550.15 (No external fault 1)

Table 13 Control/status word for 12-pulse mode (r599)

Control word 2 (r551), bit 23: 12-pulse mode selection command

Associated source selection parameter: P583

Low state: "no 12-pulse mode", i.e. there is only one "normal unit"

High state: "12-pulse mode is selected"

The command is effective in the high state and effects the following changes with respect to the operational behavior of a single unit (i.e. a "normal single unit" becomes a 12-pulse master or 12-pulse slave depending on control word 2, bit 27, or the associated source selection parameter P587.i001 or i002):

- The P-gain of the Ud controller is halved internally according to P313 and the DC link capacitance P144 of the 12-pulse master is halved internally but only when the 12-pulse slave reports the "run" operating state to the 12-pulse master via r599 (bit 3 of the first SST2 receive data). Halving is not performed if this device is an "IR unit" and the partner device signals by means of r599 (Bit5 of the 1st SST2 received data) that it is an "infeed unit" and if regenerative feedback operation is currently active.
- During "forming" or "circuit identification", only one unit is permitted to carry current. This prevents firing of the thyristors of the rectifier/regenerating bridge in the "run" operating state on the 12-pulse master or 12-pulse slave by forcing the state r000 = "--", when the corresponding partner unit reports via r599 (bit 6 of the first SST2 receive telegram) that "forming" or "circuit identification" is being carried out. Apart from which, on the unit that is held in the state r000= "--", error message F061 (fault value 3, 4, 5) is suppressed.
- On completion of "forming" or "circuit identification" of the partner unit (i.e. with the trailing edge of bit 6 of the first SST2 receive data), the unit switches to the operating state SWITCH-ON INHIBITED (r000=°008).
- On switch-on, on the 12-pulse master following the °012 operating state (test phase - earth short-circuit test), firing of the thyristors of the rectifier/regenerating bridge by forcing the state r000 = "--" is prevented until the 12-pulse slave reports the "run" operating state via r599 (bit 3 of the first SST2 receive data) or until a maximum waiting time of 5 s has elapsed. During this waiting time, the 12-pulse slave is given the opportunity of carrying out the earth short-circuit test. In addition, ramping up of the pre-charging ramp (parameter P329) is prevented.
- Bits 0, 1, 8 and 9 of r599 (control/status word for 12-pulse mode) are linked with control word bit 23 such that an ON command is only passed on via r599 when control word bit 23 is 1 ("12-pulse mode is selected").

Note: The prerequisite for 12-pulse mode is that the 12-pulse master and 12-pulse slave are coupled via the SST2 serial interface using Peer-to-Peer protocol (P688=1) and that in each case, the "control/status word for 12-pulse mode" (r599) is transmitted in word 1 of the transmission protocol (P681.i001= 599).

3.8.5 Start-up with 12-pulse mode

- **Linking the units via SST2 RS485 interface**

  Mount the optional A2 submodule (C98043-A1690) on the A10 CUR electronic module (C98043-A1680) of master and slave (see Section 9.6) and connecting an interface cable (RS485 4-core cable, see Section 3.8.7) on the 5-pole terminal block -X117 of A2.

- **Parameterizing a unit as a 12-pulse master (see Section 3.8.3)**

  Following "Generate factory setting" (see Section 4.3.9.1), only the following parameters have to be set:

  - P051= 3 (expert mode)
  - P688 = 1 (select Peer-to-Peer protocol)
  - P583.i001 (or i002) = 1 (12-pulse mode is selected)
  - P573.i001 (or i002) = 6001 (only set when the 12-pulse master is also required to go into the "fault" state in the event of a 12-pulse slave fault - see Section 3.8.6)
  - Switch off earth short-circuit test (P354 = 0), when the unit is supplied by a non-earthed supply - e.g. from the delta winding of the 12-pulse transformer

  Note: The basic setting (index i001) of the unit is used in practice for the parameterization as 12-pulse master (with the appropriate source wiring for the ON command (P554, P555) and other external control commands), and the reserve setting (index i002) is used to operate the unit as a stand-alone unit with user control on-site via the OP1S or PMU.

♦ **Parameterizing a unit as a 12-pulse slave (see Section 3.8.3)**

Using P077 = 5 or 6, almost all settings required for the parameterization as a 12-pulse slave can be carried out automatically (see Chapter 4.3.9.1).
Meaning of P077 = 5 or 6:

P077= 5: Basic setting (index i001): 12-pulse slave (all control is carried out via the master)
Reserve setting (index i002): stand-alone unit with operator control via PMU

P077= 6: Basic setting (index i001): 12-pulse slave (all control is carried out via the master)
Reserve setting (index i002): stand-alone unit with operator control via OP1S

Note: When the reserve setting is selected, the unit operates as a stand-alone unit with on-site operator control. Changeover between the basic and reserve settings takes place via binary input 5 (P590=1005), but the reserve setting can be set permanently via P590= 1.

Procedure for carrying out the P077-dependent factory setting (see Section 4.3.9.1):

- Set P051= 3 (expert mode)
- Set P052= 2 (Select "Initialize" function (set MLFB), so that P077 can be modified)
- Set P077= 5 or 6 (Select the required P077-dependent parameter setting)
- Set P052= 0 and press the <P> key (terminate the "initialize" function)
- Set P052= 1 (select the function "Generate manufacturer setting"; when the <P> key is pressed, all parameters are reset to their factory setting or to the P077-dependent value)

If only those parameter values that are dependent on P077 are required to be changed and all other parameters should remain unchanged, the following procedure is necessary:

- Set P051= 3 (expert mode)
- Set P052= 2 (select "Initialize" function (set MLFB))
- Note P070 and set P070= 0
- Set P077= 5 or 6 (select the required P077-dependent parameter setting)
- Set P052= 0 and press the <P> key (read in the parameter values dependent on P077)
- Move the F060 error message into the "background" by pressing <P>+<H>
- Set P052= 2 (select "Initialize" function (set MLFB) again)
- P070= noted value (restore MLFB)
- P052= 0 and press the <P> key (MLFB is read in and the dependent parameters P071, P075 and P076 are set)
- Move the F060 error message into the "foreground" again by pressing <P>+<T>, and reset by pressing the <P> key

Additional parameter settings for the 12-pulse slave:

- P051= 3 (expert mode)
- P688 = 1 (Peer-to-Peer protocol)
- Switch off earth short-circuit test (P354 = 0), when the unit is supplied from an unearthed supply, e.g. from the delta winding of the 12-pulse transformer
- For factory settings in accordance with P077= 5 or 6, binary input 1 is a source for "No external fault 1" and binary input 2 is a source for "No external warning 1". If this is not required, e.g. in the case of open terminals, P575 = 1 and P588 = 1 must be set.

♦ **Circuit identification:**

Circuit identification should be carried out successively on the 12-pulse master and on the 12-pulse slave. P052= 21 must be set on each unit for this purpose, and the switch-on command for the 12-pulse slave comes from the 12-pulse master (the control word wiring ensures that the partner unit, in each case, does not carry current or is held in the operating state r000= "--".

- **Circuit identification procedure for 12-pulse master:**

  Set P052= 21 on the 12-pulse master unit, switch on ⇒ circuit identification is carried out on the 12-pulse master

- **Circuit identification procedure for 12-pulse slave:**

  Set P052= 21 on the 12-pulse slave unit, switch on the 12-pulse master unit ⇒ circuit identification is carried out on the 12-pulse slave

  Note: If circuit identification is carried out with the basic settings selected (operation as a 12-pulse slave, all control is from the 12-pulse master), the switch-on command must come from the 12-pulse master and the power terminals of the 12-pulse master unit must be connected to the supply voltage.

  Note: When the reserve setting is selected on the 12-pulse slave unit (with appropriate parameterization of index i002 of the "Source selection parameters" P554, P555, ...) it is also possible to issue the switch-on command for circuit identification on the slave unit on-site via the PMU or OP1S.

♦ **Setting additional functions**:

If required, activate the "auto restart" (via P366= 2) on the master and on the slave unit. This will be effective in the event of failure of the electronics supply voltage provided that the Peer-to-Peer telegram failure monitoring time has been switched off via P687.i003= 0.

3.8.6 Redundancy mode

If both rectifier/regenerating units are rated such that each separate unit is capable of carrying the full load current, the following possibilities are available with respect to redundant operation:

- **Uninterrupted changeover of the 12-pulse master unit to stand-alone 6-pulse mode in the event of failure of the 12-pulse slave unit during 12-pulse mode:**

  If the 12-pulse master is required to continue to run in "normal" stand-alone 6-pulse mode in the event of failure of the 12-pulse slave unit without interruption, "External fault 3" must not be "wired" to the Peer-to-Peer interface, but instead the parameterization P573.i001 (or i002) = 1 is required on the 12-pulse master. If the master unit is also required to continue to run without an interruption in the event of failure of the Peer-to-Peer interface cable, the Peer-to-Peer telegram failure monitoring time also has to be switched off via P687.i003= 0 on the master.

- **Reconnection of the 12-pulse slave unit during operation of the master:**

  If (12-pulse) operation of a 12-pulse slave unit is required to be reinstated following an interruption of the Peer-to-Peer interface cable without error message and during (stand-alone 6-pulse) operation of the master unit, the Peer-to-Peer telegram failure monitoring time also has to be switched off via P687.i003= 0 on the 12-pulse slave unit.

- **Changeover of the 12-pulse slave unit to stand-alone 6-pulse mode in the event of failure of the 12-pulse master unit**:

  In the event of failure of the master unit during 12-pulse mode, it is possible for the 12-pulse slave unit to change over to stand-alone 6-pulse mode almost without interruption, because all external control commands that are wired to the terminals of the master unit (e.g. ON command) are also carried to the terminals of the 12-pulse slave unit. Externally implemented logic must ensure that in the event of failure of the master unit, the 12-pulse slave is switched from the basic to the reserve setting. The 12-pulse slave must be parameterized appropriately in the reserve setting to facilitate stand-alone 6-pulse mode with external control. The Peer-to-Peer telegram failure monitoring time also has to be switched off via P687.i003= 0 in this case.

Note:
With the parameterization P687.i003 = 0 AND P681.i001 = 599, in the event of telegram failure, bits 3 and 6 of the first SST2 Peer-to-Peer receive data (i.e. the control/status word for 12-pulse mode sent from the partner unit) are set to 0.

3.8.7 RS485 interface cable for the Peer-to-Peer link on SST2

The RS485 interface cable required for the serial Peer-to-Peer link on SST2 is in the form of a four-wire connection.

A screened 4-core cable must be connected at the screw terminals of the 5-pole plug of terminal block -X117 on submodule A2 (C98043-A1690). Submodule A2 is fitted to the CUR A10 electronics module (see Section 9.6). The 4-core cable is not included in the scope of delivery.

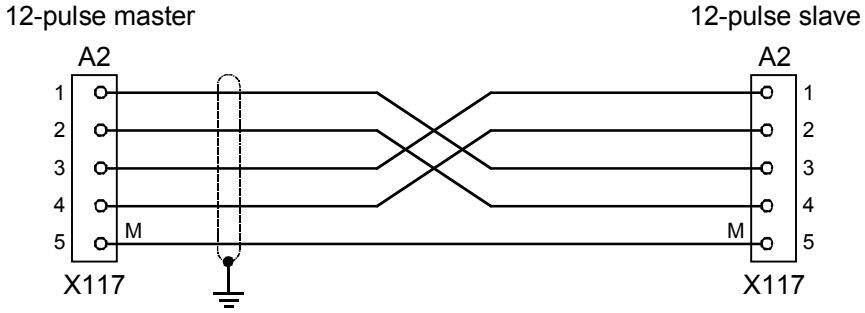
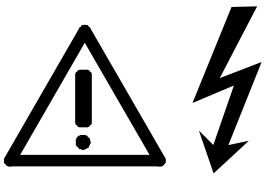


Figure 3.42 Connecting cable for "Peer-to-Peer" communication on SST2 (between the terminals of the A2 submodule (C98043-A1690))

4 Start-Up

4.1 Introduction and handling start-up



WARNING

Despite disconnecting the power terminals from the supply, voltage may still be present on terminal X19 due to the external fan supply.

4.1.1 Handling the start-up instructions

NOTE

- Section 4.2 First start-up:
  First start-up of the rectifier/regenerating unit
- Section 4.3 Start-up aids:
  Index-type reference for start-up and use of the rectifier/regenerating unit, which only has to be used if actually required!
- Section 4.4 Function diagrams:
  Graphical overview of the setpoint channel, open-loop/closed-loop control, analog inputs/outputs, and the rectifier/regenerating unit data sets

4.1.2 General explanation of the terminology and functions of the rectifier/regenerating unit

Abbreviations:

- Abbreviations used: Refer to Section 15 "Information, notes "

Mode and automatic control variants of the rectifier/regenerating unit:

- "Function block diagrams: Open and closed-loop control": see Section 4.4
  - Application: Power supply of the variable-voltage DC link of SIMOVERT converters of the 6SEE70 series
  - Mode variants:

    a) The line voltage in the regenerative branch is stepped up by an (auto) transformer to prevent having to reduce the DC link voltage in regenerating mode

    b) Permanent reduction of the DC link voltage by phase angle control in rectifier mode in order to always be able to feed power back into the system
    P318 Reduced DC link voltage setpoint (e.g. = 80 %)
    P571 = 0001 Permanent selection of reduced voltage

    c) Reduction of the link voltage for regenerative mode only by means of open-loop control to be able to exploit the line voltage fully in rectifier mode and not have to use an autotransformer for feeding power back into the system. This type of power feedback is not intended for dynamic operation, but only for setpoint-controlled operation in conjunction with external open-loop control.

    P318 Reduced DC link voltage setpoint (e.g. = 80 %)
    P571 = 1004 Selection of reduction via terminal X101-12
    P613 = 1001 Output "DC Link voltage reduced" message to signaling relay X104-17/18
    P319 Hysteresis "Link voltage reduced" message

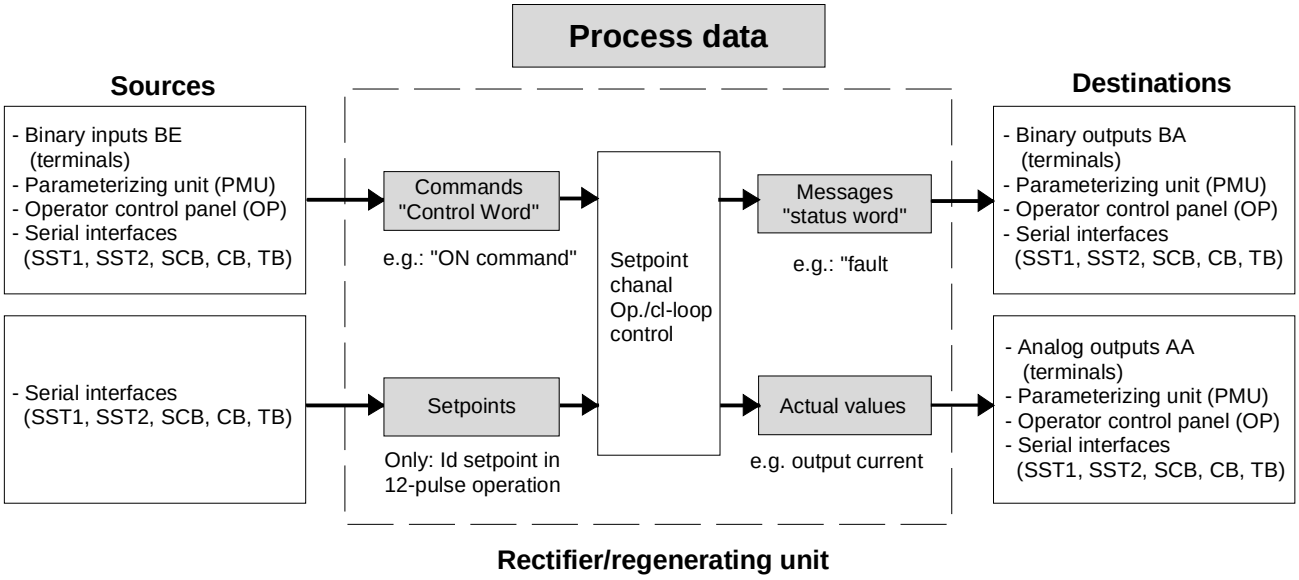
- Closed-loop control variant:

  a) Parallel connection (see Section 3.7)
  The output current can be increased by connecting up to 2 "parallel units of identical rated current in parallel with the power section of a rectifier/regenerating unit of size K ("basic unit"). The "basic unit" controls the DC-link voltage. The firing pulses of the basis unit are transmitted to the parallel unit(s) via ribbon cable. A parallel unit does not contain a CUR electronic module.
  When connected in parallel, the load current must be reduced by 10 % with respect to the total rated current.
  Due to the use of identical power sections, commutating reactors, autotransformers as well as identical cable lengths for connection to the mains supply, an almost symmetrical division of current between the "basic unit" and the "parallel unit(s)" can be ensured.

  b) 12-pulse mode (see Section 3.8)
  Two rectifier/regenerating units are connected in parallel on the output side and fed on the line side with galvanically isolated AC supplies, each displaced by 30 degrees. A rectifier/regenerating unit controls the DC-link voltage and supplies a second rectifier/regenerating unit with the current setpoint. The second rectifier/regenerating unit that is linked to the first via the SST2 serial interface (RS485 interface option) with peer-to-peer protocol only becomes a "12-pulse slave" after parameterization.
  12-pulse mode is used to reduce the harmonic loading on the system and to increase the performance for high-power rectifier/regenerating units.

"Process data":

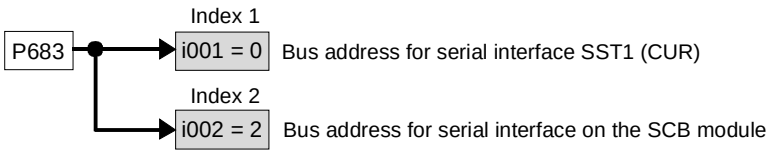
- "Process data" are commands and setpoints from "outside" fed into the rectifier/regenerating unit, as well as signals and actual values which are output from the rectifier/regenerating unit



"Indexed" parameters:

- Several parameter values are assigned to one parameter number, which can be accessed via the separate indices (in brief: i001, i002, etc.).
  The meaning of the indices of the respective parameter (parameter number) is explained in the parameter list in Chapter 5.

Example:



"Data sets":

- "Indexed" parameters can be sub-divided according to data sets.
  A data set comprises a group of several parameter values with the same index. Depending on the status of certain control word bits, a specific data record is accessed
  (see the function diagram for "selecting the data sets " in Section 4.4).
  There are two types of data set:

  - Data sets for basic/reserve setting (B/R) can be selected via control word 2/bit 30
    Associated source selection parameter: P590
    Affected parameters: P486, P554 to P557, P561, P565 to P569, P571 to P575, P578, P579, P583 and P586 to P589
    e.g. for changing over between manual and automatic operation

  - 4 changeover reserve data sets (RDS) 1, 2, 3 or 4, selectable via the bit combination in control word 2/bits 18 and 19.
    Associated source selection parameters: P578, P579
    Affected parameters: P140 to P144, P160, P161, P310 to P320, P329, P408, P517, P518, P773 to P777
    Used, e.g. for alternating operation of different inverter types on one rectifier/regenerating unit

4.2 Initial start-up

4.2.1 Preparatory measures

- Transporting, unpacking, assembling: refer to Section 2
- Connecting-up: Refer to Section 3

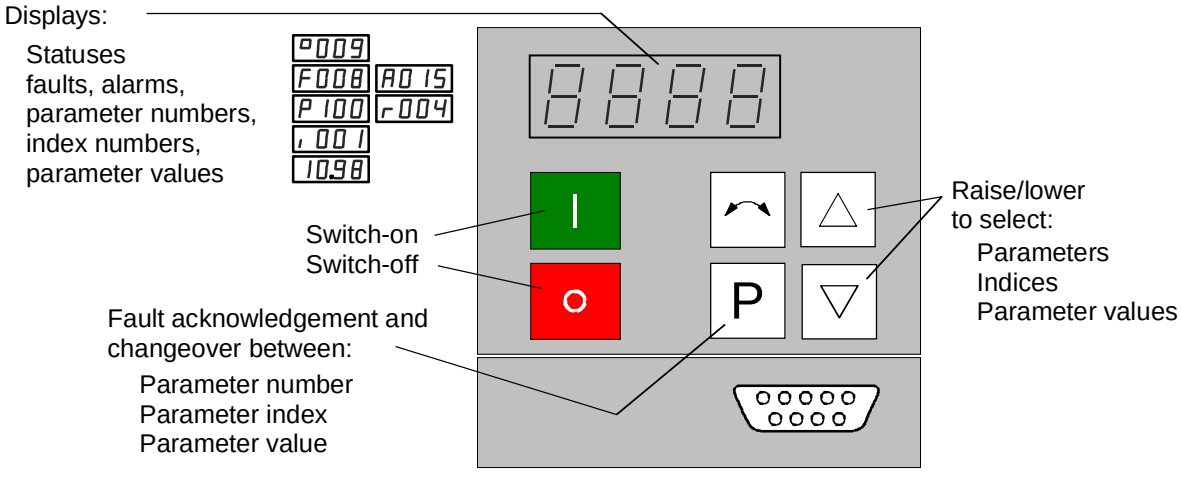
NOTE
The rectifier/regenerating feedback unit is a line-commutated converter. The main contactor, which connects the IR unit to the network, must always be actuated by the device itself via the isolated contacts X9.4 and X9.5. (See also the block diagrams with connection suggestions as described in Chapter 3.5). Direct, externally controlled opening of the main contactor (e.g. with system fault signals or emergency shutdown) during operation of the IR unit can cause uncontrollable excessive current (due to "commutation failure"). This can cause damage to the unit or in the system. The IR unit must always be switched on/off via the signal sources selected according to parameters P554 to P557. The relay for main contactor actuation (isolated contacts X9.4 and X9.5) is actuated depending on these signal sources. The internal device control in regenerative feedback operation in particular ensures a correct switch-off sequence.

- Read "Introduction and handling the start-up instructions": Section 4.1
- Forming: If the inverter(s) connected have been switched off continuously or not connected for more than a year, is/their link capacitors must be formed (see Section 4.3.9.6).
- Connect-up the supply and electronics power supply of the converter with the front panel closed.

The rectifier/regenerating unit is supplied with the "factory setting" (refer to Section 5 "Parameter list", column 4) and access stage 2 (standard mode). That means:

- The settings of the rectifier/regenerating unit data correspond to the unit type according to the MLFB (i.e. converter already initialized).

When supplied, the converter is controlled and parameterized by the parameterizing unit (PMU) located on the front side of the converter.



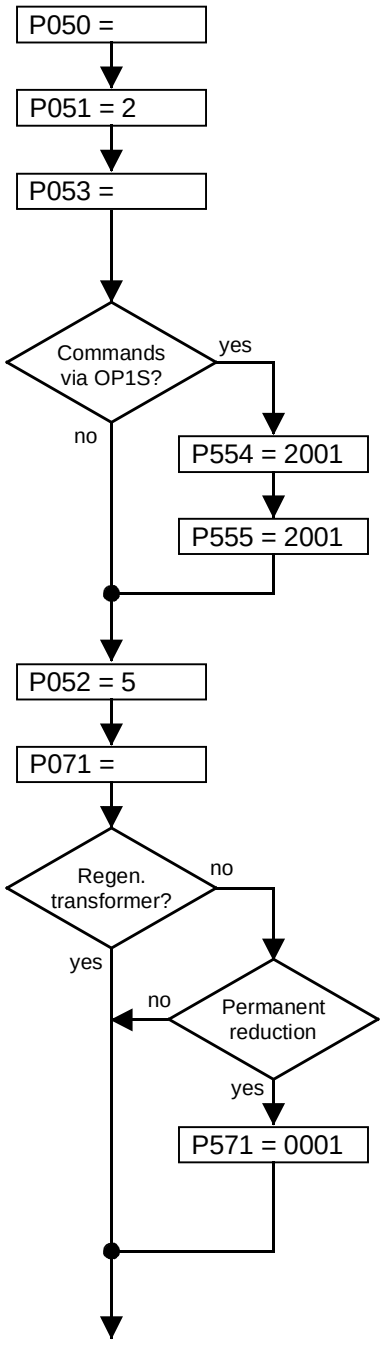
A detailed description of the displays as well as the parameterizing and operator control possibilities of the rectifier/regenerating unit via the PMU, is provided in Section 6 "operator control".

Parameterization is realized according to Sections 4.2.2 and 4.2.3

NOTE
It is possible to jump into the appropriate sequence step (in the following flow diagrams) if incorrect entries have been made, taking into account the access stage (P051) and a function selection (P052) which may be required. It is recommended that the following parameters and function steps after the jump-in position are re-checked and executed due to the background calculations !

NOTE
To avoid oscillating of the link voltage in regenerative mode, it is advisable to set parameter P287 of the SIMOVERT Master Drives FC (time constant for filtering the link voltage) to the value 3.

4.2.2 Parameterization "Standard application"



Language (only important when an OP1S is in use; see Section 9.4):
0: German, 1: English, 2: Spanish, 3: French, 4: Italian

Access stage "Standard mode“

Parameterization enable

e.g. with P053=6, the parameters from the parameterization unit (PMU) and from serial interface 1 of the basic unit (SST1- and therefore also from the optional user-friendly operator panel OP1S) can be modified.

Operator control

If the unit is to be switched on and off via the optional user-friendly operator panel OP1S:
P554=2001 Source for control command "ON/OFF1"
P555=2001 Source for control command "OFF2"

Drive setting

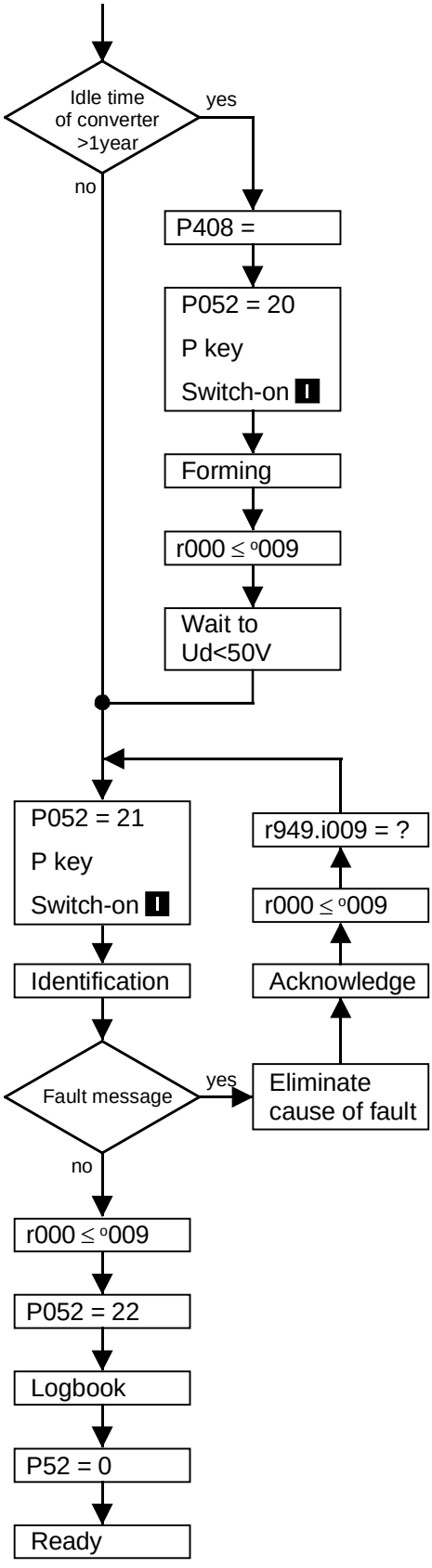
Supply voltage [V]

Value of the rated voltage at the input bridge

Mode variants:

a) The system voltage in the regenerative branch is stepped up by an (auto) transformer in order not to have to reduce the link voltage in regenerative mode
b) Permanent reduction of the link voltage by phase angle control in rectifier mode to always be able to feed power back into the system
In accordance with the manufacturer setting P318=80%, it is reduced to a setpoint of 80% of 1.35 x system voltage at the rectifier bridge 1)
P571 = 0001 permanent selection of reduced voltage

1) P318 is not displayed in "standard mode"



Forming the DC link (if necessary, see Section 4.3.9.6)

- The rectifier/regenerating unit must be in status o009 less (give SWITCH ON command)
- Set P408 (forming time: 1.0 to 600.0 minute)
- Select function (**P052 = 20**)
- Press P key on the PMU
- Press the I key on the PMU
- The DC link is formed.
- When forming is completed, the operating status display appears.

(see r006)

Circuit identification
(see Section 4.3.9.7)

- The rectifier/regenerating unit must be in operating state o009 or less (give SWITCH OFF command!).
- Select circuit identification (**P052 = 21**).
- Press the P key on the PMU
- Switch on: Press the I key on the PMU
- Circuit identification takes place (takes about 10 s)
- Following circuit identification, the operating display is activated.
- If an error occurs during circuit identification, the identification process must be repeated (error value r949 assigned to error memory r947 can provide more information on the cause of error (if the error in index i009 has been reset) see Sections 5.16 and 7.1)

Documenting the settings

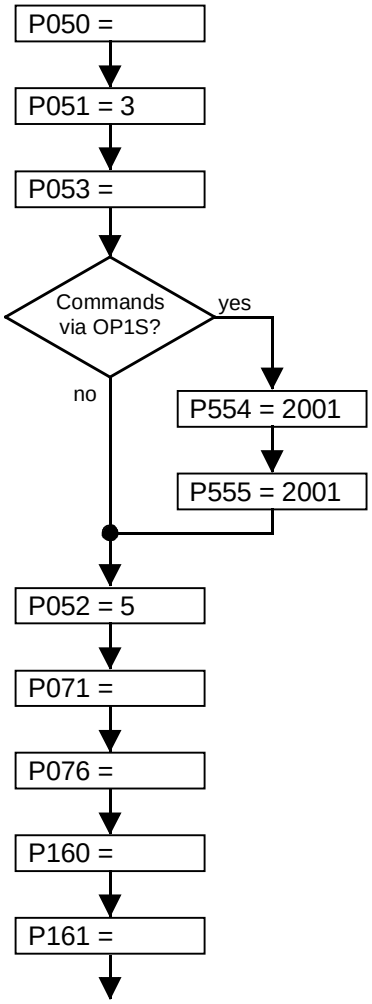
- Select the "Display modified parameters“ function (**P052 = 22**).
  (see Section 4.3.9.8 "Display modified parameters“)
  Note: Function can only be used with operator control via the PMU
- Enter the values of the modified (i.e. system-specific) parameters in the logbook (Chapter 12)
- Select the "Return" function (**P052 = 0**).

DC link voltage smoothing

- By parameterizing P287=3 (time constant for smoothing the DC link voltage) on the connected SIMOVERT Master Drive FC the dynamic behavior of the closed-loop control of the DC link voltage can be improved.

4.2.3 Parameterization for "Expert application"

Parameterization can be simplified by selecting an appropriate factory setting via parameter P077 using special functions such as 12-pulse mode with two rectifier/regenerating units coupled via a peer-to-peer link. In this case, this is carried out by selecting the function "Generate factory setting" as described in Section 4.3.9.1 with P077≠0. Then the parameterization shown in the following diagram can be carried out.
In all other cases, the following parameterization is started immediately.



Language (only important when an OP1S is in use; see Section 9.4):
0: German, 1: English, 2: Spanish, 3: French, 4: Italian

Access stage "Standard mode“

Parameterization enable

e.g. with P053=6, the parameters from the parameterization unit (PMU) and from serial interface 1 of the basic unit (SST1- and therefore also from the optional user-friendly operator panel OP1S) can be modified.

Operator control

If the unit is to be switched on and off via the optional user-friendly operator panel OP1S:
P554=2001 Source for control command "ON/OFF1"
P555=2001 Source for control command "OFF2"

Drive setting

Supply voltage [V

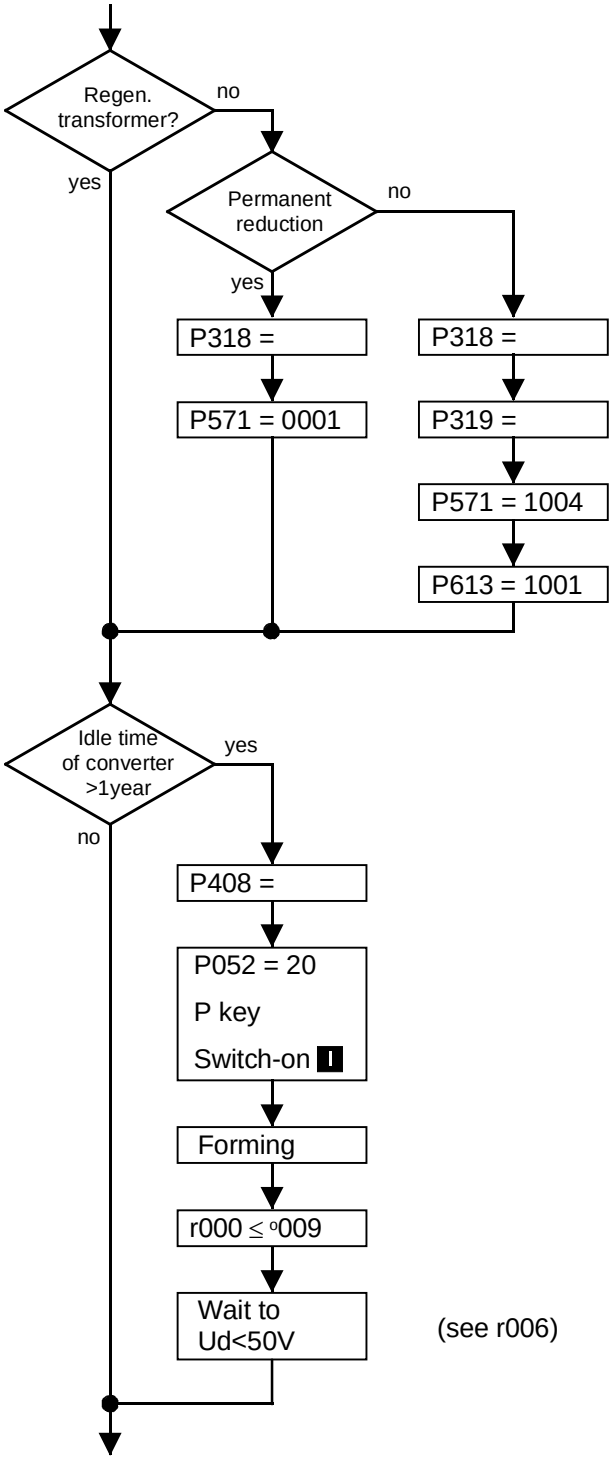
Value of the rated voltage at the rectifier bridge

Configuration of the power section

P076 = 00x No power section connected in parallel
11x 1 rectifier/regenerating parallel unit connected in parallel with the basic unit
01x 1 common rectifier parallel unit connected in parallel with the basic unit
etc.
22x 2 rectifier/regenerating parallel units connected in parallel with the basic device
(see also Chapter 5, P076 and Chapter 3.7)

Current limits:

P160 = Max. supply current (in % P075 rated current of rectifier/regenerating unit (factory setting: +150% only briefly available)
P161 = Max. regenerative current (in % of P075 rated current of rectifier/regenerating unit (factory setting: -150% only briefly available)



Mode variants:

a) The system voltage in the regenerative branch is stepped up by an (auto) transformer in order not to have to reduce the link voltage in regenerative mode

b) Permanent reduction of the link voltage by phase angle control in rectifier mode to always be able to feed power back into the system
P318 Reduced DC link voltage setpoint (e.g. = 80 %)
P571 = 0001 Permanent selection of reduced voltage

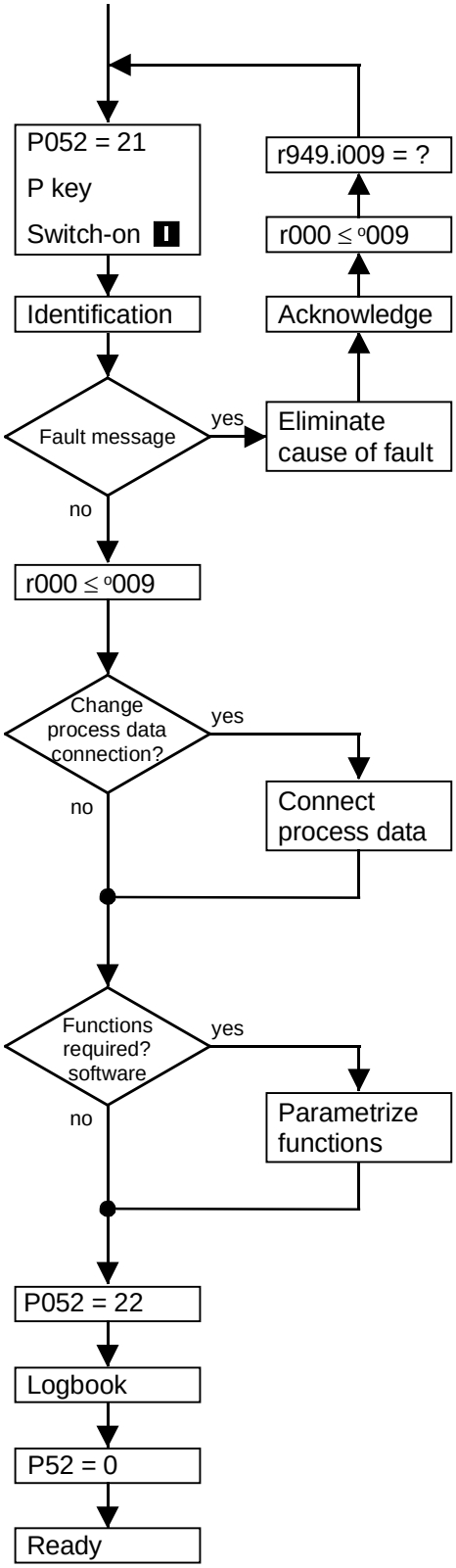
c) Reduction of the DC link voltage only for regenerative feedback operation to make full use of the line voltage in infeed operation and to obviate the need for an autotransformer for regenerative feedback. (See also Chapter 4.3.10.2)

c1) Externally required reduction of the DC link voltage by external control (using the control word command "Ud reduction requested")
P318 reduced DC link voltage setpoint (e.g. = 80 %)
P571 = 1004 on selection of the reduction via terminal X101-12 (binary input 4)
P613 = 1001 message "DC link voltage reduced" output at alarm relay X104-17/18 (ready for regenerative feedback)
P319 Hysteresis for the message "DC link voltage reduced" (ready for regenerative feedback)

c2) Automatic reduction of the DC link voltage depending on the DC link current (only implemented on Software Version 3.2 and higher and not shown in the adjacent diagram):
If the DC link current falls below threshold P321 in infeed direction, the command for Ud reduction is generated internally. The load current drawn must still remain positive for long enough before it changes direction after falling below P321 to permit a drop of Ud to the required value. The current-dependent Ud reduction therefore only works if the appropriate load cycle applies.
Relevant parameters: P318, P319, P321, P322, P323

Forming the DC link (if necessary; see Section 4.3.9.6)

- The rectifier/regenerating unit must be in status o009 or less (give SWITCH OFF command!).
- Set P408 (forming time: 1.0 to 600.0 minutes).
- Select function (**P052 = 20**)
- Press the P key on the PMU
- Switch on: Press the I key on the PMU
- Forming of the DC link takes place
- Following the forming process, the status display is activated.



Circuit identification
(see Section 4.3.9.7)

- The rectifier/regenerating unit must be in operating state o009 or less (give SWITCH OFF command!).
- Select circuit identification (**P052 = 21**).
- Press the P key on the PMU
- Switch on: Press the I key on the PMU
- Circuit identification takes place (takes about 10 s)
- Following circuit identification, the operating display is activated.
- If an error occurs during circuit identification, the identification process must be repeated (error value r949 assigned to error memory r947 can provide more information on the cause of error (if the error in index i009 has been reset) see Sections 5.16 and 7.1)

Change factory setting for: Command and setpoint sources, Destinations for signals and actual values

Process data: refer to Section 4.3.1
- Control word (commands) / status word (messages)
- Setpoint/actual values

Possible process data sources/destinations:
(refer to Sections 4.3.2 to 4.3.6)
- Binary inputs, binary outputs
- Analog inputs
- Serial interface in the basic unit (SST1, SST2)
  (SST2 only with optional RS485 interface PTP1)
- Option boards (SCB, CB, TB)

Simple applications: refer to Section 4.2.5

Possible functions:
WEA (automatic restart)

Parameterize functions:
Refer to Section 4.3.10 "Functions" and Section 5 "Parameter list"

Documenting the settings

- Select the "Display modified parameters“ function (**P052 = 22**).
  Note: Function can only be used with operator control via the PMU
- Enter the values of the modified (i.e. system-specific) parameters in the logbook (Chapter 12)
- Select the "Return" function (**P052 = 0**).

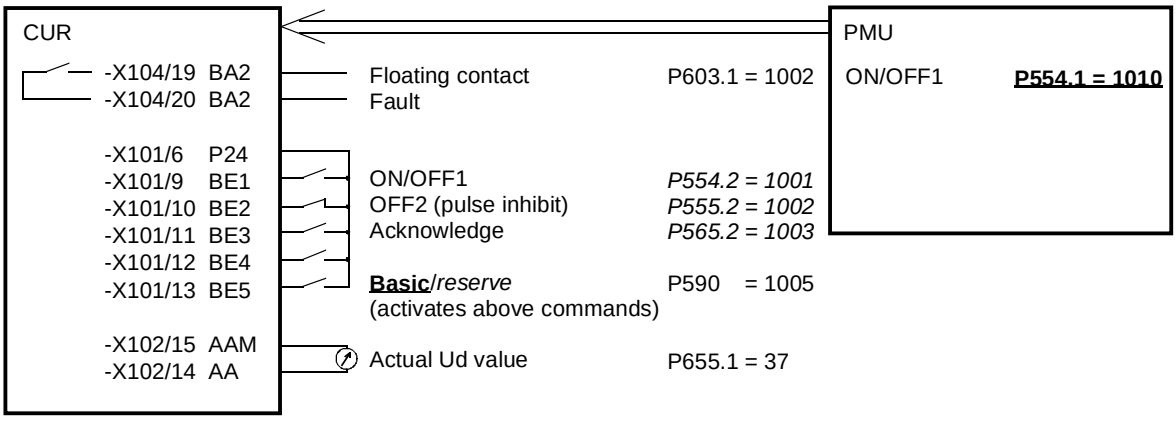
DC link voltage smoothing

- By parameterizing P287=3 (time constant for smoothing the DC link voltage) on the connected SIMOVERT Master Drive FC the dynamic behavior of the closed-loop control of the DC link voltage can be improved.

4.2.5 Simple application examples for connecting process data with connection assignment

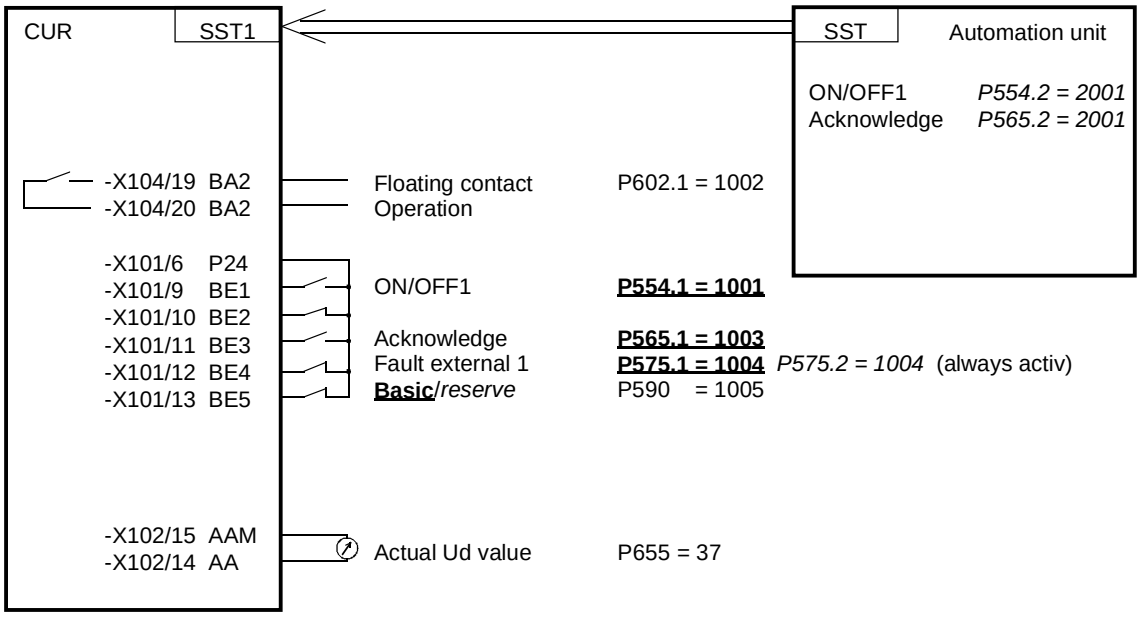
Connecting-up: Refer to Section 3.3 "Control terminal strip"

Factory setting:
Switch-on/off via the PMU, messages and actual values via the terminal strip.
Terminal strip only operational if binary input 5 (BE5) is energized (high signal level corresponds to "reserve").



Manual/automatic operation:

Automatic operation (BE5 high signal level): Command input from the automation unit via serial interface (SST1), the monitoring of external faults via a terminal strip also possible.
Manual operation (BE5 low signal level): Command input via the terminal strip.



4.3 Start-up aids

4.3.1 Process data

Process data are commands and setpoints which are entered into the rectifier/regenerating unit from "outside" as well as signals and actual values which the rectifier/regenerating unit outputs.

4.3.1.1 Control word (control word 1 and control word 2)

Control/status word for 12-pulse mode, see Section 3.8

4.3.1.1.1 Introduction and application example

The two control words 1 (bits 0 to 15) and 2 (bits 16 to 31) output commands and external signals (messages) to the rectifier/regenerating unit.

Their status can be read-out via parameter r550 or r967 (control 1) and r551 (control word 2).

An overview is provided in Section 4.3.1.1.2 "Overview of the control word".
The significance of the possible commands and signals, entered externally, is described in Section 4.3.1.1.7 "Significance of the control word commands".

Every control word bit is assigned a selection parameter, which defines from which source(s) this bit can be changed (refer to Section 4.3.1.1.2, right-hand column).
The selection parameters for the sources are, with the exception of P590 (source selection for control word bit 30 "basic/reserve setting") and P591 (source selection for control word bit 31 "Main contactor checkback signal") are indexed 2x as follows:

Index	i001	Basic setting
	i002	Reserve setting

An overview of possible sources, which are assigned fixed values (0-6005, non-consecutively), are provided in Section 4.3.1.1.3 to 4.3.1.1.6 "Selecting the source for the control word".

In this overview, values 0 and 1 are an exception; sources are not selected with these values, but the bits are set permanently to 0 (LOW) or 1 (HIGH) (also refer to select parameters P554 to P591 in Section 5 "parameter list").

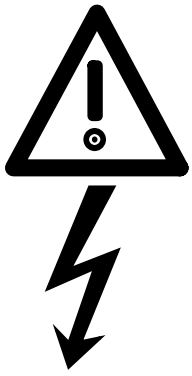
NOTE

The control word commands "OFF2" (bit1), "OFF3" (bit2) and "Acknowledge" (bit7) are always simultaneously effective from 3 sources (can be parameterized) !
"Acknowledge" (bit7) is also always effective from the PMU !

NOTICE

If the "On" command (bit 0) is connected to a serial interface (SST1, CB/TB, SCB-SST), then the following must be observed for safety-related reasons:

Additionally, an "OFF2" or "OFF3" command must be parameterized at the terminal strip/PMU, as otherwise the converter cannot be shutdown with a defined command, when communications fail!

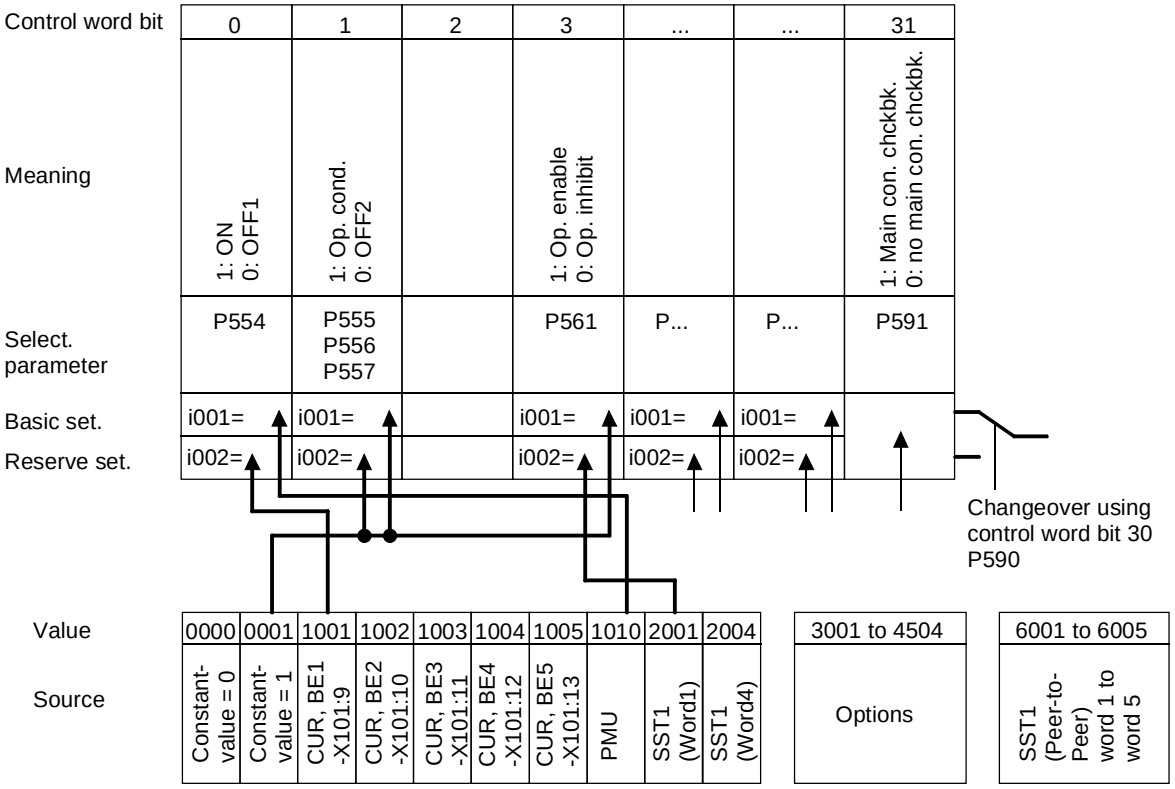


WARNING

When making any modifications to control or other wiring, make absolutely sure that no dangerous situations can arise!

Example
If a terminal at logic H potential is programmed as the source for the ON/OFF1 command, the rectifier/regenerating unit will enter the "Run" ("R") state when the P key is pressed (activates the value set!).
Conversely, a rectifier/regenerating unit that is in the "R" state will enter the "Ready" ("B") state if the terminal is at logic L potential.

Typical application:

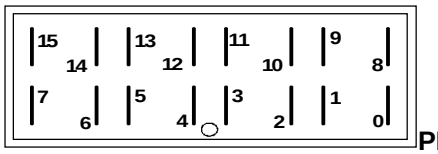


ON/OFF1:	Basic set.:	via PMU (keys I/0)	Reserve set.:	via bin. input 1 of CUR
Op. cond/OFF2:	Basic set.:	Constant value= 1= always op. cond.	Reserve set.:	Constant value = 1 = always op. cond.

Note: For OFF2 and OFF3, 3 selection parameters can be assigned differently in the same index!

Op. enable/inhibit:	Basic set.:	Constant value = 1 = always op. enable.	Reserve set.:	Constant value = 1 = via serial interface SST1 of the CUR

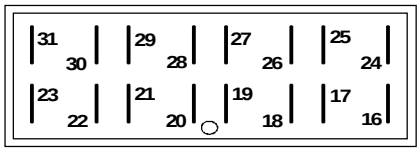
4.3.1.1.2 Overview of the control word (control word 1 and control word 2)



PMU Display

"Control word 1" (visualization parameter r550 or r967)

Bit	High	Low	Comments	Source selection
0	ON	OFF1 (stop)	(Priority OFF 2/1)	P554
1	Operating condition	OFF2 (electrical)	3 sources simultaneously effective; (Priority OFF 2/1)	P555 P556 P557
2			always HIGH	
3	Operating condition	Inhibit operation	Firing pulse enable	P561
4			always High	
5			always High	
6			always High	
7	Acknowledge		Simultaneously effective from 3 sources and PMU; Positive edge evaluation	P565 P566 P567
8	Inching 1 ON	Inching 1 OFF	Same effect as ON/OFF1	P568 1)
9	Inching 2 ON	Inching 2 OFF	Same effect as ON/OFF1	P569 1)
10	Control from the PLC	No control	Only effective via CB,TB,SST1,SST/SCB	
11	Ud reduction requested	Ud reduction inactive		P571 1)
12	Regenerating enabled	Regenerating inhibited		P572 1)
13	No fault, external 3	Fault, external 3		P573 1)
14	Motoring	Generating	Specification of the direction of supply	P574 1)
15	No fault, external 1	Fault, external 1		P575



PMU Display

"Control word 2" (visualization parameter r551)

Bit	High	Low	Comments	Source selection
16				
17				
18	RDS (reserve data set) bit 0 (LSB)		Logic operation with bit 19	P578 1)
19	RDS (reserve data set) bit 1 (MSB)		Logic operation with bit 18	P579 1)
20				
21				
22				
23	12-pulse mode selected	No 12-pulse mode		P583 1)
24				
25				
26	No fault, external 2	Fault, external 2		P586
27	Slave S/F unit	Master S/F unit	Changeover Ud/Id control	P587
28	No alarm, external 1	Alarm, external 1		P588
29	No alarm, external 2	Alarm, external 2		P589
30	Reserve setting for setpoints and control word	Basic setting for setpoints and control word		P590
31	HS checkback signal	No HS checkback signal	Can only connected at the converter term. strip or SCB	P591

1) This bit has a different meaning for the rectifier/regenerating unit as for the converter

4.3.1.1.3 Selecting the source for control word 1 (bit 0-7)

Bit	0	1	2	3	4	5	6	7
Selection P. basic setting	554.1	555 to 557.1		561.1				565 to 567.1
Selection P. reserve setting	554.2	555 to 557.2		561.2				565 to 567.2

Value	Source								
0000	Constant value = 0	x			x				**xG/R**
0001	Constant value = 1		**xG/R**		**xG/R**				
1001	CUR, BE1, -X101:9	**xR**	x		x				x
1002	CUR, BE2, -X101:10	x	**xR for 555**		x				x
1003	CUR, BE3, -X101:11	x	x		x				**xR for 565**
1004	CUR, BE4, -X101:12	x	x		x				x
1005	CUR, BE5, -X101:13	x	x		x				x
1010	PMU	**xG**	**xG for 555**						1)
2001	SST1 (PMU -X300 or -X100:1...5) Word1	x	x		x				**xG/R for 567**
2004	SST1 (PMU -X300 or -X100:1...5) Word4								
	OPTIONS								
3001	CB/TB (Word1)	x	x		x				x
3004	CB/TB (Word4)								
4101	SCI 1 and 2, Slave 1,BE1	x	x		x				x
4102	BE2	x	x		x				x
...	Consecutively to	x	x		x				x
4110	BE10	x	x		x				x
4111	only SCI 2, Slave 1,BE11	x	x		x				x
4112	BE12	x	x		x				x
...	Consecutively to	x	x		x				x
4116	BE16	x	x		x				x
4201	SCI 1 and 2, Slave 2,BE1	x	x		x				x
4202	BE2	x	x		x				x
...	Consecutively to	x	x		x				x
4210	BE10	x	x		x				x
4211	only SCI 2, Slave 2,BE11	x	x		x				x
4212	BE12	x	x		x				x
...	Consecutively to	x	x		x				x
4216	BE16	x	x		x				x
4501	SCB-SST (USS /Peer-t-Peer) Word1	x	x		x				x
4504	SCB-SST (USS /Peer-t-Peer) Word4								
6001	SST2 (PTP1, A2-X117:1..5) Word 1	x	x		x				x
...	Consecutively to	x	x		x				x
6005	SST2 (PTP1, A2-X117:1..5) Word 5	x	x		x				x

x: Value can be assigned for the selection parameters (BE can only be assigned once in the same index of all selection parameters!)

1) Value 1010 cannot be set, but reset is <u>always</u> possible from PMU.

Factory setting: **xG:** for basic setting with P077=0
xR: for reserve setting with P077=0

4.3.1.1.4 Selecting the source for control word 1 (bit 8-15)

Bit	8	9	10	11	12	13	14	15
Selection P. basic setting	568.1	569.1		571.1	572.1	573.1	574.1	575.1
Selection P. reserve setting	568.2	569.2		571.2	572.2	573.2	574.2	575.2

Value	Source								
0000	Constant value = 0	**xG/R**	**xG/R**		**xG/R**	x		**xG/R**	
0001	Constant value = 1				x	**xG/R**	**xG/R**		**xG/R**
1001	CUR, BE1, -X101:9	x	x		x	x	x	x	x
1002	CUR, BE2, -X101:10	x	x		x	x	x	x	x
1003	CUR, BE3, -X101:11	x	x		x	x	x	x	x
1004	CUR, BE4, -X101:12	x	x		x	x	x	x	x
1005	CUR, BE5, -X101:23	x	x		x	x	x	x	x
1010	PMU								
2001	SST1 (PMU -X300 or -X100:1...5) Word1	x	x		x	x	x	x	x
2004	SST1 (PMU -X300 or -X100:1...5) Word4								
	OPTIONS								
3001	CB/TB (Word1)	x	x		x	x	x	x	x
3004	CB/TB (Word4)								
4101	SCI 1 and 2, Slave 1,BE1	x	x		x	x	x	x	x
4102	BE2	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4110	BE10	x	x		x	x	x	x	x
4111	only SCI 2, Slave 1,BE11	x	x		x	x	x	x	x
4112	BE12	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4116	BE16	x	x		x	x	x	x	x
4201	SCI 1 and 2, Slave 2,BE1	x	x		x	x	x	x	x
4202	BE2	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4210	BE10	x	x		x	x	x	x	x
4211	only SCI 2, Slave 2,BE11	x	x		x	x	x	x	x
4212	BE12	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
4216	BE16	x	x		x	x	x	x	x
4501	SCB-SST (USS /Peer-t-Peer) Word1	x	x		x	x	x	x	x
4504	SCB-SST (USS /Peer-t-Peer) Word4								
6001	SST2 (PTP1, A2-X117:1..5) Word 1	x	x		x	x	x	x	x
...	Consecutively to	x	x		x	x	x	x	x
6005	SST2 (PTP1, A2-X117:1..5) Word 5	x	x		x	x	x	x	x

x: Value can be assigned for the selection parameters

Factory setting: **xG:** for basic setting with P077=0
xR: for reserve setting with P077=0

4.3.1.1.5 Selecting the source for control word 2 (bit 16-23)

Bit	16	17	18	19	20	21	22	23
Selection P. basic setting			578.1	579.1				583.1
Selection P. reserve setting			578.2	579.2				583.2

Value	Source								
0000	Constant value = 0			**xG/R**	**xG/R**				**xG/R**
0001	Constant value = 1			x	x				x
1001	CUR, BE1, -X101:9			x	x				x
1002	CUR, BE2, -X101:10			x	x				x
1003	CUR, BE3, -X101:11			x	x				x
1004	CUR, BE4, -X101:12			x	x				x
1005	CUR, BE5, -X101:13			x	x				x
1010	PMU								
2001	SST1 (PMU -X300 or -X100:1...5) Word1								
2004	SST1 (PMU -X300 or -X100:1...5) Word4			x	x				x
	OPTIONS								
3001	CB/TB (Word1)								
3004	CB/TB (Word4)			x	x				x
4101	SCI 1 and 2, Slave 1, BE1			x	x				x
4102	BE2			x	x				x
...	Consecutively to			x	x				x
4110	BE10			x	x				x
4111	only SCI 2, Slave 1, BE11			x	x				x
4112	BE12			x	x				x
...	Consecutively to			x	x				x
4116	BE16			x	x				x
4201	SCI 1 and 2, Slave 2, BE1			x	x				x
4202	BE2			x	x				x
...	Consecutively to			x	x				x
4210	BE10			x	x				x
4211	only SCI 2, Slave 2, BE11			x	x				x
4212	BE12			x	x				x
...	Consecutively to			x	x				x
4216	BE16			x	x				x
4501	SCB-SST (USS /Peer-t-Peer) Word1								
4504	SCB-SST (USS /Peer-t-Peer) Word4			x	x				x
6001	SST2 (PTP1, A2-X117:1..5) Word 1			x	x				x
...	Consecutively to			x	x				x
6005	SST2 (PTP1, A2-X117:1..5) Word 5			x	x				x

x: Value can be assigned for the selection parameters

Factory setting: **xG:** for basic setting with P077=0
xR: for reserve setting with P077=0

4.3.1.1.6 Selecting the source for control word 2 (bit 24-31)

Bit	24	25	26	27	28	29	30	31
Selection P. basic setting			586.1	587.1	588.1	589.1	590	591
Selection P. reserve setting			586.2	587.2	588.2	589.2	590	591

Value	Source								
0000	Constant value = 0				**xG/R**			x	
0001	Constant value = 1			**xG/R**	x	**xG/R**	**xG/R**	x	***X***
1001	CUR, BE1, -X101:9			x	x	x	x	x	x
1002	CUR, BE2, -X101:10			x	x	x	x	x	x
1003	CUR, BE3, -X101:11			x	x	x	x	x	x
1004	CUR, BE4, -X101:12			x	x	x	x	x	x
1005	CUR, BE5, -X101:13			x	x	x	x	***X***	x
1010	PMU								
2001	SST1 (PMU -X300 or -X100:1...5) Word1								
2004	SST1 (PMU -X300 or -X100:1...5) Word4			x	x	x	x	x	
	OPTIONS								
3001	CB/TB, Word1								
3004	CB/TB, Word4			x	x	x	x	x	
4101	SCI 1 and 2, Slave 1,BE1			x	x	x	x	x	x
4102	BE2			x	x	x	x	x	x
...	Consecutively to			x	x	x	x	x	x
4110	BE10			x	x	x	x	x	x
4111	only SCI 2, Slave 1,BE11			x	x	x	x	x	x
4112	BE12			x	x	x	x	x	x
...	Consecutively to			x	x	x	x	x	x
4116	BE16			x	x	x	x	x	x
4201	SCI 1 and 2,Slave 2,BE1			x	x	x	x	x	x
4202	BE2			x	x	x	x	x	x
...	Consecutively to			x	x	x	x	x	x
4210	BE10			x	x	x	x	x	x
4211	only SCI 2, Slave 2,BE11			x	x	x	x	x	x
4212	BE12			x	x	x	x	x	x
...	Consecutively to			x	x	x	x	x	x
4216	BE16			x	x	x	x	x	x
4501	SCB-SST (USS /Peer-t-Peer) Word1								
4504	SCB-SST (USS /Peer-t-Peer) Word4			x	x	x	x	x	
6001	SST2 (PTP1, A2-X117:1..5) Word 1			x	x	x	x	x	
...	Consecutively to			x	x	x	x	x	
6005	SST2 (PTP1, A2-X117:1..5) Word 5			x	x	x	x	x	

x: Value can be assigned for the selection parameters

Factory setting: **X:** for P590 / P591
xG: for basic setting with P077=0
xR: for reserve setting with P077=0

4.3.1.1.7 Significance of control word (1 and 2) commands

The status of the rectifier/regenerating unit can be read in the operating display r000: e.g. READY-TO-SWITCH-ON r000=009

The function sequences are described in the sequence in which they are realized.

Bit 0: ON command (↑ "ON")

The command is executed with a positive edge change from L to H (L → H) only in the READY-TO-SWITCH-ON (009).

After the command has been accepted:

- Changeover to the status WAIT FOR LINE VOLTAGE (010)
  The main contactor is closed.
- Changeover to the status READY STATUS(011)
- Changeover to the status TEST PHASE (012)
  Takes place only if thyristor or ground-fault test (P353,P354) selected.
- Changeover to the RUN status(014)
  Pre-charging is carried out, followed by normal operation.

Bit 0: OFF1 command (L "OFF1")

The OFF1 command (stop) is executed with an L signal.

After the command has been accepted:

- The rectifier/regenerating unit discharges the DC link with the fixed discharge ramp of 2 s to about 20% of 1.35 * P071.
  The firing pulses are then inhibited and the main contactor (if installed) drops out.
  If the OFF1 command is removed again (ON command) during the discharge process, the latter is interrupted and changeover is made again to the RUN (014) status.
- If the rectifier/regenerating unit is in the READY status, the firing pulses are disabled and the main contact, if installed, drops out.
- If there is no OFF2 command:
  Changeover to the READY TO SWITCH ON status (009)

Bit 1: OFF2 command (L "OFF2")

The OFF2 command (electrical) is realized with an L signal.

After the command has been accepted:

- The firing pulses are inhibited and the main contact drops out.
- Changeover into the SWITCH-ON INHIBIT status(008)

NOTE
The OFF2 command is simultaneously effective from three sources (P555, P556 and P557)!!

NOTE
Priority of the OFF commands **OFF2** > **OFF1**

Bit 3: Run enable command (H "Run enable")

The RUN ENABLE command (firing pulse enable) is implemented with an H signal.

After the command has been accepted:

- If the READY status (011) still applies.
  Changeover to the RUN status (014); the firing pulses are enabled and the voltage setpoint is approached over the pre-charging ramp.

Bit 3: Run inhibit command (L "Run inhibit")

The RUN INHIBIT command (firing pulses disabled) is implemented with an L signal.

After the command has been accepted:

- If the RUN status (014) applies:
  Changeover to the READY status (01); the firing pulses are inhibited.

Bit 4 to 6: reserved

Bit 7: Acknowledge command (↑ "Acknowledge")

The command is executed with a positive edge change from L to H (L → H) only in the FAULT status (007).

After the command has been accepted:

- All actual faults are deleted after having been previously transferred into the diagnostics memory
- If no faults are present:
  The drive changes into the status SWITCH-ON INHIBIT (008)
- If actual faults are present:
  The drive remains in the FAULT status (007).

NOTE
The **acknowledge** command is simultaneously effective from three sources (P565, P566 and P567) and always from the PMU!

Bit 8: Inching 1 ON command (↑ "Inching 1 ON")

The command is executed with a positive edge change from L to H (L → H) only in the READY-TO-SWITCH-ON status (009).

After the command has been accepted

- an ON command is automatically executed (description, refer to control word bit 0).

Bit 8: Inching 1 OFF command (L "Inching 1 OFF")

The command is executed with an L signal.

After the command has been accepted:

- An OFF 1 command is automatically executed (description, refer to control word bit 0).

Bit 9: Inching 2 ON command (↑ "Inching 2 ON")

The command is executed with a positive edge change from L to H (L → H) only in the READY-TO-SWITCH-ON status (009).

After the command has been accepted

- an ON command is automatically executed (description, refer to control word bit 0).

Bit 9: Inching 2 OFF command (L "Inching 2 OFF")

The command is executed with an L signal.

After the command has been accepted:

- An OFF 1 command is automatically executed (description, refer to control word bit 0).

Bit 10: Control from the PLC command (H "Control from the PLC")

The command is executed with an H signal

Process data PZD (control word, setpoints) originating from a PLC which were sent via the SST1 interface of CU1, the CB/TB interface (option) and the SST/SCB interface (option), are only evaluated if the command was accepted.

- If several interfaces are operational, only the process data of the interfaces are evaluated, which transmit the H signal.
- For an L signal, the last values are retained in the appropriate dual port RAM of the interface.

An H signal appears in the visualization parameter r550 "control word 1", if one of the interfaces transmits an H signal!

Bit 11: Ud reduction command (H "Ud reduction requested")
(See also Chapter 4.3.10.2)

The command is executed with an H signal.

After the command has been accepted:

- The DC link voltage setpoint drops to the value set with P318:

$$\text{Setpoint} = 1.35 * U_{\text{Supply,rectifier}} * \frac{\text{P318}}{100.00\%}$$

  If the value of P330 is even, Ud setpoint lowering takes place abruptly. If it is odd, the setpoint is ramped down according to the discharge time in P330.

- At the same time, the intermediate DC link voltage threshold for enabling the regenerating bridge is reduced to the following value if an autotransformer is not present (i.e. when $\frac{U_{\text{Supply,regenerating}}}{U_{\text{Supply,rectifier}}} < 1.17$):

$$1.35 * U_{\text{Supply,regenerating}} * \frac{\text{P318}}{100.00\%}$$

  This causes the signal "Regenerating ready" (status word 1, bit 10) to switch to low.

- The DC link should now discharge.
- When the DC link voltage drops below the following threshold value

$$1.35 * U_{\text{Supply,rectifier}} * \frac{\text{P318}}{100.00\%} + \frac{2\%}{100\%} * 1.35 * \text{P071}$$

  the message "Ud reduced" (status word 1, bit 13) is issued, and a converter connected to the DC link can regenerate. At the same time as the message "Ud reduced" is issued, for which the hysteresis of P319 applies, the regenerating bridge is enabled such that the DC link voltage threshold for the message "Regenerating ready" is set to a higher value.

- The appearance of a trailing edge of the Ud reduction command causes the output of the ramp-up/return element (precharging time P329) to be set to the current value of DC link voltage so that the DC link voltage setpoint can ramp up again from this value.

- The L signal of the Ud reduction command causes the "Ud reduced" message (status word 1, bit 13) to be held low (regardless of the DC link voltage level)

Bit 12: Regenerating enable command (H "Regenerating enable")

The REGENERATING ENABLE command is executed with an H signal.

After the command has been accepted:

- The regenerating bridge of the rectifier/regenerating unit is enabled (firing pulse enable).

Bit 12: Regenerating inhibit command (L "Regenerating inhibit")

The REGENERATING INHIBIT command is executed with an L signal.

After the command has been accepted:

- The regenerative branch of the rectifier/regenerating unit is inhibited (firing pulse inhibit).

Bit 13: Fault, external 3 command (L "Fault, external 3")

The command is executed with an L signal.

After the command has been accepted:

- Changeover to the FAULT status (007) (fault F038)
  The firing pulses are inhibited and the main contactor, if installed, drops out (see also Chapter 7 ""Faults and Warnings").

Bit 14: Power direction command (H " Motoring "; L " Generating ")

The command is used to specify the power direction.

With an H signal only the rectifier bridge can carry current, and with an L signal only the regenerating bridge.

Bit 15: Fault, external 1 command (L "Fault, external 1")

The command is executed with an L signal.

After the command has been accepted:

- Changeover to the FAULT status (007) (fault F035)
  The firing pulses are inhibited and the main contactor, if installed, drops out.(see also Chapter 7 ""Faults and Warnings")

Bit 16 and 17: reserved

Bit 18: Reserve data set RDS bit 0 (LSB) command

In conjunction with bit 19 "RDS bit 1", this command permits changeover between four possible data sets (see "Data sets" in Section 4.1.2 and "Selecting the data sets" in Section 4.4).

NOTE
The values in the data sets must be meaningful. This is the case, for example, when current identification (see Section 4.3.9.7) has been carried out for the currently selected reserve data set or when a valid data set has been copied using copy parameters (see P055 in Section 5.3). Otherwise errors will be reported.

After the command has been accepted:

- The parameter settings of the corresponding data set in the closed/open-loop control are activated.

Bit 19: Reserve data set RDS bit 1 (MSB) command

In conjunction with bit 18 "RDS bit 0", this command permits switches over between four possible data sets (see bit 18).

Bits 20 to 22: reserved

Bit 23: 12-pulse mode selection command (H "12-pulse mode is selected")

The command is executed with an H signal and causes a change in operational behavior from that of a single unit (i.e. a "normal" single unit becomes a 12-pulse master or a 12-pulse slave depending on parameter P587 or control word bit 27). See Section 3.8.4 for further details.

Bits 24 and 25: reserved

Bit 26: Fault, external 2 command (L "Fault, external 2")

The command is recognized with an L signal and does not become active until the pre-charging time (P329) and an additional time delay of 3000 ms has elapsed when the operating mode RUN is active. During formation (P052=20) or circuit identification (P052=21), the command is ineffective.

After the command has been accepted

- Changeover to the FAULT status (007) (fault F036)
  The firing pulses are inhibited and the main contactor, if installed, drops out (see also Chapter 7 "Faults and Warnings").

Bit 27: Master/slave changeover (H "Slave S/F unit"/L "Master S/F unit")

The command switches between slave and master mode.

Slave S/F unit: The closed-loop control operates with an external DC link current setpoint
Even when a thyristor test is selected (P353=1, 2 or 3) if Ud > 5% it does not wait in state o012 and the thyristor test is not carried out.

Master S/F unit: The closed-loop control operates with an external DC link current setpoint

Bit 28: Alarm, external 1 command (L "Alarm, external 1")

The command is executed with an L signal.

After the command has been accepted

- The operating status is retained. An alarm message (A015) is output (also refer to Section 7 "Fault and Alarm Messages")

Bit 29: Alarm, external 2 command (L "Alarm, external 2")

The command is executed with an L signal.

After the command has been accepted:

- The operating status is retained. An alarm message (A015) is output (also refer to Section 7 " Fault and Alarm Messages ")

Bit 30: Selection, basic/reserve setting command (L "Basic setting / H "Reserve setting")

The command activates the BASIC SETTING with an L signal and the RESERVE SETTING with an H signal

After the command has been accepted:

- The parameter settings of the basic or reserve setting for the control word itself, the setpoint channel, and the closed-loop control are activated (see "Data sets" in Section 4.1.2 and "Selecting the data sets" in Section 4.4).

Bit 31: Main contactor checkback signal command (H "Main contactor checkback signal")

This command permits you to include an auxiliary contact of the main contactor in the unit control circuit (an H signal implies that the main contactor has picked up).

After the command has been accepted:

- An operating status > o010 is permitted

4.3.1.2 Status word (status word 1 and status word 2)

4.3.1.2.1 Introduction and application example

Status words 1 (bits 0 to 15) and 2 (bits 16 to 31) issue messages and commands from the rectifier/regenerating unit to external destinations.
Their particular status can be read-out via parameters r552 or r968 (status word 1) and r553 (status word 2).

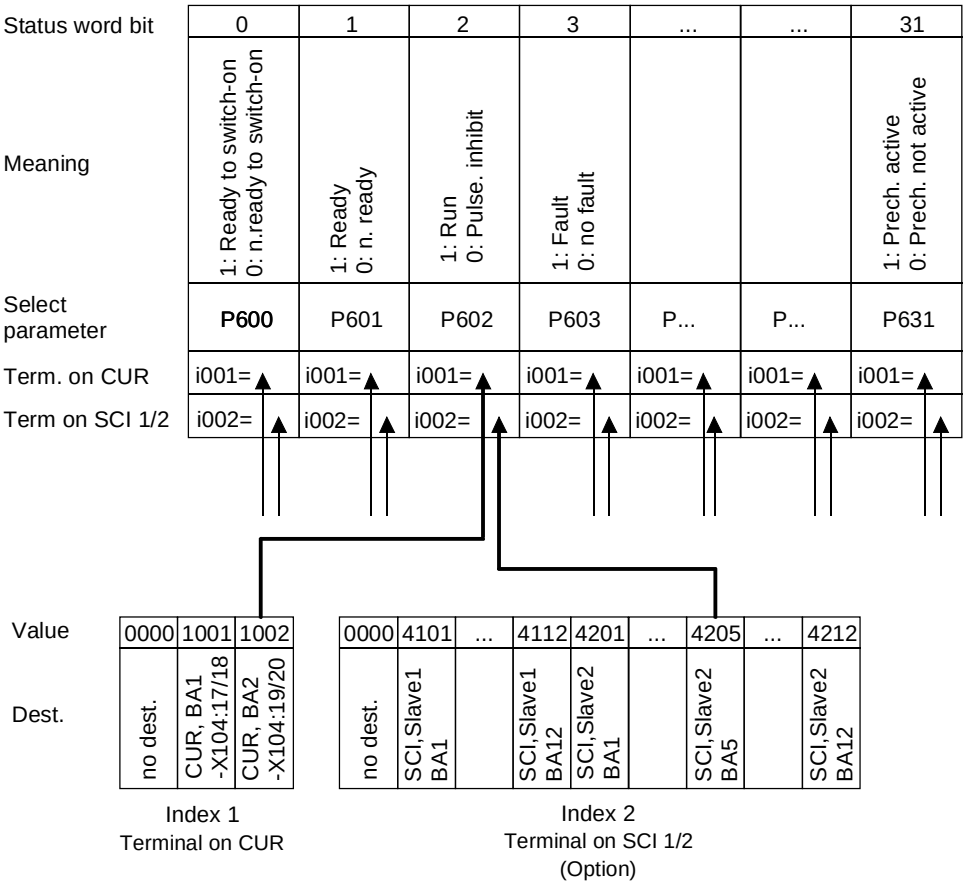
An overview is provided in Section 4.3.1.2.2 "Overview of the status word".
The significance of the possible messages and commands to the outside is described in Section 4.3.1.2.4 "Significance of the status word messages".
Each status word bit is assigned a selection parameter, which defines, to which destination this bit is sent (refer to Section 4.3.1.2.2, right-hand column).
The selection parameters for the destinations are indexed twice as follows:

Index: i001 Selecting a terminal on the CU / PEU board (basic converter)
i002 Selecting a terminal on the SCI 1/2 board (option)

An overview of the possible destinations, which are assigned fixed values, is provided in Section 4.3.1.2.3 "Selecting the destinations for the status word".

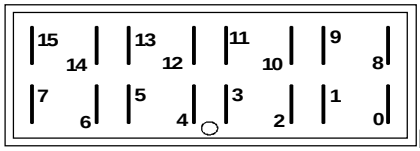
NOTE
For the output of faults, alarms and switch-on inhibit of the status word (**HIGH active**) via the terminal strip, then these are LOW active at the terminals (binary outputs) (i.e.: the relay drops out)! This is also true for possible option boards! Also refer to Section 4.3.3 "Binary outputs"

Example:



"Run" signal: - at terminal -X104:19/20 of the CUR
- at terminal of the binary output 5 of the SCI (option),which is coded as slave 2

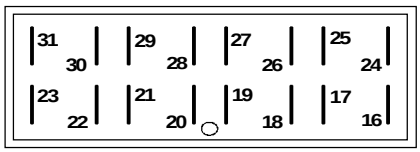
4.3.1.2.2 Overview of the status word (status word 1 and status word 2)



PMU Display

"Status word 1" (visualization parameter r552 or r968)

Bit	High	Low	Comments	Dest. selection
0	Ready-to-switch-on	Not ready to switch on		P600
1	Ready	Not ready		P601
2	Run	Firing pulses inhibited		P602
3	Fault	No fault	Inverted for terminal strips!	P603
4	No OFF 2	OFF2		P604
5			always High	
6	Switch-on inhibit	No switch-on inhibit	Inverted for terminal strips!	P606
7	Alarm	No alarm	Inverted for terminal strips!	P607
8	No setpt. act. val. deviation	Setpt. act. value deviation	Can be parameterized	P608
9	PZD control requested		always "High" (for CB,TB,SST1,SST/SCB)	
10	Regenerating ready	Regenerating not ready		P610 1)
11	Fault, undervoltage	No undervoltage fault	Inverted for terminal strips!	P611
12	Main contactor energized	Main contactor not energized	Can only be connector for terminals CUR or SCI!	P612
13	Ud reduced	Ud not reduced		P613 1)
14	Motoring	Generating		P614 1)
15				



PMU Display

"Status word 2" (visualization parameter r553)

Bit	High	Low	Comments	Dest. selection
16				
17				
18	Current active	Current limit not active	Inverted for terminal strips!	P618 1)
19	Fault, external 1	No fault, external 1	Inverted for terminal strips!	P619
20	Fault, external 2	No fault, external 2	Inverted for terminal strips!	P620
21	Alarm, external	No alarm, external	Inverted for terminal strips!	P621
22	Alarm i2t power sections	No alarm, i2t power section	Inverted for terminal strips!	P622
23	Fault, overtemp., p.s.	No fault, overtemp. p.s.	Inverted for terminal strips!	P623
24	Alarm, overtemp., p.s.	No alarm, overtemp., p.s.	Inverted for terminal strips!	P624
25				
26				
27				
28				
29				
30				
31	Pre-charging active	Pre-charging not active		P631

1) The meaning of this bit is <u>different</u> for the rectifier/regenerating unit than for the <u>converter</u>

4.3.1.2.3 Selecting the destinations for the status word (bits 0 - 31)

For the selection parameters **P600 to P631**, in which the destination of the appropriate bit can be specified, then the indices are uniformly assigned as follows:

Index i001 Selecting a terminal on the CUR board (basic converter)
i002 Selecting a terminal on the SCI 1/2 board (option)

Index i001 Selecting a terminal on the CUR board (basic converter)

Value	Destination	
0000	No destination	**Factory setting, except P603**
1001	CUR, BA1, -X104:17/18,	
1002	CUR, BA2, -X104:19/20,	**Factory setting, for P603**

Index i002 Selecting a terminal on the SCI 1/2 board (option)

Value	Destination	
0000	No destination	**Factory setting**
4101	SCI 1 and 2,Slave 1, BA1	
4102	BA2	
4103	BA3	
4104	BA4	
4105	BA5	
4106	BA6	
4107	BA7	
4108	BA8	
4109	only SCI 2,Slave 1, BA9	
4110	BA10	
4111	BA11	
4112	BA12	
4201	SCI 1 and 2,Slave 2, BA1	
4202	BA2	
4203	BA3	
4204	BA4	
4205	BA5	
4206	BA6	
4207	BA7	
4208	BA8	
4209	only SCI 2,Slave 2, BA9	
4210	BA10	
4211	BA11	
4212	BA12	

4.3.1.2.4 Significance of the status word messages

NOTE
When **faults, alarms and switch-on inhibit** of the status word are output (**HIGH active**) via the terminal strip, then these are **LOW active at the terminal strips** (binary outputs) (i.e.: **relay drops out**)! This is also valid for possible option boards! Also refer to Section 4.3.3 "Binary outputs"

Bit 0: Signal, "Ready to switch-on" (H)

An H signal indicates that the operating status SWITCH-ON INHIBIT (008) or READY-TO-SWITCH-ON (009) is available. The firing pulses are inhibited.

Bit 1: Signal, "Ready" (H)

H An H signal, indicates that the operating status READY (011) or PRE-CHARGING (010) is available. The firing pulses are still inhibited.

Bit 2: Signal, "Run" (H)

An H signal indicates that the operating status RUN (014) is available. The firing pulses are enabled and the output terminals are live.

Bit 3: Signal, "Fault" (H)

An H signal indicates that the operating status FAULT (007) is available. If the fault is output at a terminal strip (CUR, SCI1/2) an L signal appears there for this fault message.

Bit 4: Signal, "OFF2" (L)

An L signal indicates that an OFF2 command is present via the control word (bit 1).

Bit 5: reserved

Bit 6: Signal, "Switch-on inhibit" (H)

An H signal indicates that the operating status SWITCH-ON INHIBIT (008) is present. The message remains as long an OFF2 command is applied over the control word (bit 1) and/or an ON command is still applied the control word (bit 0) (edge evaluation).
If the message is output at a terminal strip (CUR, SCB1) an L signal appears there for this message.

Bit 7: Signal, "Alarm" (H)

An H signal indicates that an alarm (Axxx) is present. If the alarm is output at the terminal strip (CUR, SCB1), an L signal appears there for this alarm.

Bit 8: Signal, "Setpoint/actual-value deviation" (L)

The L signal indicates that the absolute value of the difference between the Ud setpoint and the Ud actual value is greater than or equal to a programmable deviation (P517 "Setpoint/actual-value deviation Ud" for longer than the "Setpoint/actual-value deviation time" (P518). The bit is again set high as soon as the absolute value of the difference between the Ud setpoint and the Ud actual value is less than the deviation (P517).

Bit 9: Signal, "PZD control requested" (H)

An H signal is always present.

Bit 10: Message, "Regenerating ready" (H)

An H signal indicates that the rectifier/regenerating unit us ready to feed power back into the system (see control word/bit 11 in Section 4.3.1.1.7).

Bit 11: Message, "Fault" (reserved, L)

An L signal is always present. If the fault signal is output to a terminal block (CUR, SCI 1/2), an L signal appears there for this fault.

Bit 12: Signal, "Main contactor energized" (H)

This message is identical to the status of the relay contact at terminals 9-4/5 with which a main contactor can be driven.

Bit 13: Message, "Ud reduced" (H)

An H signal indicates that the DC link voltage has been reduced below the following value:

$$1.35 * U_{Supply,rectifier} * \frac{P318}{100\%} + \frac{2\%}{100\%} * 1.35 * P071$$

The signal changes from H to L when the DC link voltage exceeds the following threshold:

$$1.35 * U_{Supply,rectifier} * \frac{P318}{100\%} + \left(\frac{2\% + P319}{100\%} \right) * 1.35 * P071$$

L signal ("Ud not reduced") is also output for as long as control word 1, Bit 11=0 ("No Ud reduction requested") is pending and for as long as no Ud reduction command for current-dependent Ud reduction has been generated internally.

Bit 14: Message, " Motoring mode" (H)

An H signal indicates that the rectifier bridge is carrying current or is ready to carry current or that neither the rectifier nor the regenerating bridge is carrying current.

Message, " Generating mode" (L)

An L signal indicates that the regenerative bridge is carrying current or is ready to carry current or that neither the rectifier nor the regenerating bridge is carrying current.

Bits 15 to 17: reserved

Bit 18: Message, "Current limit active" (L)

An L signal indicates that the rectifier/regenerating unit is operating at the current limit. If the message is output at a terminal (CUR, SCB1), an L signal appears there for this message

Bit 19: Signal, "Fault, external 1" (H)

An H signal indicates that a "Fault, external 1" is present in control word bit 15. If this fault is output at a terminal strip (CUR, SCB1), an L signal appears there for this fault signal.

Bit 20: Signal, "Fault, external 2" (H)

An H signal indicates that a "Fault, external 2" is present in control word bit 26. If this fault is output at a terminal strip (CUR, SCB1), an L signal appears there for this fault signal.

Bit 21: Signal, "External alarm" (H)

An H signal indicates that an "Alarm, external 1" is present in control word bit 28, or an "alarm, external 2" in control word, bit 29.
If this fault is output at a terminal strip (CUR, SCB1), an L signal appears there for this fault signal.

Bit 22: Signal, "Alarm I^2t power section" (H)

H signal indicates that the "I^2t alarm power section" (A025) is present. Also refer to Section 7 "Fault and Alarm Messages".
If this alarm is output at a terminal strip (CUR, SCB1), an L signal appears there for this fault signal.

Bit 23: Signal "Overtemperature fault signal power section (H)

An H signal indicates that an "Power section temperature too high" fault (F023) is present. Also refer to Section 7 "Fault and Alarm Messages".
If this fault is output at a terminal strip (CUR, SCB1), an L signal appears there for this fault signal.

Bit 24: Signal "Overtemperature alarm power section" (H)

An H signal indicates that the "Power section temperature too high" alarm (A022) is present. Also refer to Section 7 "Fault and Alarm Messages". If this fault is output at a terminal strip (CUR, SCB1), an L signal appears there for this fault signal.

Bits 25 to 30: reserved

Bit 31: Signal, "Pre-charging active" (H)

An H signal indicates that the DC link has been charged following a successful ON command.

4.3.1.3 Setpoints

The only possible setpoint selection that can be programmed on a rectifier/regenerating unit is the selection of the Id setpoint for a rectifier/regenerating unit in slave mode (e.g. the slave rectifier/regenerating unit in 12-pulse operation) using parameter
(See also Chapter 5 "Parameter list")

The control word command can be used for effecting the changeover:
"Basic and reserve settings"
See Section 4.4 "Function diagrams"

The source for the setpoint is defined using values:

Value entry in **Index1 i001** **active when "basic setting" selected"** (control word)
Index2 i002 **active when "reserve setting" selected** (control word)

Value assignment for **P486 "Source Id-setpoint"**:

Value	Source	
0000	Constant setpoint = 0	**Factory setting: P486 i001, i002**
2002	SST1 (PMU -X300 or -X100:1...5) Word2	
2003	Word3	
2004	Word4	⇐ only if word 4 is not assigned for "control word 2 with 2004 (Section 4.3.1.1)
...	consecutively to	
2016	Word16	
	OPTIONS	
3002	CB/TB Word2	
3003	Word3	
3004	Word4	⇐ only if word 4 is not assigned for "control word 2 with 3004 (Section 4.3.1.1)
...	consecutively to	
3016	Word16)	
4101	SCB1 with SCI 1,Slave1, analog input AE1	
4102	AE2	
4103	AE3	
4201	SCB1 with SCI 1,Slave2, analog input AE1	
4202	AE2	
4203	AE3	
4501	SCB-SST (only Peer to Peer, Word1)	⇐ only if word 1 is not assigned for "control word 1 with 4501 (Section 4.3.1.1)
4502	USS /Peer to Peer, Word2	
4503	USS /Peer to Peer, Word3	
4504	USS /Peer to Peer, Word4	⇐ only if word 4 is not assigned for "control word 2 with 4504 (Section 4.3.1.1)
4505	USS /Peer to Peer, Word5	
4506	only USS, Word6	
...	consecutively to	
4516	only USS, Word6	
6002	SST2 (PTP1, A2-X117:1..5) Peer-to-Peer, Word2	
6003	SST2 (PTP1, A2-X117:1..5) Peer-to-Peer, Word3	
6004	SST2 (PTP1, A2-X117:1..5) Peer-to-Peer, Word4	
6005	SST2 (PTP1, A2-X117:1..5) Peer-to-Peer, Word5	

4.3.1.4 Actual values

All available parameter numbers (0 to 999) can be entered into the actual value parameters, sorted according to destinations (refer to the following).
The parameter value of the entered parameter number is output at the selected destination.

Note: - When specifying parameter numbers, which are indexed, the value of the first index (.i001) is always output!
- When specifying "0", no output is made to the appropriate destination!

Destinations:

P655 "CUR-AA actual values"
Output via the CUR control terminal strip (Section 3.3)
Analog output 1 (-X102:14 / reference potential -X102:15)
(refer to Section 4.3.5 "analog output")

P680 "SST1 actual values"
Output via the basic converter interface SST1
Indices: i001 Word 01 of the telegram (PZD)
⇓ ⇓
i016 Word 16 of the telegram (PZD)
(refer to Section 4.3.6.1 "basic converter interface SST1")

Destination, options:

P664 "SCI-AA actual values"
Output via the SCB1 interface with SCI1
(also refer to the Instruction Manual for the option boards)
Indexes i001 Destination: Analog output 1 from slave 1
i002 Destination: Analog output 2 from slave 1
i003 Destination: Analog output 3 from slave 1
i004 Destination: Analog output 1 from slave 2
i005 Destination: Analog output 2 from slave 2
i006 Destination: Analog output 3 from slave 2

P690 "SCB actual values"
Output via the SCB1 interface with peer-to-peer protocol or SCB2
(also refer to the Instruction Manual for the option boards)
Indexes: i001 Destination: Word 01 of the telegram (PZD)
⇓ ⇓
i016 Destination: Word 16 of the telegram (PZD)

P694 "CB/TB actual values"
Output via the CB or TB interface
(also refer to the Instruction Manual for the option boards and Sections 4.3.6.2 "DPR")
Indices: i001 Destination: Word 01 of the telegram (PZD)
⇓ ⇓
i016 Destination: Word 16 of the telegram (PZD)

NOTE
For telegram data transfer (P680,P690,P694), it is generally necessary/practical to assign "Word 01 of the telegram (PZD)" with status word 1 (r968 or r552)!

4.3.2 Binary inputs

5 binary inputs (24V) which can be parameterized at the control terminal strip (board CUR, -X101) to enter commands, external faults/alarms as well as a checkback signal to the rectifier/ regenerating unit control word.

Connecting-up:
Refer to Section 3.3 "Control terminal strip"

Parameterization:
Refer to Section 4.3.1.1 "Control word"

Function of the binary inputs for factory setting with P077 = 0 (see Section 4.3.9.1):

Binary input 1	ON/OFF 1 command (control word bit 0) for RESERVE SETTING (binary input 5 = high state)
Binary input 2	OFF2 command "pulse inhibit" (control word bit 1) for RESERVE SETTING (binary input 5 = high state)
Binary input 3	Acknowledge (control word bit 7) for RESERVE SETTING (binary input 5 = high state)
Binary input 4	No function
Binary input 5	RESERVE/BASIC SETTING (control word bit 30)

4.3.3 Binary outputs

2 binary outputs, which can be parameterized, for the output of signals and external commands of the rectifier/regenerating unit status word.

Connecting-up:

Binary output 1 on the CUR control terminal strip (connector X104 / NO contact):
Refer to Section 3.3 "Control terminal strip "

Binary output 2 on the CUR control terminal strip (connector X104 / NO contact):
Refer to Section 3.3 "Control terminal strip"

Parameterization:

Refer to Section 4.3.1.2 "Status word "

Factory setting:

Binary output 1 X104 on the CUR	No function (relay always de-energized)
Binary output 2 X104 on the CUR	Fault (status word bit 3)

NOTE
When **faults, alarms and switch-on inhibit** of the status word (**HIGH active**) are output via the terminal strip, these are **LOW active at the terminal strip** (binary outputs) (i.e. **relay drops out**)! Also refer to Section 4.3.1.2 "Status word".

4.3.5 Analog output

1 analog output, which can be parameterized, at the control terminal strip (board CUR, -X102 / Section 3.3) to output actual values and other internal rectifier/regenerating unit quantities.

Analog output:
- Voltage range: ± 10V
- Resolution: 39mV (8 bits + sign)
- Accuracy: ± 5%
- Smoothing: 20ms
- Output current: max. ± 5mA
- Short-circuit proof and non-floating

Connecting-up:

Refer to "Control terminal strip", Section 3.3

Parameterization:

Also observe "Function diagram, analog output CUR", Section 4.4!

- Enter the parameter number (0 to 999) whose value is to output, in P655 "CUR-AA actual values".

- Set the analog output gain factor in P656 "CUR-AA gain".
  (setting range: -320.00V to +320.00V / pre-setting: +10.00V ⇔ gain of 1)

- Set the offset in P657 "CUR-AA offset".
  (setting range: -100.00V to +100.00V / pre-setting: +0.00V ⇔ no offset)

The following is obtained for the calculation from the "Function diagram, analog output CUR":

$$\text{Uoff} = \left(\frac{\text{Parameter value in } [\%]}{100\ [\%]} \times \text{Gain in } [\text{V}] \right) + \text{Offset in } [\text{V}]$$

Pre-assignment (gain of 1 and no offset): 100% = 10V

The parameter value in [%] for the appropriate parameter number can be taken from the parameter list, Chapter 5!

- **Configuring examples:**

Example 1: Available: P071 (line voltage) = 400 V

Required: Map the actual DC link voltage r037 between 400 and 600 V to 0.00V to +10.00 V at the analog output

♦ Connect-up parameter R037 at the analog output:
P655 "CUR-AA actual values" **= 037**

♦ Converter the required output range in [%]:
r037 should be taken from the parameter list, Section 5:
Analog output: 100% = 1.35 x P071 (in this case: 1.35 x 400 V = 540 V)

Thus, the following is obtained for the range to be represented:
400 V $\rightarrow$ 74.05% (Parameter value PWE1) to be represented as U_{off1} = 0.00 V
600 V $\rightarrow$ 111.07% (Parameter value PWE2) to be represented as U_{off2} = +10.00 V

♦ Define gain factor **P656** and offset **P657**:

The following is obtained from the formula shown above:

$$\text{Gain factor}\,[\text{V}] = \frac{(U_{off1}[\text{V}] - U_{off2}[\text{V}]) \times 100\,\%}{\text{PWE1}[\%] - \text{PWE2}[\%]} = \frac{(0.00\ \text{V} - 10.00\ \text{V}) \times 100\,\%}{74.05\,\% - 111.07\,\%}$$

$$= \frac{-10{,}00\ \text{V} \times 100}{-37\,\%} = 27.03\ \text{V}$$

$$\text{Offset}\,[\text{V}] = U_{off1}[\text{V}] - \left(\frac{\text{Gain factor}\,[\text{V}] \times \text{PWE1}[\%]}{100\,\%}\right) = 0\text{V} - \left(\frac{27.03\ \text{V} \times 74.05\,\%}{100\,\%}\right)$$

$$= 0\ \text{V} - \left(\frac{27.03\ \text{V} \times 74.05\,\%}{100\,\%}\right) = -19.98\ \text{V}$$

To be adjusted: gain: **P656 = +27,03V**
offset: **P657 = –19,98V**

Example 2: Available: P075 (rated DC current) = 420 A

Required: Map the output current r035 between -630 and +630 A to -10.00 V to +10.00 A at the analog output

♦ Connect-up parameter r035 at the analog output:
P655 "CUR-AA actual values“ **= 035**

♦ Convert the required output range in [%]:
r035 should be taken from the parameter list, Section 5:
Analog output: 100% = P075

Thus, the following is obtained for the range to be represented:
-630 A → -150% (Parameter value PWE1) represented as V_{off1} = -10.00 V
+630 A → 150% (Parameter value PWE2) represented as V_{off2} = +10.00 V

♦ Define gain factor **P656** and offset **P657**:

The following is obtained from the formula shown above:

$$\text{Gain factor}\,[\text{V}] = \frac{(U_{off1}[\text{V}] - U_{off2}[\text{V}]) \times 100\,\%}{PWE1[\%] - PWE2[\%]} = \frac{(-10.00\ \text{V} - 10.00\ \text{V}) \times 100\,\%}{-150\,\% - 150\,\%}$$

$$= \frac{-20.00\ \text{V} \times 100\,\%}{-300\,\%} = 6.67\ \text{V}$$

$$\text{Offset}\,[\text{V}] = U_{off1}[\text{V}] - \left(\frac{\text{Gain factor}\,[\text{V}] \times PWE1[\%]}{100\,\%}\right) = -10\text{V} - \left(\frac{6.67\ \text{V} \times (-150.00\,\%)}{100\,\%}\right)$$

$$= -10\ \text{V} + 10.00\ \text{V} = 0.00\ \text{V}$$

To be adjusted: Gain **P656 = +6,67 V**
offset **P657 = 0,00 V**

4.3.6 Serial interfaces

4.3.6.1.1 Basic converter interface SST1

The USS protocol (universal serial interface) is implemented at the basic converter interface SST1.

The following documentation is available depending on the particular application of the SST1 basic converter interface:

- Connection of higher-level programmable controllers with USS protocol:
  SIMOVERT Master Drives
  Use of the serial interface with USS protocol
  Order No.: 6SE7087-6CX87-4KB0
- Additional general comments regarding connecting-up and parameterization:
- Connecting-up: Also refer to "Control terminal strip" Section 3.3

NOTE
Communications can either be realized via the terminal strip of CUR-X100 (RS485 standard) or the interface connector on PMU-X300 (9-pin SUB D connector / RS485 or RS232) **Only one of the two possible connections (-X100 or -X300) may be used!**

NOTE
The bus terminating resistors (total 150 Ω) must be switched-in at the last bus node (slave). To realize this, jumpers of DIP-FIX switches S1 and S2 must be closed on board CUR!!

- Parameterization:
  - Defining the interface: **P683 to P687**
  - Define the process data (control word, status word, setpoints, actual values) for the interface:
    Refer to "Process data" Section 4.3.1
  - Enabling parameterization: **P053 or P927**

NOTE
The factory setting (refer to "Parameter list" Chapter 5) can be used if the SST1 basic converter interface is not used!

4.3.6.1.2 Basic converter interface SST2 (A2-X117), see Section 9.6, Options

4.3.6.2 Dual-port RAM (DPR for SCB, CB, TB)

The dual-port RAM is the internal interface on the CUR (-X107) to connect possible option boards via the backplane bus of the electronics box (LDA bus adapter required).

Possible option boards: TB (Technology board);
SCB (serial communications board); CB (Communications board).

To connect possible option boards and parameterize the interface, also refer to the Section 3.5 "Recommended circuits" as well as in the appropriate Instruction Manuals to the various option boards.
Additional information can be taken from Sections 4.3.1.1 to 4.3.1.4 "Control word, status word, setpoints, actual values".

4.3.9 Function selection (P052)

Function selection is activated via parameter P052 and permits various special functions during the start-up phase.

Access stage 2 (**P051 = 2**) must be enabled and the rectifier/regenerating unit may only be in the "Run" (R) status. Apart from this, P053 must be set for parameter enable (e.g. P053=6).

The following functions are available:

- Return from function selection (P052 = 0)
- Generate factory setting (P052 = 1)
- Initialization (MLFB setting) (P052 = 2)
- Download (P052 = 3)
- Hardware configuration (P052 = 4)
- Drive setting (P052 = 5)
- Forming (P052 = 20)
- Circuit identification (P052 = 21)
- Display modified parameters (P052 = 22)

The "Generate factory setting", "Forming", and "Circuit identification" functions are automatically reset on completion, i.e. P052 = 0 ("Return").
The other functions must be manually reset!

4.3.9.1 Generate factory setting (P052 = 1 or P970 = 0)

This function is used to reset the parameter values, in accordance with a) the parameter list (dispatch status for the unit; see Section 5, column 4) and b) parameter P077 (see below). Only the settings of parameters P070 (MLFB) and P077 (type of factory setting) remain unchanged.

The MLFB-dependent parameters P071, P075 and P076 are set in accordance with the type of the rectifier/regenerating unit (see Section 4.3.9.2 "Initialization").
The parameters dependent on P077 are set in accordance with the table shown below.

In the normal case (P070=0), the values listed in the parameter list in Section 5 are used as factory settings, so the table shown below does not have to be considered.

For fast parameterization of special functions, using P077=1 to 6, an appropriate set of factory settings can be selected for certain parameters in accordance with the table shown below. In this manner, for example, certain terminals of the basic unit can be parameterized fast as sources for certain control word functions.

The following table shows the factory settings for the parameters that are dependent on P077:

Para-meters depend. on P077	Designation of the parameter on OP1S	**Normal factory setting**		Standard cubicle with terminals		Standard cubicle with PMU		Standard cubicle with OP1S		Standard cubicle with PMU as 12-pulse slave		Standard cubicle with OP1S as 12-pulse slave	
		P077= 0		**P077= 1**		**P077= 2**		**P077= 4**		**P077= 5**		**P077= 6**	
		Basic (i001)	Res. (i002)	Basic (i001)	Res. (i002)	Basic (i001)	Res. (i002)	Basic (i001)	Res. (i002)	Basic (i001)	Res. (i002)	Basic (i001)	Res. (i002)
P486	Src Current Setp	0	0	0	0	0	0	0	0	6002	0	6002	0
P554	Src ON/OFF1	1010	1001	2001	1001	1003	1010	1003	2001	6001	1010	6001	2001
P555	Src1 OFF2(electr.)	1010	1002	2001	1002	1003	1010	1003	2001	6001	1010	6001	2001
P561	Src InvRelease	1	1	1	1	1	1	1	1	6001	1	6001	1
P565	Src1 fault reset	0	1003	0	1003	0	0	0	0	0	0	0	0
P566	Src2 fault reset	0	0	0	0	1004	0	1004	0	6001	0	6001	0
P567	Src3 fault reset	2001	2001	2001	2001	0	0	2001	2001	2001	0	2001	2001
P572	Src RegenRelease	1	1	1	1	1	1	1	1	6001	1	6001	1
P575	Src No ExtFault1	1	1	1	1	1001	1001	1001	1001	1001	1001	1001	1001
P583	Src 12-pulse mode	0	0	0	0	0	0	0	0	1	0	1	0
P587	Src Master/Slave	0	0	0	0	0	0	0	0	1	0	1	0
P588	Src No Ext Warn1	1	1	1	1	1002	1002	1002	1002	1002	1002	1002	1002
P607	Trg Bit Warning	0		0		1001		1001		1001		1001	

The factory setting for P607.002 (responsible for the optional SCI1/2 module) is not affected by P077.

In column 1, the parameters are listed for which the factory setting depends on P077. The right-hand columns contain the factory settings for index 1 and 2 of these parameters depending on the value of parameter P077. The values in the column "Normal factory setting" (P077=0) are the same as those listed in the parameter list in Chapter 5 and are in accordance with the standard factory setting.

When P077 is set and the function "Generate factory setting" is selected, all parameters are set to their factory settings, whereby the P077-dependent factory settings are taken into account.

"Generate factory setting" can be selected in the following statuses: "Switch-on inhibit" (008), "Ready-to-switch-on" (009) or "Fault" (007).

Procedure:

If a special factory setting dependent on P077 is not required, i.e. P077=0, part a) of the following procedure is not required and you start with part b).

a) Start of the procedure when a special factory setting is required, otherwise start at b) :

⇓	P051 = 3	Access stage "Expert mode" to permit access to P077
⇓	P052 = 2	Select "Initialize" function to modify P077
⇓	P key	The operating display appears (000)
⇓	P077	Select the required P077-dependent parameter set in accordance with the above table
⇓	P052 = 0	Terminate the function "Initialize"
⇓	P key	The operating display appears. Then continue with b) .

b) Start of the procedure when a normal factory setting is required:

⇓	P052 = 1	Function selection, "Generate factory setting" (or P970 = 0)
⇓	P key	The operating display appears (001), and the following parameters can be re-assigned: - Factory setting for all parameters according to the parameter list in Chapter 5 (also the board configuration P090/P091) taking P077 into account - Data of the rectifier/regenerating unit (from the MLFB / P070) P071 Rated voltage at the input of the rectifier bridge P075 Rated DC current P076 Configuration of the power section
⇓	The operating display "Switch-on inhibit" (008) or "Ready-to-switch-on" (009) appears after the factory setting has been completed.	

4.3.9.2 Initialization (MLFB setting) (P052 = 2)

This function is used to change the rectifier/regenerating unit MLFB (type setting).
The parameters P071, P075 and P076 are only set dependent on the new MLFB when changing the MLFB .

"Initialization" can be selected in the following statuses: "Switch-on inhibit" (008), "Ready-to-switch-on" (009) or "Fault" (007).

Procedure:

⇓ P051 = 3 Access stage "Expert mode" to permit access to P070

⇓ P052 = 2 Function selection "Initialization"

⇓ P070 Specification of the number of the MLFB of the rectifier/regenerating unit (rating plate data on the unit) according to the table at the end of this Section.

⇓ P052 = 0 Terminate the function "Initialize"

⇓ P key The operating display appears and once the MLFB has been modified, the following parameters are reassigned in accordance with the MLFB:

- P071 Rated voltage at the input to the rectifier bridge
- P075 Rated DC current
- P076 Only the ones position is modified
  Ones position = 2, when rectifier and regenerating mode is possible
  Ones position = 1, when only rectifier mode is possible
  (only set when P070 ≥ 101)

⇓ The operating display "Switch-on inhibit" (008) or "Ready-to-switch-on" (009) appears after "Initialization" has been completed

MLFB table:

Brief description of the table columns:

PWE Parameter value (to be entered at initialization / PMU / P070)

MLFB Machine-readable product designation (see rating plate)

I(n) Rated DC current in A (P075)

U-Kl. Voltage class, voltage range

BF Type of construction

PWE	MLFB	Rated current [A]	Supply voltage [V]	BF
0	none	0,0	0	0
14	6SE7022-1EC85-1AA0	21,0	3AC 380-480	C
15	6SE7022-7FC85-1AA0	27,0	3AC 500-600	C
20	6SE7024-1EC85-1AA0	41,0	3AC 380-480	C
21	6SE7024-1FC85-1AA0	41,0	3AC 500-600	C
28	6SE7027-2FC85-1AA0	72,0	3AC 500-600	C
31	6SE7028-6EC85-1AA0	86,0	3AC 380-480	C
32	6SE7028-8FC85-1AA0	94,0	3AC 500-600	C

PWE	MLFB	Rated current [A]	Supply voltage [V]	BF
36	6SE7031-4HE85-1AA0	140,0	3AC 660-690	E
38	6SE7031-5FE85-1AA0	151,0	3AC 500-600	E
39	6SE7031-7EE85-1AA0	173,0	3AC 380-480	E
42	6SE7032-2EE85-1AA0	222,0	3AC 380-480	E
43	6SE7032-2HE85-1AA0	222,0	3AC 660-690	E
44	6SE7032-4FE85-1AA0	235,0	3AC 500-600	E
46	6SE7032-7FE85-1AA0	270,0	3AC 500-600	E
47	6SE7032-7HE85-1AA0	270,0	3AC 660-690	E
48	6SE7033-1EE85-1AA0	310,0	3AC 380-480	E
49	6SE7033-5FE85-1AA0	354,0	3AC 500-600	E
51	6SE7033-8EE85-1AA0	375,0	3AC 380-480	E
52	6SE7034-2FE85-1AA0	420,0	3AC 500-600	E
53	6SE7034-2HE85-1AA0	420,0	3AC 660-690	E
54	6SE7034-6EE85-1AA0	463,0	3AC 380-480	E
55	6SE7035-4FE85-1AA0	536,0	3AC 500-600	E
56	6SE7035-3HE85-1AA0	536,0	3AC 660-690	E
57	6SE7036-1EE85-1AA0	605,0	3AC 380-480	E
61	6SE7037-7FH85-1AA0	774,0	3AC 500-600	H
62	6SE7037-7HH85-1AA0	774,0	3AC 660-690	H
63	6SE7038-2EH85-1AA0	821,0	3AC 380-480	H
66	6SE7041-0EH85-1AA0	1023,0	3AC 380-480	H
67	6SE7041-0FH85-1AA0	1023,0	3AC 500-600	H
68	6SE7041-0HH85-1AA0	1023,0	3AC 660-690	H
71	6SE7041-3FK85-1AA0	1285,0	3AC 500-600	K
72	6SE7041-3HK85-1AA0	1285,0	3AC 660-690	K
73	6SE7041-3EK85-1AA0	1333,0	3AC 380-480	K
74	6SE7041-5FK85-1AA0	1464,0	3AC 500-600	K
75	6SE7041-5HK85-1AA0	1464,0	3AC 660-690	K
79	6SE7041-8EK85-1AA0	1780,0	3AC 380-480	K
80	6SE7041-8FK85-1AA0	1880,0	3AC 500-600	K
81	6SE7041-8HK85-1AA0	1880,0	3AC 660-690	K
85	6SE7041-5EH85-1BA0	1500,0	3AC 380-480	H
86	6SE7041-3FH85-1BA0	1300,0	3AC 500-600	H
87	6SE7041-3HH85-1BA0	1300,0	3AC 660-690	H
88	6SE7042-1EH85-1BA0	2100,0	3AC 380-480	H
89	6SE7042-0FH85-1BA0	1950,0	3AC 500-600	H
90	6SE7042-0HH85-1BA0	1950,0	3AC 660-690	H
91	6SE7042-8EH85-1BA0	2850,0	3AC 380-480	H
92	6SE7042-8FH85-1BA0	2850,0	3AC 500-600	H
93	6SE7042-7HH85-1BA0	2660,0	3AC 660-690	H

4.3.9.3 Download or upread (P052 = 3)

P052 has to be set to 3 when a "download" (write) or "upload" (read) has to be carried out for the parameters of the rectifier/regenerating unit at the basic unit interface (SST1) using USS protocol (e.g. using D or OP1S).

“Upread/Download" can be selected in the following statuses: "Switch-on inhibit" (008), "Ready-to-switch-on" (009) or "Fault" (007).

Procedure:

⇓ P052 = 3 Function selection “Upread/Download

⇓ P key The operating display appears(021)

- Using a PC at the basic device interface SST1 and an appropriate application program (e.g. DriveMonitor), it is possible to read and change all parameters independently of their operating state and access level (P051).

⇓ P052 = 0 Function selection Return

⇓ P key

⇓ After return, the operating display appears, "Switch-on inhibit" (008) or "Ready-to-switch-on" (009)

4.3.9.4 Hardware configuration (P052 = 4)

This function is used to select option boards (SCB, CB, TB) in the rectifier/regenerating unit electronics box. In order to install these modules, an LBA bus coupling (Local Bus Adapter) is required for the electronics box (see Section 9.1)!

All parameters, which can be written into the "Hardware configuration" status ("H", refer to the right-hand column in the parameter list in Chapter 5), can be changed.

The "hardware configuration" selection can be realized in the "Switch-on inhibit", "Ready-to-switch" or "Fault" status

Procedure:

⇓ P052 = 4 Function selection Hardware configuration

⇓ P051 = 3 Access stage Expert mode (to change the following parameters)

⇓ Set the parameters to configure the optional board (see Section 4.5 or the operating instructions for the board)

⇓ P090 = Board, slot 2 (To the RIGHT in the electronics box!)

P091 = Board, slot 3 (In the CENTER in the electronics box!)

Parameter values for P090/P091:

0: No option board
1: CB Communications board
2: TB Technology board (only P090)
3: SCB Serial Communication Board

⇓ Additional parameters, depending on the option boards (refer to the associated Instruction Manuals or Section 4.5)

⇓ P052 = 0 Function selection return

⇓ P key The operating display appears (r000) while parameters and interval variables are being re-assigned
- The hardware is initialized
If error/fault message F050, F070 or F080 appears: see Chapter 7

⇓ After the selected function selection has been completed, the "Switch-on inhibit" (008) or "Ready-to-switch-on" (009) operating display appears.

4.3.9.5 Drive setting (P052 = 5)

This function is used to change the drive setting(rectifier/regenerating data, system data).

This includes all parameters that can be written in the "Drive setting" status ("A" ,see right-hand column of the parameter list in Chapter 5).

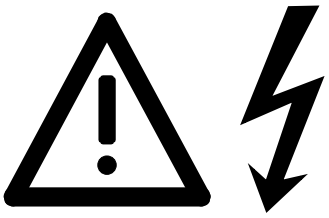
Once you have completed the drive setting procedure, you can decide whether to implement the function selection "Forming" (P052=20) or "Circuit identification" (P052 = 21) or whether just to reset the status (P052 = 0).

"Drive setting" can be selected in the following statuses: "Switch-on inhibit", "Ready-to-switch-on" or "Fault".

Procedure:

⇓	P052 = 5	Function selection		Drive setting
⇓	P051 = 3	Access stage Expert mode - (if all parameters, which can be accessed in the "drive setting" status (A) are required)		
⇓		All parameters, which can be written into the "drive setting" (A) status (see right-hand column of the parameter list in Chapter 5), can be changed.		
⇓	if necessary	⇓	P052 = 20	Function selection " Forming "
				(refer to Section 4.3.9.6)
		⇓	P052 = 21	Function selection " Circuit identification "
				(refer to Section 4.3.9.7)
		⇓	P052 = 0	Return
⇓		The display appears (r000) while parameters and internal variables are being de-assigned, depending on the function selected.		
⇓	The "Switch-on inhibit" (008) or "Ready-to-switch-on" (009) operating display appears after the selected function or selection has been completed			

4.3.9.6 Form DC link (P052 = 20)



DANGER

The "Form DC link" function may only be implemented if the rectifier/regenerating unit and the converter(s) connected have the same voltage class (9th digit position of the MLFB).

If the converters have been left to stand idle for more than a year, the DC link capacitors must be re-formed. If the converters are taken into service within a year of being delivered (factory number, rating plate); it is not necessary to re-form the DC link capacitors. For more details on this subject, please refer to Section 4.3.12 of the converter's operating instructions

The DC link capacitors are formed as described below.

The "Form DC link" function can be selected in the "Ready to switch on" status (009).

Procedure:

⇓	P408	Set the forming time (1.0 to 600.0 minutes; see Section 4.3.12 of the converter's operating instructions
⇓	P052 = 20	Select the "Form DC link" function"
⇓	P key	The operating display appears: The rectifier/regenerating unit must be switched on within 20 s, otherwise message F091 (fault value 4) appears.
⇓	Switch on the rectifier/regenerating unit	

NOTE

The firing pulses are enabled, the rectifier/regenerating unit carries current and the DC link is charged!

During the forming procedure, the connected SIMOVERT Master Drives FC, VC, SC must not be switched on.

⇓ Forming of the DC link takes place (duration as set with P406):
While the forming time P408 is running, the control angle is reduced linearly from 120 degrees to 30 degrees and the DC link capacitor is charged up to the peak value of rectifier supply voltage.
If DC link voltage reduction is selected (control word 1 bit 11, P571), the forming procedure will be completed on reaching a DC link voltage of P318 * rectifier network peak value.
During the forming procedure, the current limit set at P160 is not effective.

⇓ When this function has been completed, the "Ready to switch on" display (009) appears.

4.3.9.7 Circuit identification (P052 = 21)

This function identifies the DC link and the supply and re-assigns certain control parameters.
Specific closed-loop control parameters are re-assigned in connection with this function.
Only the parameters of the reserve data sets currently selected are modified (see "Data sets" in Section 4.1.2 and "Selecting the data sets" in Section 4.4).

NOTE
Circuit identification (i.e. automatic setting of the appropriate parameters) must be carried out, otherwise error message F061 will be generated when the unit is switched on. While circuit identification is being carried out, the constellation of supply, and reactor and autotransformer arrangement as well as the capacitive load connected to the DC link terminals of the rectifier/regenerating unit must be identical to the constellation for normal operation later. The main reason being that the Ud controller gain that is set depends on the measured intermediate circuit capacitance. If more than one inverter of the series SIMOVERT Master Drives 6SE70 are to be operated with the rectifier/regenerating unit, whereby the number of inverters connected to the DC link at any one time varies, it is recommended that reserve data set selection is implemented. Up to 4 different configurations can be formed for this purpose that are each assigned to a reserve data set. Circuit identification has to be carried out separately for each of these reserve data sets. During circuit identification, the appropriate configuration must exist for the selected data set. Circuit identification must be carried out whenever the supply network changes and/or whenever the number of connected inverters changes.

The "Circuit identification" function can be aborted at any time with an OFF command. This triggers fault message F091 "Circuit identification aborted by external cause".

During circuit identification, which is carried out in a series of separate stages, code numbers appear on the PMU that indicate the current working stage.
If an error occurs during a stage, the circuit identification function is aborted. The exact cause of the abort is indicated in the fault value r949 assigned to the fault number memory r947 (for a non-reset fault in index i001 and if reset in index i009).
You will find a detailed description of the fault messages, associated fault values and a description on the warning messages in Chapter 7 "Faults and Warnings".

You can select the "Circuit identification" function in the "Ready to switch on" status (009).

Procedure:

⇓ P052 = 21 Select the "Circuit identification" function

⇓ P key The display appears:
The rectifier/regenerating unit must be switched on within 20 s, otherwise fault message F091 (fault value 4) appears.

⇓ Switch on the rectifier/regenerating unit.

NOTE
The firing pulses are enabled, the rectifier/regenerating unit carries current and the DC link is charged up to a certain limit! During circuit identification, the control angle is reduced until the generated separate current crests reach an average value (with reference to an averaging time of 1/6 of the supply cycle time) of 25% of P075 (with P160 = 150.0 %). By reducing P160 to 60.0 %, the required current crest size of up to 10 % of P075 can be reduced (with values P160 < 60.0 %, the threshold remains at 10 % of P075). Reduction of the size of the generated current crests may be necessary when the sum of the rated currents of the inverters connected to the rectifier/regenerating unit significantly drops below the rated current of the rectifier/regenerating unit.

⇓ The operating display appears. Circuit identification takes about 10 s with a discharged DC link capacitor. The following parameters are set automatically:

P140 Circuit resistance of the rectifier bridge
P142 Circuit resistance of the regenerating bridge
P143 Circuit inductance of the regenerating bridge
P144 Capacitance of the DC link
P310 Proportional gain of current controller
P311 Integral-action time of current controller
P313 Proportional gain of DC link voltage controller
P772 Correction of measured values for thyristor voltage acquisition
(parameters for special access)

⇓ On completion of the function, "Ready to switch on" (009) appears in the display.

NOTE
If a fault message occurs during circuit identification, the cause of the fault must be eliminated and the function repeated (see Section 7.1).

Circuit identification for 12-pulse mode must be carried out in succession on the 12-pulse master and on the 12-pulse slave units (see Section 3.8.5).

4.3.9.8 Display modified parameters (P052 = 22)

This function is used to display all parameters (regardless of the access stage) that differ from the factory setting (i.e. plant-specific parameters). This function only works with operator control via the PMU but not with the OP1S.
Adjustable parameters that have no factory setting (P070) or whose value depends on other parameters (P071,...) are regarded as "modified".
Those parameters that are dependent on P077 (see Section 4.3.9.1 "Factory setting") whose values differ from the setting for P077=0 are also regarded as modified.
"Modified" parameters for "special access" are also displayed that are only accessible to specially trained personnel using P799.

The "Display modified parameters" function can be selected in all operating statuses.

Procedure:

⇓	P052 = 22	Select the "Display modified parameters" function
⇓	P key	Only parameters that differ from the factory setting appear on the PMU (i.e. plant-specific parameters), irrespective of the access stage (P051). It is not possible to modify the parameter value here.
⇓	P052 = 0	Select the Return function
⇓	P key	

NOTE
Parameters r990 and r991 provide a list of modified parameters for the PMU and also for the OP1S.

4.3.10 Functions

4.3.10.1 WEA (automatic restart)

The Automatic Restart function can be used for the automatic acknowledgment of faults and automatic restart of the unit following a power failure (F003, F004, F005, F007, F009 or F010) without the operator having to intervene.

The rectifier/regenerative unit will react according to the selection below in the following scenarios: If the voltage fails at one of the connections 1U/L1, 1V/L2, 1W/L3, 1U2/1T1, 1V2/1T2, 1W2/1T3, X9.1, X9.2 or if its values are not within the permissible tolerance range and if the period of so-called "self-synchronous operation" (see further down) has expired and if the DC link voltage has dropped below the threshold P074 * 1.35 * P071:

P366 = 0: WEA (automatic restart) is inhibited

No automatic restart; the relevant fault message (F003, F004, F005, F007, F009 or F010) is initiated.

P366 = 1: Acknowledgment of power failure after system recovery

The rectifier/regenerating unit enters the operating status o008 (Switch-on inhibit) or o009 (when switching on/off with the I/O keys of the PMU). On power recovery, a new ON command must be

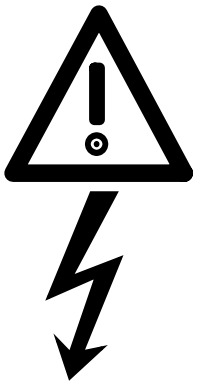
given to enable the DC link to re-charge. The converter is not automatically restarted by the WEA function.

P366 = 2 Restart after system recovery and pre-charging of the DC link after system recovery

While the system is down, the automatic controllers and firing pulses of the rectifier and regenerating bridges are inhibited. The rectifier/regenerating unit enters the status o010. On power recovery, the unit is automatically switched on again by the WEA. The DC link is re-charged.
The unit is only switched back on again if there is still an ON command (control word bit 0) active following system recovery. The WEA function is therefore not possible with an ON command (control word bit 0) programmed from the PMU or operator panel OP1S provided the external 24 V supply does not fail.

IMPORTANT: External measures must be taken to guarantee safety on an automatic restart!

Warning **A065** (Automatic restart active):
This warning bit is set following a system failure if the automatic restart function is active, and reset following a restart by the WEA and completion of the pre-charging process.
The unit can also be switched off by a manual OFF command during this restart phase. Please also refer to Chapter 7 "Faults and Warnings"



WARNING

In the event of system failures when the WEA function has been activated (P366 = 2), the unit may restart on system recovery and re-charge the DC link.

If the WEA function (P366 = 2 or P366 = 3) of the converter has been activated, the converter may also be switched back on. The drive may then stop for some considerable time and may be erroneously assumed to be switched off.

Fatal injuries, severe bodily harm or damage to property and machinery may result if the area surrounding the drive is entered while the drive is in this state.

NOTE

If the kinetic buffering function (KIP) is activated on a connected converter from the series SIMOVERT Master Drives 6SE70, on the rectifier/regenerating unit, P366=2 must be parameterized.

If two rectifier/regenerating units for 12-pulse mode are coupled via peer-to-peer protocol via the basic unit interface SST2, the peer-to-peer telegram failure time monitoring must be switched off via P687.i003=0 on the "12-pulse master" unit, otherwise the automatic switch-on with the parameterization P366=2 (on both units) will not work correctly if the electronics supply voltage fails.

Note about "self-synchronous operation":

When the power section supply voltage fails, the rectifier/regenerative feedback unit initially switches to so-called "self-synchronous operation" for a period of up to about 160 ms. Firing pulses are still output in the rectifying direction during this period, but regeneration to the system is inhibited.
This ensures continuous rectifier operation on the two uninterrupted mains supply cables in the case of single-pole supply voltage failures lasting up to 160 ms minus P793 (130 ms when P793 = 0.03 s).
The rectifier/regenerative feedback unit does not exit the Run operating state until the "self-synchronous operation" period ends. It then switches to operating state o010 and behaves according to the setting in P366 after the DC link voltage has dropped below the threshold P074 * 1.35 * P071.

4.3.10.2 Externally requested and current-dependent U_d reduction

Up to and including Unit Software Release 3.1, U_d reduction was implemented only upon external request by means of the control word 1 command "U_d reduction demanded" (STW1, Bit 11= 1):

When an edge is detected on this command (source selection by P571), the U_d setpoint is lowered to the value ($1.35*U_{mains,infeed}*P318/100.00\%$) according to P318 (with or without deceleration ramp according to P330, depending on whether P330 has an odd or even value) and regenerative feedback is disabled (the message "Recovery not ready“ is displayed, status word ZSW1, Bit 10= 0). The DC link should now discharge (free discharge or current withdrawal from the DC link). When the DC link voltage has been reduced, the message "U_d is reduced" is issued via ZSW1, Bit 13= 1. Energy recovery is re-released again, the message ZSW1, Bit 10= 1 is issued. When the message "U_d is reduced" has been issued, an inverter connected to the DC link may start returning energy into the DC link.

An external logical linking is required for the energy recovery!

As from Unit Software Release 3.2, the U_d can also be reduced automatically, as an alternative, depending on the DC link current I_d:

When the current-dependent U_d reduction is released by **P323**= 1, the command for the reduction is generated internally by U_d. The U_d setpoint is automatically reduced to the value in accordance with P318 when I_d (averaged over 3 current crests) falls below the threshold **P321**. If I_d exceeds the sum of threshold **P321** and hysteresis **P322**, the "full" U_d setpoint value ($1.35*U_{line,feed}$) is selected again. In contrast to U_d lowering by means of STW1, bit 11, precharge time **P329** or discharge time **P330** are always active (setpoint input with ramp) when the U_d setpoint is specified internally.

Attention: Undisturbed recovery mode is only possible if, after falling below P321, the load current withdrawn (by the inverters connected to the DC link) still remains positive for a sufficient length of time before changing direction to permit a reduction of the DC link voltage to the specified value before recovery is started. The current-dependent U_d reduction functions therefore only if an appropriate load cycle exists !

4.4 Function diagrams

Notes on the function diagrams:

The function diagrams on the two following sheets show the controller structure of the infeed/regenerative feedback unit.

A value in brackets for a parameter indicates the factory setting of the parameter in question.

Switch positions drawn are the factory setting.

These function diagrams also contain parameters that are not listed in the parameter list (Chapter 5) of these operating instructions. They are the expert parameters that are only visible at the PMU if P051 = 3 and P799 = 4. These expert parameters contain a useful factory setting and must not usually be altered.

Not only the parameter but also the most important "connectors" (Kxxx) are drawn into the function diagrams. Connectors can be seen as "digital measuring points" of internal controlled variables or memory locations (e.g. DC link voltage K287, DC link current K114, control angle K100). The connectors are only used for factory internal diagnostic purposes and are not described in more detail in these operating instructions. A hexadecimal display of a single connector value is possible using the expert parameters P787 and r786 on the PMU by parameterizing the number of the connector to be displayed at parameter r786 at P787.

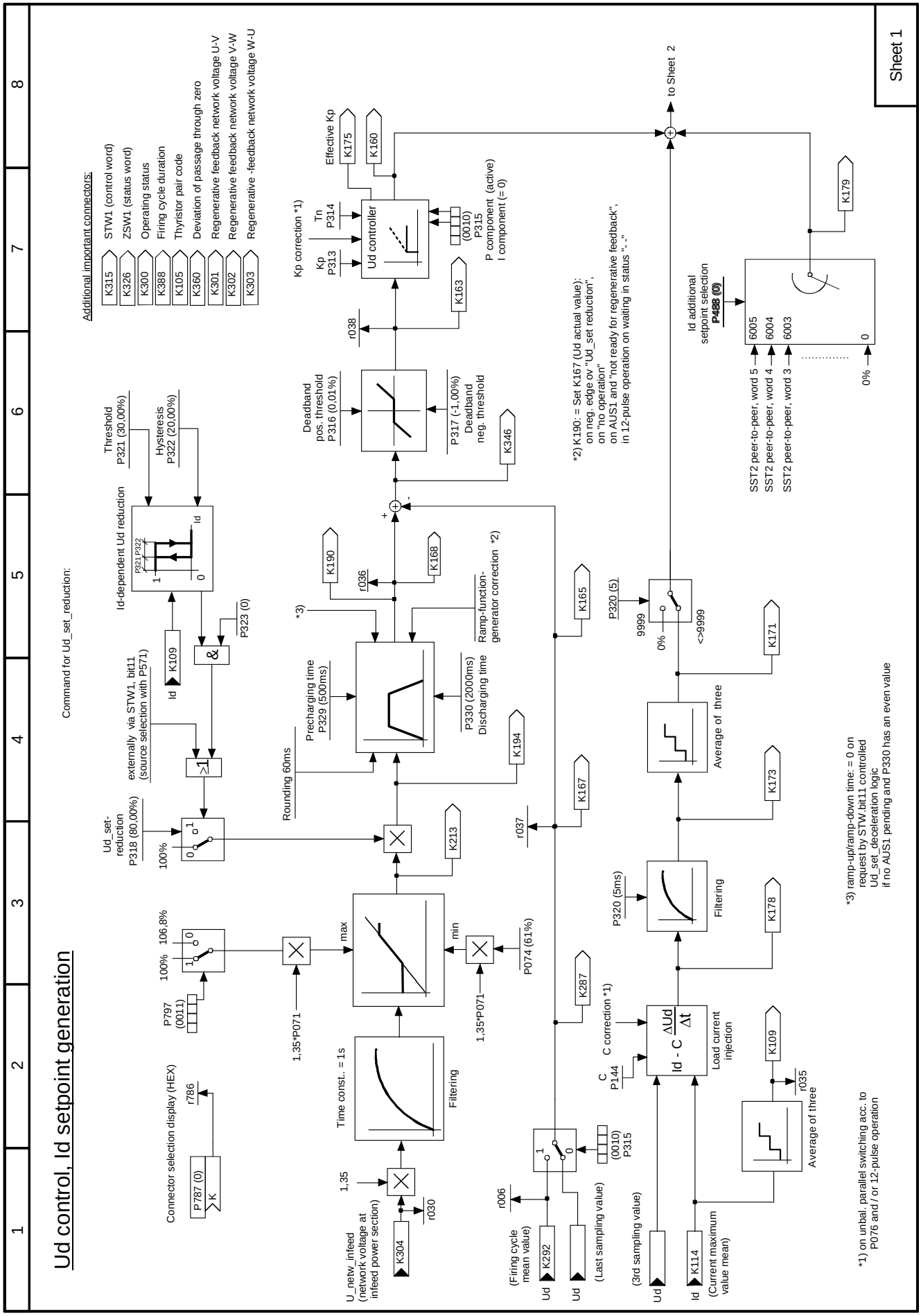


Figure 4.4.1 Ud control, Id setpoint generation

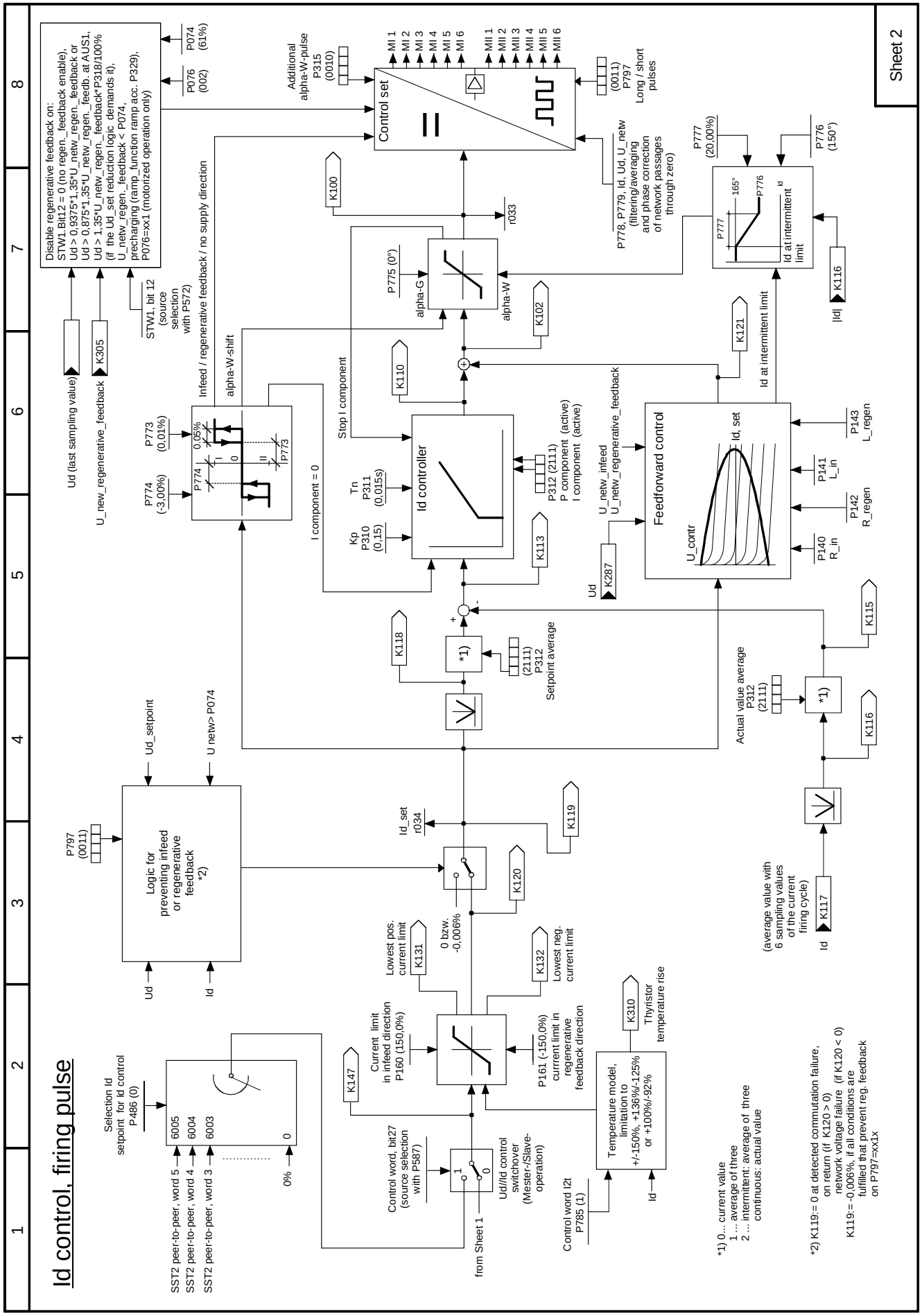


Figure 4.4.2 Id control, firing pulse

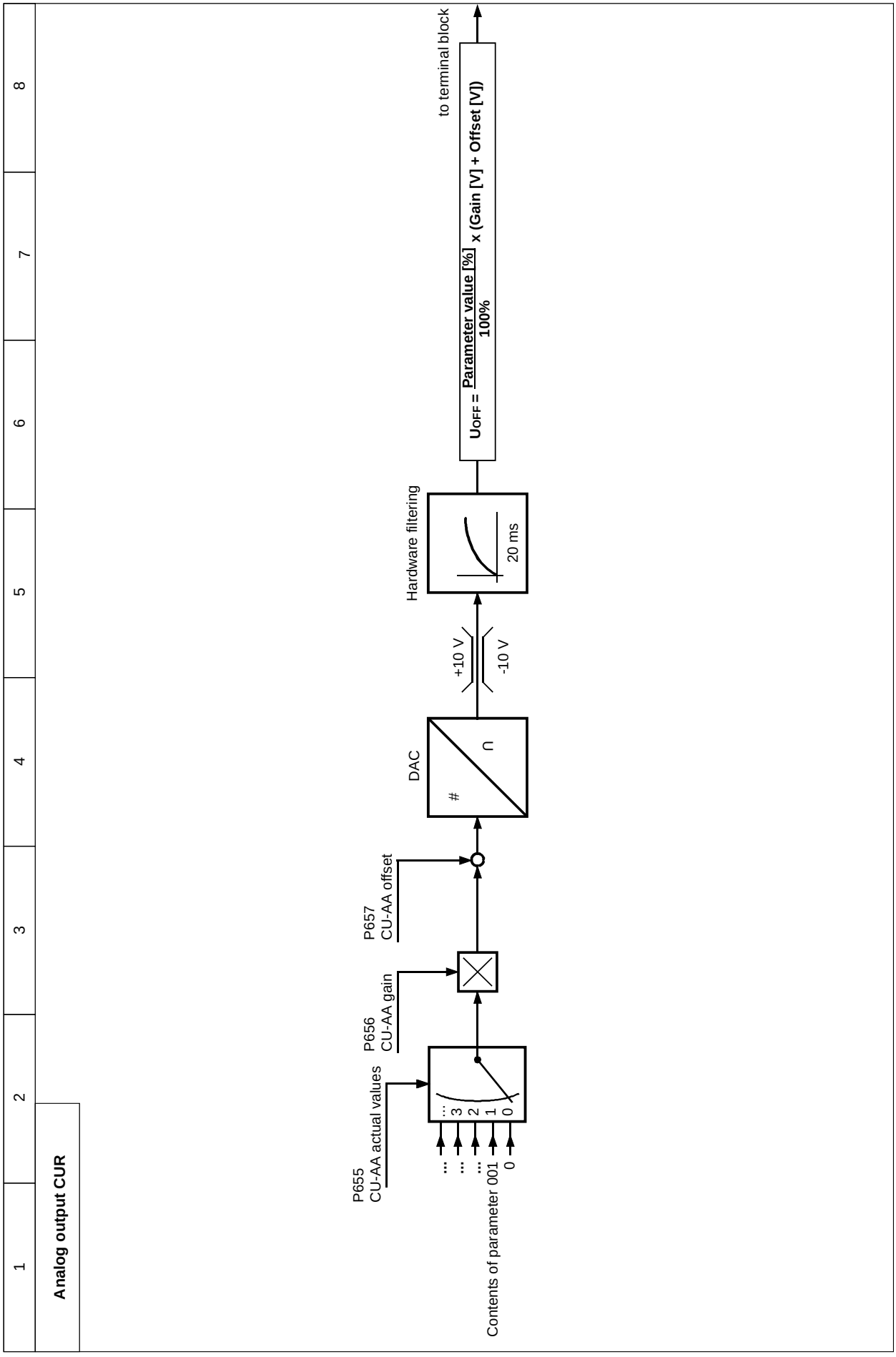


Figure 4.4.3 Analog output CUR

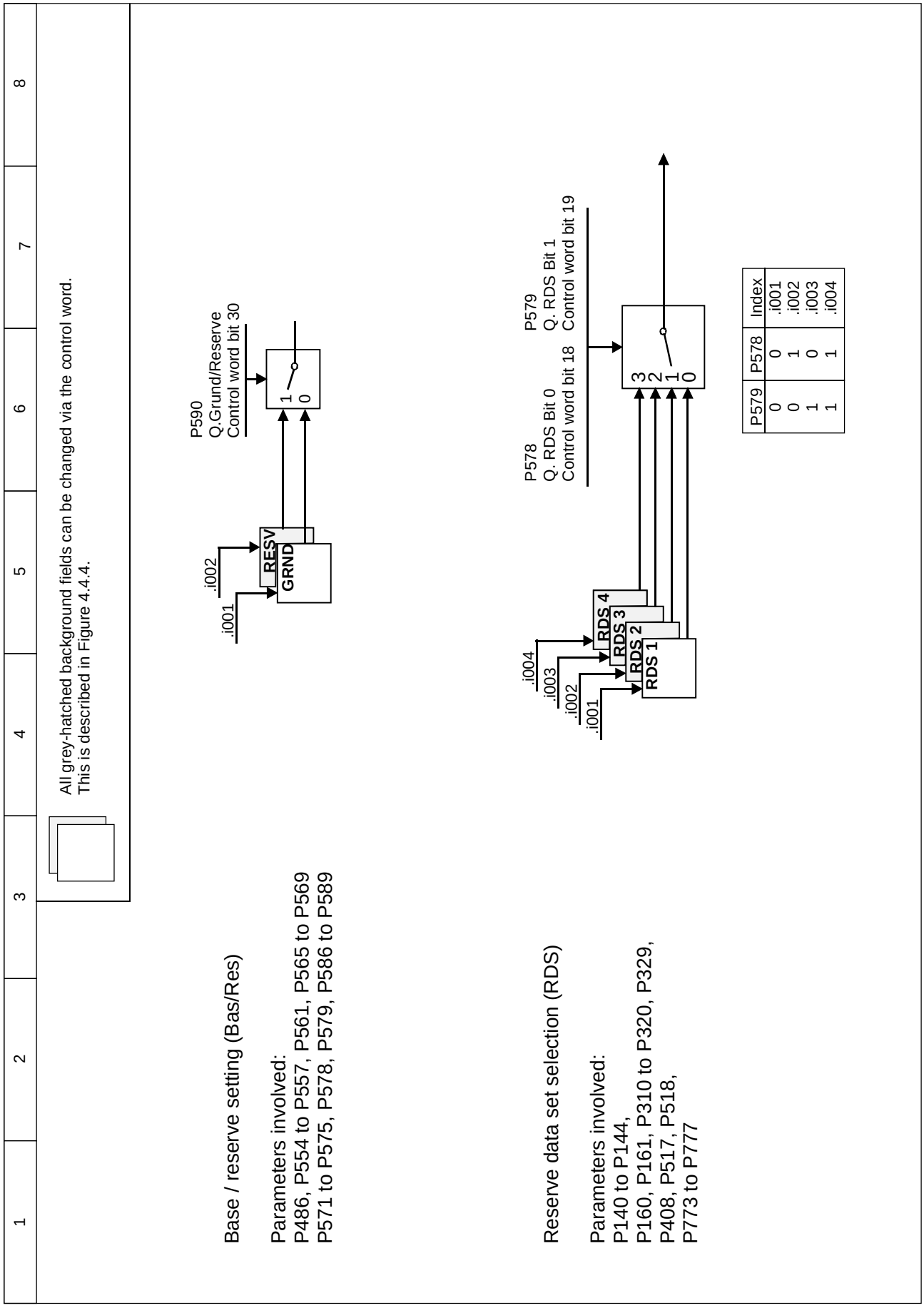


Figure 4.4.4 Selecting the data sets

4.5 Starting up optional supplementary boards

For installation of the board, see Section 9.1, Options for integration into the electronics box. The unit only supports 1 optional board of each type.

Communication-related settings must be defined in parameters. Parameter P052 (hardware configuration) must be set to "4" before most other parameters can be set (for further details, see Chapter 5, "Parameter List", right-hand column specifying criterion for parameter alteration).

The supplementary boards must then be logged in the unit via P090 or P091. Otherwise they will be ignored by the unit and no communication will take place.

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

NOTE
Freely configurable technology boards T300 and T400 are guaranteed to operate correctly (board runup and data exchange with the SIMOVERT 6SE70). 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 After the next switch-on, the board must be logged in via P090. The parameters of the technology board (d and H parameters) can then be accessed.

The connections for the process data on the basic unit are made using the corresponding source and target connections (see Section 4.3).
For the meaning of the bits in the control words and the status words, see Section 4.3.

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 for the process data to be transferred 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 (CBC, CBD, CBP2, SCB1, SCB2) may be installed in slot G. Other boards are not supported

4.5.2 Sequence of operations for starting up PROFIBUS board (CBP2):

1 Switch off the power supply and insert the board or adapter with board. For installation details see Section 9.1, Options for integration into the electronics box.

2 The following are important communication parameters:

- P697 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)
- P695 Telegram failure time for process data (0 = deactivated)
  The DP master configuring data determine whether the slave (CBP2) must monitor telegram traffic with the master. If this monitoring function is activated, the DP master passes a time value (watchdog time) to the slave when the link is set up. If no data are exchanged within this period, the slave terminates the process data exchange with the SIMOVERT 6SE70. The latter can monitor the process data as a function of P695 and activate fault message F082
- P918 Busadresse
- P053 Parameterization enable (same function as P927; need only be set if parameters are to be assigned via PROFIBUS)
- P090 or P091 for logging the board

The connections for the process data on the communications board are made using the corresponding source and target parameters (see Section 4.3). For the meaning of the bits in the control words and the status words, see Section 4.3.

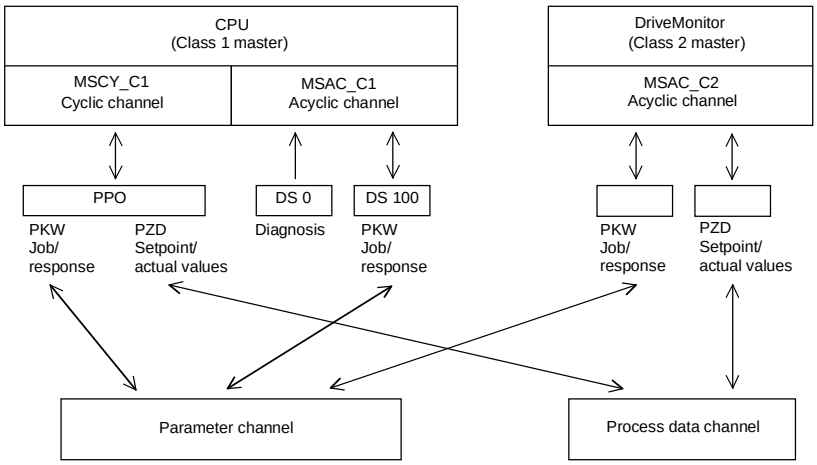
3 Switching off and on of the electronics supply voltage. Doing this causes the values of parameters P695, P697 and P918 to be transferred from the supplementary board.

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

Masters control the data traffic via the bus and are also referred to as **active nodes**. There are two classes of master:
DP masters of class 1 (DPM1) are central stations (e.g. SIMATIC S5, SIMATIC S7 or SIMADYN D) which exchange data with slaves in predefined message cycles.
DPM1s support both a **cyclic channel** (transmission of process data and parameter data) and an **acyclic channel** (transmission of parameter data and diagnostic data).
DP masters of class 2 (DPM2) are programming, configuring or operator control/visualization devices (e.g. DriveMonitor) which are used in operation to configure, start up or monitor the installation.
DPM2s support only an **acyclic channel** for transferring parameter data.

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

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



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

PROFIBUS (**Pro**cess **Fi**eld Bus) combines high baud rates (to RS485 standard) with simple, low-cost installation. The PROFIBUS baud rate can be selected within a range of 9.6 kbaud to 12 Mbaud and is set for all devices connected to the bus when the bus system is started up.
The bus is accessed according to the token-passing method, i.e. permission to transmit for a defined time window is granted to the active stations (masters) in a "logical ring". The master can communicate with other masters, or with slaves in a subordinate master-slave process, within this time window.
PROFIBUS-**DP** (**D**istributed **P**eripherals) predominantly utilizes the master-slave method and data is exchanged cyclically with the drives in most cases.

The user data structure for the **cyclic channel MSCY_C1** (see picture above) is referred to as a Parameter Process(data) Object (**PPO**) in the PROFIBUS profile for variable-speed drives. This channel is also frequently referred to as the **STANDARD** channel.
The user data structure is divided into two different sections which can be transferred in each telegram:

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

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

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

Process data are always transferred and processed as priority data in the drive.
Process data are "wired up" by means of connectors of the basic unit (drive) or via technology board parameters, if these are configured.

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

A total of five PPO types are defined:

	PKW section				PZD section									
	PKE	IND	PWE		PZD1 STW1 ZSW1	PZD2 HSW HIW	PZD3	PZD4	PZD5	PZD6	PZD7	PZD8	PZD9	PZD 10
	1st word	2nd word	3rd word	4th word	1st word	2nd word	3rd word	4th word	5th word	6th word	7th word	8th word	9th word	10th word
PPO1														
PPO2														
PPO3														
PPO4														
PPO5														

PKW:	Parameter ID value	IND:	Index	ZSW	Status word
PZD:	Process data	PWE:	Parameter value	HSW:	Main setpoint
PKE:	Parameter identifier	STW:	Control word	ISW:	Main actual value

The **acyclic channel MSCY_C2** (see diagram above) is used exclusively for the start-up and servicing of DriveMonitor.

4.5.2.1 Mechanisms for processing parameters via the PROFIBUS:

The PKW mechanism (with PPO types 1, 2 and 5 and for the two acyclic channels MSAC_C1 and MSAC_C2) can be used to read and write parameters. A parameter request job is sent to the drive for this purpose. When the job has been executed, the drive sends back a response. Until it receives this response, the master must not issue any new requests, i.e. any job with different contents, but must repeat the old job.

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

Parameter identifier PKE	Index IND	Parameter value 1 PWE1 (H word)	Paramter value 2 PWE2 (L word)

Details about the telegram structure can be found in Section 4.5.6, "Structure of request/response telegrams“.

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

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

- Definition in the PPOs (structure of IND with cyclical communication via PPOs)
- Definition for acyclical channels MSAC_C1 and MSAC_C2 (structure of IND with acyclical communication)

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

In the case of **acyclical data traffic** (MSAC_C1, MSAC_C2) the number of the index is transferred in the **low-order** byte (bits 0 to 7). Bit 15 in the high-order byte is used as the Page Select bit. This assignment complies with the USS specification.

Index value 255 (request applies to all index values) is meaningful only for acyclical transmission via MSAC_C1. The maximum data block length is 206 bytes with this transmission mode.

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

Example

Read parameter P140.004 (for details, see Section 4.5.6, "Structure of request/response telegrams“):

Request identifier PKE = 0x608C (request parameter value (array) P101),
Index IND = 0004h = 4d
Parameter value PWE1 = PWE2 = 0

SIMOVERT response:

Response identifier PKE = 0x408C,
Index IND = 0004h = 4d
Value of P140.004 = 1388h = 5000d, i.e. 5.000Ω (PWE1 = 0, because it is not a double word parameter)

Rules for job/response processing:

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

The master must send the job repeatedly until it receives an appropriate response from the slave. The master recognizes the response to the job it has sent by 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 <siem8045.gsd> is needed for board CBP2.
The appropriate file can be chosen in the selection menu for the SIMOVERT MASTER DRIVES files in later versions of the configuring tool.
If a device master file is not available in the menu, it can be collected from an Internet site. The Internet address is http://www.ad.siemens.de/csi/gsd or http://www.ad.siemens.de/simatic-cs
Product Support/PROFIBUS GSD files/Drives/ . Have all entries displayed using the search function and click on the search results.

SIMOVERT/SIMOREG/SIMADYN CBP
File: siem8045.gsd

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

Detailed information about communication via PROFIBUS can be found in Section 8.2 of the compendium for SIMOVERT MASTER DRIVES Motion Control (order no. 6SE7080-0QX50).

4.5.2.2 Diagnostic tools:

LED displays of CBP2 (flashing LEDs mean normal operation):

Red LED	Status of CBP2
Yellow LED	Communication between SIMOVERT and CBP2
Green LED	Communication between CBP2 and PROFIBUS

As a start-up support tool, the PROFIBUS board supplies data which can be displayed in r731.001 to r731.032. The values of the indices are as follows:

Index	Meaning for CBP2
001	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 (P696 <> 0) (not set in normal operation) Bit8: Incorrect identifier bytes transferred (incorrect configuring message from PROFIBUS Master) (not set in normal operation) Bit9: Incorrect PPO type (incorrect configuring message from PROFIBUS Master) (not set in normal operation) Bit10: Correct configuring data received from PROFIBUS_DP Master (set in normal operation) Bit12: Fatal error detected by DPS Manager software (not set in normal operation) Bit13: Program in endless loop in main.c (loop can only be exited by a Reset) Bit15: Program in communications online loop (loop can only be exited through re-initialization by basic unit)
002	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	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	L byte: No. of received error-free messages (DP Standard only) H byte: Reserved
005	L byte: "Timeout" counter H byte: Reserved
006	L byte: "Clear Data" counter H byte: Reserved
007	L byte: "Heartbeat counter error" counter H byte: Reserved
008	L byte: No. bytes for special diagnosis H byte: Reserved
009	L byte: Mirroring of slot identifier 2 H byte: Mirroring of slot identifier 3

Index	Meaning for CBP2
010	L byte: Mirroring of P918 (CB bus addr.) H byte: Reserved
011	L byte: "Re-config. by CUD" counter H byte: "Initialization runs" counter
012	L byte: Error ID DPS manager error H byte: Reserved
013	L byte: PPO type found H byte: Reserved
014	L byte: Mirroring of "DWord specifier ref"
015	H byte: Mirroring of "DWord specifier act"
016	L byte: DPV1:DS_Write, pos. ack. counter H byte: Reserved
017	L byte: DPV1:DS_Write, neg. ack. counter H byte: Reserved
018	L byte: DPV1:DS_Read, pos. ack. counter H byte: Reserved
019	L byte: DPV1:DS_Read, neg. ack. counter H byte: Reserved
020	L byte: DP/T:GET DB99 pos. ack. counter H byte: DP/T:PUT DB99 pos. ack. counter
021	L byte: DP/T:GET DB100 ps. ack. counter H byte: DP/T:PUT DB100 ps. ack. counter
022	L byte: DP/T:GET DB101 ps. ack. counter H byte: DP/T:PUT DB101 ps. ack. counter
023	L byte: DP/T service neg. acknow. counter H byte: DP/T:Application association pos. acknow. counter
024	Reserved
025	Date of creation: Day, month
026	Date of creation: Year
027	Software version (Vx.yz, display x)
028	Software version (Vx.yz, display yz)
029	Software version: Flash-EPROM checks.
030	Reserved
031	Reserved
032	Reserved

Fault and alarm messages:

For details about fault messages, see Section 7.

Fault F080
An error occurred as board CBP2 was being initialized, e.g. incorrect value of a CB parameter, incorrect bus address or defective module.

Fault F081
The heartbeat counter (counter on CBP2) which is monitored by SIMOVERT 6SE70 for "signs of life" from the board has not changed for at least 800 ms.

Fault F082
Failure of PZD telegrams or a fault in the transmission channel.

Alarm A081
The identifier byte combinations transmitted by the DP master in the configuration telegram do not match the permitted identifier byte combinations (configuring error on DP master)
Effect: No link can be established with the DP master, reconfiguration necessary.

Alarm A082
No valid PPO type can be determined from the configuration telegram from the DP master.
Effect: No link can be established with the DP master, reconfiguration necessary.

Alarm A083
No user data, or only invalid data, are being received from the DP master.
Effect: The process data are not transferred to the basic unit. When the telegram failure monitoring function is active (P695 set to value other than 0), this disturbance generates fault message F082 with fault value 10.

Alarm A084
The exchange of data between the communication board and DP master has been interrupted (e.g. cable break, bus connector removed or DP master switched off).
Effect: When the telegram failure monitoring function is active (P695 set to value other than 0), this disturbance generates fault message F082 with fault value 10

Alarm A085
Error in the DPS software of the communication board.
Effect: Fault message F081 is generated.

Alarm A086
Failure of heartbeat counter detected by SIMOVERT 6SE70.
Effect: Interruption in communication with PROFIBUS.

Alarm A087
DP slave software has detected serious fault, fault number in diagnostic parameter n731.08.
Effect: Total communication failure (secondary fault F082).

Alarm A088
At least 1 configurable internode transmitter is not yet active or has failed again (for details, see diagnostic parameter n731).
Effect:If a transmitter is not yet active, the associated setpoints are set to "0" as an alternative. If an internode transmitter fails again, transmission of the setpoints to the SIMOVERT 6SE70 may be interrupted depending on the setting of P700 (with secondary fault F082).

4.5.3 Sequence of operations for starting up CAN bus boards (CBC):

1 With the power supply switched off, insert the board with adapter board (ADB) into the slot. For installation details see Section 9.1, Options for integration into the electronics box.

2 The following are important communication parameters:

P696 Basic identifier for PKW request/PKW response

P697 Basic identifier for PZD receive

P698 Basic identifier for PZD transmit

P699 No. of the PZD for PZD transmit

P700 Refreshment rate for PZD transmit

P701 Basic identifier for PZD receive broadcast

P702 Basic identifier for PZD receive multicast

P703 Basic identifier for PZD receive lateral communication

P704 Basic identifier for PKW request broadcast

P705 Baud rate, when P706.002 = 0:
0=10kBit/s, 1=20kBit/s, 2=50kBit/s, 3=100kBit/s, 4=125kBit/s, 5=250kBit/s, 6=500kBit/s, 7=reserved, 8=1MBit/s

P706.01 0 = functionality corresponding to layer 2 of the ISO OSI 7-layer model (CANopen is not supported by the SIMOVERT 6SE70 rectifier/regenerative feedback unit

P706.02 Bus timing (this should not be changed)

P695 Telegram failure time (0 = deactivated)

P918 Bus address (node ID)

P053, P927 Parameterization enable (need only be set if parameter values are to be altered via the CAN bus)

P090 or P091 Logging the board

The connections for the process data on the communications board are made using the corresponding source and target parameters (see Section 4.3). For the meaning of bits in the control words and the status words, see Section 4.3.

3 Switching off and on of the electronics supply voltage. Doing this causes the values of parameters P696 to P706 and P918 to be transferred from the supplementary board.

The CAN (**C**ontroller **A**rea **N**etwork) fieldbus is being used increasingly for industrial applications in spite of its limited network length (max. 40 m with a data transmission rate of 1 Mbaud).

Data are transferred by means of telegrams. Each data message, the so-called **COBs** (**C**ommunication **Ob**jects), has its own individual **identifier** and contains a maximum of 8 bytes of user data. The CBC board uses the Standard Message Format with **11-bit identifier**. Simultaneous use by other nodes of Extended Message Format with 29-bit identifiers is tolerated, but messages with this format are not evaluated.
Nodes on the bus determine from the identifier which telegrams apply to them. The COBs to be sent and received by each node must be defined before data transmission commences.
The identifiers also determine bus accessing priority. Low identifiers gain faster access to the bus, i.e. they have higher priority then high identifiers.

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

The figure below shows a diagram of the CAN architecture model that is oriented toward the ISO-OSI-7 layer reference model. The CBC supports the functionalities provided by layers 2 and 7 of this model.

Functionality according to layer 2
The user data from the user software (as COBs on byte level) must be transferred directly to layer 2 (see also the examples of PZD and PKW data exchange given further down).

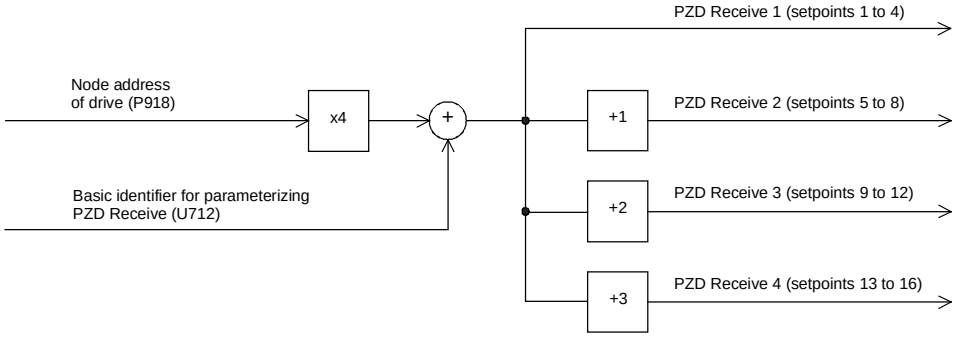
Functionality according to layer 7 (CANopen)
CANopen is not supported by the SIMOVERT 6SE70 rectifier unit.

<table>
<tr><td colspan="3"></td><td>CAN protocol</td><td>Device Net</td></tr>
<tr><td rowspan="2">Application</td><td></td><td>Device profile</td><td></td><td rowspan="3">Device net specification includes:
- Device profile
– Communication profile
– Application layer</td></tr>
<tr><td></td><td>Communication profile</td><td>CIA
DS 301</td></tr>
<tr><td rowspan="5">Communication</td><td>Layer 7</td><td>Application layer</td><td>CIA CAL
DS 201 .. 205, 207
CAL</td></tr>
<tr><td>Layer 3-6</td><td></td><td colspan="2"></td></tr>
<tr><td>Layer 2</td><td>Data link layer</td><td colspan="2">ISO-DIS 11898</td></tr>
<tr><td rowspan="2">Layer 1</td><td>Physical layer, electrical</td><td colspan="2"></td></tr>
<tr><td>Physical layer, mechanical</td><td>CIA DS 102-1</td><td>Device Net ODVA</td></tr>
</table>

4.5.3.1 Description of CBC with CAN Layer 2

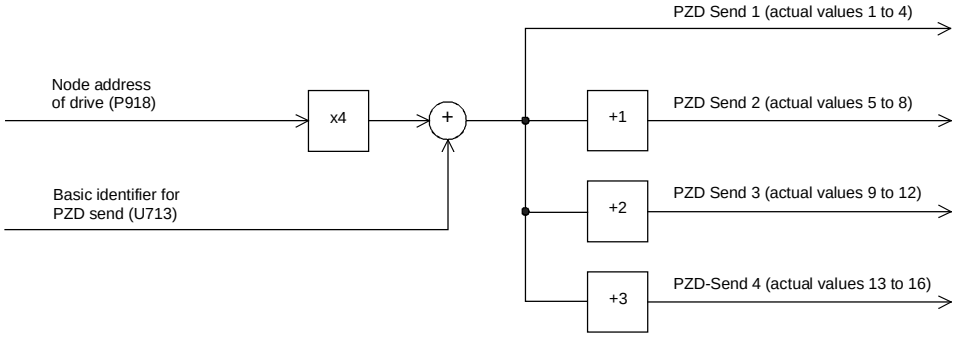
User data are exchanged between the CAN master and the CAN boards on the drives, i.e. the slaves. User data are categorized as either process data (control and status information, setpoints and actual values) or data which relate to parameters.
Process data (**PZD**s) are time-critical and therefore processed faster by the drive (every 3.3 ms at system frequency of 50 Hz) than the non-time-critical **PKW data** (parameter identifier value), which is processed by the drive every 20 ms.
All settings required to operate the communication board are made in drive parameters.

Process data (PZD) are categorized as either data received by the drive (control words and setpoints: **PZD Receive**) or data transmitted by the drive (status words and actual values: **PZD Send**). A maximum of 16 PZDs can be transferred in either direction; these are divided into COBs with 4 data words each by the communication board. In other words, 4 COBs are required to transfer 4 PZD words, with each COB requiring its own separate identifier. Identifiers are assigned in the CB parameters as shown in the following diagram:



Example of PZD Receive:

P918 = 1 This settings assigns identifier 100 to the first 4 receive PZDs,
P697 = 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,
P698 = 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.

3 different modes of COB transmission can be selected in CB parameter 5 (P700):

P700 = 0	Actual values are transmitted only on request (Remote Transmission Requests)
P700 = 1 to 65534	Actual values are transmitted after the set time [ms] or on request (Remote Transmission Requests)
P700 = 65535	Actual values are transmitted if the values have changed (event) or on request (Remote Transmission Requests). This option should only be used in cases where values seldom change so as to prevent excessive bus loading.

Structure of a telegram for PZD data exchange:

The telegram consists of the following data words:

Identifier ID	Process data word 1 PZD1	Process data word 2 PZD2	Process data word 3 PZD3	Process data word 4 PZD4

ID is the CAN identifier that is defined for the COB in question by parameterization.

PZDx are process data words

Example of a PZD setpoint telegram:

Using the receive identifier of the above example

Receive identifier	140_d	$008C_h$	
1. Setpoint	40063_d	$9C7F_h$	control word 1
2. Setpoint	8192_d	2000_h	50%
3. Setpoint	123_d	$007B_h$	
4. Setpoint	0_d	0_h	

Using the CAN BusAnalyser++ from Steinbeis, the setpoint data appear as follows (data field length = 8 bytes, low and high bytes are shown swapped round):

Identifier	Data field			
64 00	7F 9C	00 20	7B 00	00 00
ID	PZD1	PZD2	PZD3	PZD4

The following functions are also available, each allowing a maximum of 16 process data to be transferred:

PZD Receive Broadcast
This function is used to send setpoints and control words from the master **to all slaves** on the bus simultaneously. With this option, an identical identifier must be set on all slaves utilizing the function. This common identifier is set in CB parameter 6 (P701). The first 4 PZDs are transferred with the value set in P701 and the second 4 PZDs with the value in P701+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 (P702). The first 4 PZDs are transferred with the value set in 702 and the second 4 PZDs with the value in 702+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 (P703). The first 4 PZDs are transferred with the value set in P703 and the second 4 PZDs with the value in P703+1, etc.

Notes regarding PZD transmission:

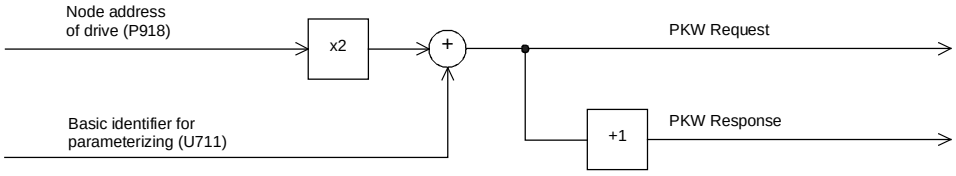
Control word 1 must always be transferred as the first PZD word for setpoints. If control word 2 is needed, then it must be transferred as the fourth PZD word.

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

The consistency of process data can only be guaranteed within a COB. If more than 4 data words are needed, these must be divided among several COBs. Since drives accept the data asynchronously, the data transferred in several COBs may not always be accepted and processed in the same processing cycle.
For this reason, interrelated data should be transferred within the same COB. If this is not possible, data consistency can be assured by means of control word bit 10 (control by PLC), i.e. by setting the bit to "off" in the first COB to temporarily prevent the drive from accepting the data from the communications board. The remaining data are then transmitted. Finally, a COB containing a control word bit 10 set to "on" is transmitted. Since a drive can accept up to 16 PZDs simultaneously from the communication board, data consistency is assured.

Since a variety of different functions can be used to transfer PZDs simultaneously, data are overlayed in the drive. For example, the first PZD from PZD Receive and PZD Receive Broadcast are always interpreted as the same control word 1. For this reason, care should be taken to ensure that data are transferred in meaningful combinations.

Two CAN identifiers are required for the purpose of processing parameters, i.e. one CAN identifier for PKW Request (parameter request job to drive) and one CAN identifier for PKW Response (parameter response by drive). These assignments are made in CB parameters as shown in the following diagram:



Example of PKW data exchange:

P918 = 1 This setting assigns identifier 300 to the parameter job (request)
P696 = 298 and identifier 301 to the parameter response.

Structure of a telegram for PKW data exchange:

The telegram consists of the following data words:

Identifier ID	Parameter identifier PKE	Parameter index IND	Parameter value 1 PWE1	Parameter value 2 PWE2

ID is the CAN identifier that is defined for the COB in question by parameterization.

PKE contains the request or response ID and the parameter number

Request or response ID		Parameter number PNU

Bit 0 to bit 10 contain the number of the parameter concerned. Bit 12 to bit 15 contain the request or response ID.

The index **IND** contains the value 0 for unindexed parameters, for indexed parameters it contains the corresponding index value. Bit15 also has a special function as the page select bit for parameter numbers greater than 1999.
The index value 255 means that the request concerns all indices of the parameter in question. For a change request, the parameter values must then be passed on for all indices of the parameter. Because a COB can only contain up to 4 data words (8 bytes) of net data, use of this request is only possible for parameters with (up to) 2 indices. In the other direction, the drive supplies all index values in the response telegram to a read request.

Details about the telegram structure can be found in Section 4.5.6, "Structure of request/response telegrams“.

Example of a PKW request**:**

Changing the parameter value of the indexed parameter P140.02 (in the RAM) to 5.000Ω.

The example telegram therefore contains the following values:

Request identifier	300_d	$012C_h$	for use of the IDs of the example above
Request code	7_d	7_h	"Change parameter value (array word)"
Parameter number	140_d	$008C_h$	=> PKE = $708C_h$
Index	2_d	0002_h	
Parameter value	5000_d	1388_h	3 decimal places (value = 5000)

Using the CAN BusAnalyser++ from Steinbeis, the transmit data appear as follows (data field length = 8 bytes, low and high bytes are shown swapped round):

Identifier	Data field			
2C 01	8C 70	02 00	88 13	00 00
ID	PKE	IND	PWE1	

The following transfer function is also available:

PKW Request Broadcast
A parameter job (request) is processed simultaneously by all slaves on the bus. The node address is not used to generate the CAN identifier because this must be set identically on all slaves utilizing the PKW Request Broadcast function. This common identifier is set in CB parameter 9 (P704). 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. SIMOVERT 6SE70 does not use double word parameters itself, these jobs can only be executed where access is available to technology board parameters (e.g. T400).

The CBC does not respond to a parameter request job until the drive data are available. This normally takes 20 ms. The response times will be longer only if change (write) jobs including storage of the value in the EEPROM are received from other sources (e.g. serial basic converter interface), resulting in a delay in job execution

In certain system states (e.g. initialization states), parameter processing is greatly delayed or does not take place at all.

The master may not issue a new parameter request job until any current parameter job has been acknowledged.

4.5.3.2 Diagnostic tools:

LED displays on the CBC (flashing LEDs indicate normal operation):

Red LED	Status of CBC
Yellow LED	Communication between SIMOVERT and CBC
Green LED	Communication between CBC and CAN Bus

LED			Status
red	yellow	green	
flashing	flashing	flashing	Normal operation
flashing	off	on	CBC waiting for commencement of initialization by SIMOVERT
flashing	on	off	CBC waiting for end of initialization by SIMOVERT
flashing	flashing	off	No PZD data exchange via CAN Bus
flashing	on	on	CBC defective

Diagnostic parameter r731:

	Value	Meaning
r731.001	0	No fault Fault F080/fault value 5 is displayed under fault conditions: <u>Fault values for CAN layer 2:</u>
	1	Incorrect address on CAN Bus (P918 / slave address)
	2	Incorrect CAN identifier with PKW Request (P696)
	5	Incorrect CAN identifier with PKW Request-Broadcast (P704)
	7	Incorrect CAN identifier with PZD Receive (P697)
	13	Incorrect CAN identifier with PZD Transmit (P698)
	14	PZD transmit length = 0 (P699)
	15	PZD transmit length > 16 , i.e. too long (P699)
	20	Incorrect CAN identifier with PZD Receive-Broadcast (P701)
	21	Incorrect CAN identifier with PZD Receive-Multicast (P702)
	22	Incorrect CAN identifier with PZD Receive-Internode (P703)
	23	Invalid baud rate (P705)
	35	Incorrect CAN protocol type (P706)
	36	PKW Request-Broadcast (P704) without PKW Request (P696)
	48	Overlap between CAN identifier PKW and PKW Broadcast
	49	Overlap between CAN identifier PKW and PZD Receive
	50	Overlap between CAN identifier PKW and PZD Transmit
	51	Overlap between CAN identifier PKW and PZD Receive-Broadcast
	52	Overlap between CAN identifier PKW and PZD Receive-Multicast
	53	Overlap between CAN identifier PKW and PZD Receive-Internode
	54	Overlap between CAN identifier PKW Broadcast and PZD Receive
	55	Overlap between CAN identifier PKW Broadcast and PZD Transmit
	56	Overlap between CAN identifier PKW Broadcast and PZD Receive-Broadcast
	57	Overlap between CAN identifier PKW Broadcast and PZD Receive-Multicast
	58	Overlap between CAN identifier PKW Broadcast and PZD Receive-Internode
	59	Overlap between CAN identifier PZD Receive and PZD Transmit
	60	Overlap between CAN identifier PZD Receive and PZD Receive-Broadcast
	61	Overlap between CAN identifier PZD Receive and PZD Receive-Multicast
	62	Overlap between CAN identifier PZD Receive and PZD Receive-Internode
	63	Overlap between CAN identifier PZD Transmit and PZD Receive-Broadcast
	64	Overlap between CAN identifier PZD Transmit and PZD Receive-Multicast
	65	Overlap between CAN identifier PZD Transmit and PZD Receive Internode
	66	Overlap between CAN identifier PZD Receive-Broadcast and PZD Receive-Multicast
	67	Overlap between CAN identifier PZD Receive-Broadcast and PZD Receive-Internode

	Value	Meaning
	68	Overlap between CAN identifier PZD Receive-Multicast and PZD Receive-Internode
r731.002		Number of correctly received PZD CAN telegrams since Power ON
r731.003		Number of PZD telegrams lost since Power ON Telegrams will be lost if the CAN Bus master sends PZD telegrams faster than they can be processed by the slave.
r731.004		Counter of Bus Off states since Power ON (alarm A084)
r731.005		Counter of Error Warning states since Power ON (alarm A083)
r731.006		Status of the CAN controller
r731.007		Number of errors occurring during reception of PCD frames
r731.008		Type of error occurring during reception of PCD frames
r731.009		Value of error occurring during reception of PCD frames
r731.010		Number of correctly transmitted PZD CAN telegrams since Power ON
r731.011		Number of errors during transmission of PZD telegrams PZD telegrams cannot be transmitted when the bus is overloaded
r731.012		Type of error occurring during transmission of PCD frames
r731.013		Value of error occurring during transmission of PCD frames
r731.014		Number of correctly processed PKW requests and responses since Power ON
r731.015		Number of PKW request processing errors, e.g. owing to bus overload or missing responses from CUD1 (see below for error type)
r731.016	0 9 11 12	Type of PKW request processing error: No error Error transmitting the PKW response (while waiting for a free channel) Timeout waiting for the PKW response from the CUD1 Timeout waiting for a free channel (bus overload)
r731.017		Value of error occurring while processing PKW requests
r731.018		Number of lost PKW requests
r731.026		Software version of CBC (e.g. "12“ = version 1.2, see also r720)
r731.027		Software identifier (extended software version identifier, see also r722)
r731.028		Date of generation of CBC software Day (H byte) and month (L byte)
r731.029		Date of generation of CBC software Year

Fault and alarm messages:

Detailed information about fault messages can be found in Section 7.

Fault F080
An error occurred during initialization of the CBC board, e.g. incorrect setting of a CB parameter, incorrect bus address or defective board.

Fault F081
The heartbeat counter (counter on CBC) which is monitored by SIMOVERT for "signs of life" from the board has not changed for at least 800 ms.

Fault F082
Failure of PZD telegrams or a fault in the transmission channel.

Alarm A083 (Error Warning)
Errored telegrams are being received or sent and the error counter on the supplementary board has exceeded the alarm limit.
Errored telegrams are ignored. The data most recently transferred remain valid. If the errored telegrams contain process data, fault message F082 with fault value 10 may be activated as a function of the telegram failure time set in P695. 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 P695. No fault message is generated for PKW data.

4.5.4 Sequence of operations for starting up the serial I/O board SCB1:

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

2 Set bus address on SCI using DIP-Fix switch S1 (each SCI slave requires its own address number):

	Slave 1	Slave 2
Address number	1	2
Switch setting S1	open	closed

3 Mount the interface board(s) on the rail, make the connection to the 24 V power supply and the fiber optic connection between SCB1 and SCI.

Depending on the type of SCI slaves used and the functions required, the following parameters are relevant with respect to board operation (for details, see the parameter list in Section 5 and operating instructions for the boards):

- P660 Configuration of analog inputs of SCI1 slaves
  The type of input signal for each input is parameterized via the indices.
- P661 Filter time constant of analog inputs of SCI1 slaves
  Filtering of the input signal for each input is parameterized via the indices.
- P662 Offset compensation of analog inputs of SCI1 slaves
  The input signal for each input is zero calibrated via the indices.
- P664 Actual value output via analog outputs of SCI1 slaves
  A connector number is selected via the indices to define the output quantity at each output.
- P665 Gain of analog outputs of SCI1 slaves
  The gain for each output is parameterized via the indices.
- P666 Offset compensation of analog outputs of SCI1 slaves
  The output signal for each output is zero calibrated via the indices.
- P682 SCB protocol
  Selection of operating mode of the SCB1 board (master for SCI slaves or peer-to-peer communication via fiber optic cable).
- P684.2 SCB baud rate
  Selection of transmission rate at which the peer-to-peer interface of the SCB1 should operate (P682 = 3).
- P687.2 SCB telegram failure time
  Selection of telegram failure time for the peer-to-peer protocol.
- P689.2 SCB peer forwarding
  Identifies words in the received peer-to-peer telegram that should be forwarded immediately.
- P690i SCB actual values
  Selection of parameter values that should be transmitted via the serial interface of the SCB board.
- P090 or P091 for logging the board
- The display parameter r730 (diagnostic information) assists in the correction of problems during start-up.

Switching off and on of the electronics supply voltage. Doing this causes the values of the parameters listed above to be transferred from the supplementary board.

The optional board SCB1 (Serial Communication Board 1) is used

- as Master of SCI1 and SCI2 slaves (**S**erial **C**ommunication **I**nterface).

- for communication via the peer-to-peer interface.

In both cases, communication between the boards takes place via fiber optic cables (recommended: Siemens plastic fiber optic cable, CA-1V2YP980/1000,200A or Siemens fiber optic cable with glass core, CLY-1V01S200/230,10A)

4.5.4.1 SCB1 as master for SCI1 and SCI2

The SCI boards can be used if additional terminals are required or if safe electrical isolation via fiber optic cable is a mandatory requirement.
This board only allows the SCB1 master to exchange data with the SCI slaves. Data cannot be exchanged between the SCI slaves themselves.

A maximum of 2 SCIs, of either the same or different types, can be connected to the SCB1.

SCI1 or SCI2 are terminal expansion boards which are mounted on a rail outside the SIMOVERT 6SE70 master and supplied with 24 V DC voltage (-17% +25%, 1A) from an external source.

The interface boards extend the converter by the following additional inputs/outputs:

SCI1	SCI2
10 binary inputs	16 binary inputs
8 binary outputs	12 binary outputs
3 analog inputs	
3 analog outputs	

Reception of SCI data by the SCB1 or transmission to the SCIs is synchronized, i.e. the data of two slaves is received simultaneously or transmitted simultaneously.

Details of the input/output functions and connections can be found in the operating instructions for the boards.

CAUTION

SCI boards have no external enclosure to protect them against direct contact or ingress of pollutants. To protect them against damage, they must be installed in a housing or in the control cabinet of a higher-level system.

The maximum permissible length of fiber optic cables is 10m.

An input filter must be fitted for the external power supply of the interface boards.

Ground SCI at X80 using a short lead.

Analog inputs on SCI1: Only the voltage input or the current input may be used for each channel.

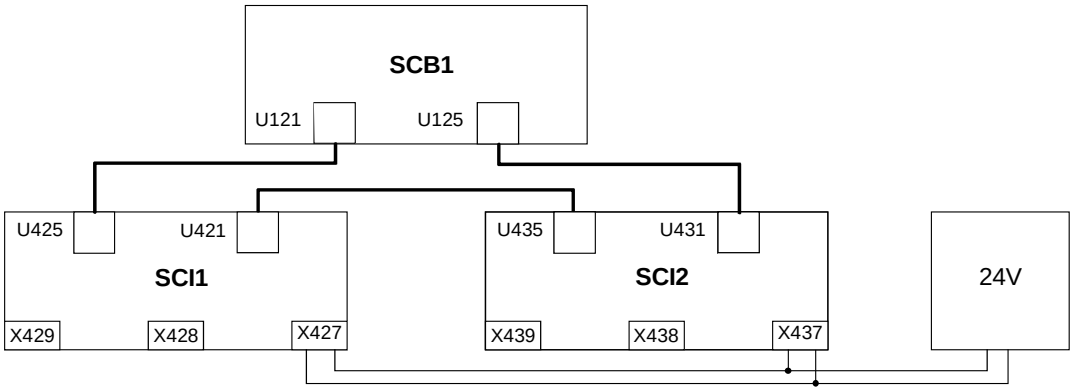
Analog outputs on SCI1: Only the voltage input or the current input may be used for each channel. The outputs are short-circuit-proof.

The binary driver outputs are short-circuit-proof. Relays may only be connected to these outputs in conjunction with an external power supply.

The binary relay outputs are not designed for protective separation.

To protect them against static discharge, the boards may only be placed on conductive surfaces.

Recommended circuit for connecting SCB1 to SCI1 and SCI2 using fiber optic cables:



	WARNING
	If the 24 V voltage supply for an SCI slave fails which data are being exchanged between the SCB1 and an SCI, then the "1" signal applied at a binary input is sent to the SCB1 or SIMOVERT 6SE70 as an "0" shortly before the power finally fails. In contrast, the "1" remains applied in the SIMOVERT 6SE70 in the event of an interruption in the fiber optic connection.

4.5.4.2 SCB1 as peer-to-peer interface

Process data can be passed quickly in a train from unit to unit (between SCB1 master boards) via the peer-to-peer interface. The data to be transmitted from the device are treated like actual values. As a result, they can be parameterized with the existing PZD gating mechanisms (P690). Data to be sent are connected via another interface in the same way as an actual-value output.
The transferred data cannot be manipulated (e.g. multiplication by a factor).
The first device at the beginning of the peer-to-peer chain feeds the required setpoints into the chain using the relevant visualization parameters.

The data received are treated in the same way as other externally supplied setpoints and connected to the appropriate source parameters.
Control word bits can be extracted individually from the peer-to-peer telegram and gated with other bits to make an internal control word. In this case, control word 1 is transferred as the 1st word and control word 2 as the 4th word in the peer-to-peer telegram.

4.5.4.3 Diagnostic tools:

LED display on SCB1:

LED on	Reset state
LED flashing	Normal operation
LED off	Error

LED display on SCI1 or SCI2 slave:

LED on	Reset state	
LED flashing	12Hz frequency	No telegram traffic (e.g. fiber optic cable not connected)
	5Hz frequency	Faulty telegram traffic (e.g. fiber optic ring interrupted or other slave has no supply voltage)
	0.5Hz frequency	Normal operation
LED off	Error	

Details about fault or alarm messages which may occur in relation to SCB1 or SCI (F070 to F079 and A049 to A053) can be found in Section 7.

4.5.5 Sequence of operations for starting up the SCB2 board:

1 With the power supply disconnected, insert the SCB2 board into slot 2 (or, if you have installed a technology board, into slot 3).

2 The following parameters are important for operation (for details, see parameter list in Section 5 and operating instructions for the SCB2):

- P682 SCB protocol
  Selection of operating mode for the SCB2 interface
- P683.2 SCB bus address
  Selection of bus address at which the SCB2 can be addressed via the USS bus (P682 = 1 or 2)
- P684.2 SCB Baud rate
  Selection of transmission rate with which the USS interface (P682 = 1 or 2) or peer-to-peer interface (P682 = 3) of the SCB2 should be operated
- P685.2 SCB PKW number
  Selection of number of words (16 bit) of the PKW part in the net data block of the USS telegram (P682 = 1 or 2)
- P686.2 SCB PZD number
  Selection of number of words (16 bit) of the PZD part in the net data block of the USS telegram (P682 = 1 or 2)
- P687.2 SCB telegram failure time
  Selection of telegram failure time for the USS or peer-to-peer protocol
- P689.2 SCB peer forwarding
  Identifies words in the received peer-to-peer telegram that should be forwarded immediately
- P690i SCB actual values
  Selection of parameter values that should be transmitted via the serial interface of the SCB2 board
- r730i SCB diagnosis
  SCB diagnostic information
- P090 or P091 for logging the board
- The display parameter r730 (diagnostic information) assists in the correction of problems during commissioning.

3 Switching off and on of the electronics supply voltage. Doing this causes the values of the parameters listed above to be transferred from the supplementary board.

The optional board SCB2 (Serial Communication Board 2) provides an additional serial interface using either the USS or peer-to-peer protocol.

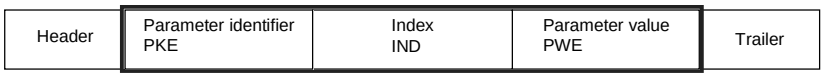
With the USS protocol, up to 31 slaves (converters) can be controlled by a master. In this case, the bus terminating resistors on the last bus node must be connected by closing the switch S1 in order to prevent transmission faults.

The peer-to-peer protocol allows data to be forwarded quickly from unit to unit (e.g. for implementing a setpoint cascade).

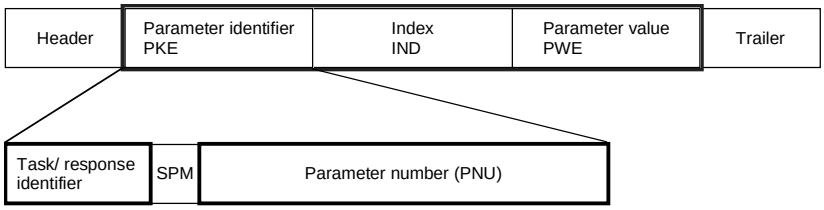
4.5.6 Structure of request/response telegrams

There is no basic difference between the useful data area in the request and response telegrams for PROFIBUS and CAN Bus. The only difference between the two types of bus telegram is in the protocol frame and the transmission sequence of H and L bytes. The structure of the protocol frame and the transmission sequence of bytes are therefore described where necessary in the sections containing the start-up description for the appropriate board.

Each request and each response basically comprises three areas apart from the telegram frame with header and trailer:



The **parameter identifier** (PKE) contains a request or response identifier (i.e. type of request or response) and the number of the addressed parameter. The spontaneous signaling bit SPM (bit11) is not used on the SIMOVERT 6SE70 Common Rectifier.



Bits 0 to 10 contain the number of the parameter specified in the request.

Parameter number (PNU):

Parameter area	Displayed number	Input on OP1S	PNU in parameter identifier
Basic unit	**P**xxx, **r**xxx	0 - 999	0 - 999
Technology board	**H**xxx, **d**xxx	1000 - 1999	1000 - 1999

Bit 12 bis Bit 15 enthalten die **Auftragskennung** bzw. die dazugehörende **Antwortkennung** entsprechend der folgenden Liste:

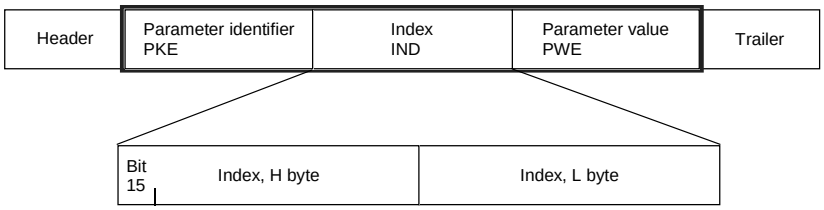
Request identifier	Meaning	**Response identifier**	
		positive	negative
0	No request	0	7 or 8
1	Request parameter value (word or double word)	1 or 2	
2	Modify parameter value (word)	1	
3	Modify parameter value (double word)	2	
4	Request descriptive element	3	
5	Reserved	-	
6	Request parameter value (array)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

If the common rectifier has been unable to process the request, it does not return the associated response identifier, but **error identifier** 7 (or 8) instead.
In this case, an error code defining the error in more detail as shown in the following list is returned as a parameter value:

Error code	Meaning	
0	Illegal parameter number (PNU)	No PNU specified
1	Parameter value cannot be modified	Visualization parameter
2	Lower or upper value limit violated	
3	Faulty subindex	
4	Parameter is not indexed (no array)	
5	Parameter is not indexed (no array)	
6	Parameter value can only be reset	
7	Descriptive element cannot be modified	
8	PPO Write (acc. to "Information Report") is not available	
9	Parameter description is not available	
10	Incorrect access level	
11	No parameterizing enable (P927)	
12	Keyword missing	Key parameter P051 incorrectly set
13	Text cannot be read cyclically	
15	No text	
16	PPO Write missing	
17	Incorrect operating state	
19	Value cannot be read cyclically	
101	Parameter number currently deactivated	
102	Channel not wide enough	
103	PKW number incorrect	Applies only to serial interfaces
104	Illegal parameter value	Applies to BiCo selection parameters

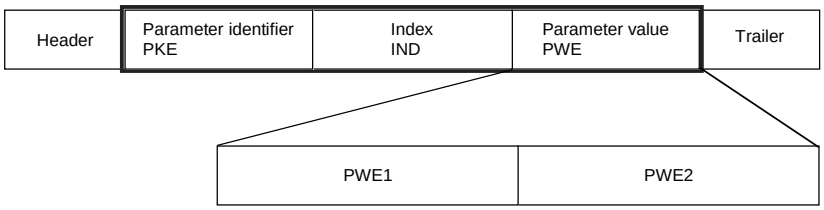
Error code	Meaning	
105	Indexed parameter	
106	Request not implemented in drive	
107	Text cannot be modified	
108	Incorrect number of parameter values	Applies to "Change all indices" request

The **index** IND contains a "0" for non-indexed parameters; a 8-bit long index value is entered (in the low-order byte) for indexed parameters.
Exception: In the case of cyclical PROFIBUS services, the L and H byte sequence is reversed (see "Start-up of PROFIBUS boards").



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

The **parameter value** PWE is treated like a double word (PWE1 and PWE2). The high word is set to 0 when a single word is transferred.



5 Parameter List

Parameter list - Overview

Range of Parameter Numbers	Function
000	Operation Display
001 - 049	General Observation Parameters
050 - 069	General Parameters
070 - 089	Drive Data
090 - 099	Hardware Configuration
100 - 149	DC Link Data
150 - 329	Control
330 - 409	Convenience functions
410 - 549	Setpoint Channel
550 - 649	Control and Status Word
650 - 679	Analog Input/Output
680 - 719	Communications
720 - 759	Diagnostics
760 - 779	Modulator
780 - 799	Factory Parameters
900 - 999	Profile Parameters (Profibus)

Parameter list; Summary of the abbreviations

Example:

PNU *: Conf. Par.	OP1S - Parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory setting	See Modify (access/ status)
P329 **1)** **8)**	**Pre-charging time** Pre-charging time of the DC link RDS parameter**2)** PNU=149Hex; Type=O2;**3)** Scaling: 1Hex ≙ 1**4)**	0 to 9999 [ms]	4 500**9)**	3**5)**/ BR**6)** 3/ BR**7)**

1) An * under the parameter number means that this is a confirmation parameter, i.e. the modified value does not become active until the P key is pressed.

2) Abbreviations for indexed parameters

RDS	Reserve data set parameter with 4 indices; changeover with control word 2, bits 18 and 19
G/R	Parameter with changeover feature for basic and reserve setting in control word 2, bit 30

3) Specification of parameter type

O2	16-bit value without sign
I2	16-bit value with sign
V2	Bit-coded quantity
L2	Nibble-coded quantity

4) Scaling for access via the PKW mechanism
If necessary: Specification of scaling group for process data (PZD)

PZD group	PZD scaling
0 or no specification	As for PKW scaling
1	4000Hex = 100%

5) Access stage (P051), starting at which a parameter can be modified or displayed

1	Operator input
2	Standard mode
3	Expert mode
4	Factory-set parameters

6) Specification of the operating states in which the parameter can be displayed

7) Specification of the operating states in which the parameter can be displayed

6) 7) Operating states:

U	MLFB input	o000
H	Hardware configuration	o002, o004
A	Drive setting	o005
B	Ready (incl.: fault)	o007, o008, o009, o010, o011, o012, o021
R	(**R**) Run	o014, o015, o018

8) An ** under the parameter number means that this parameter does not exist with a 6SE70 rectifier unit (P070 (MLFB) ≥ 101).

9) A factory setting value in brackets means that the specified value only applies for P077=0. See Section 4.3.9.1 "Generate factory setting" for more details.

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.1 Operation display

r000	**Operation Display** Status display, faults and warnings of the S/F unit For description, see Chapter 6 Operator control **o014 Run** **- -** No thyristor bridge in circuit **I** Rectifier bridge in circuit **II** Regenerative bridge in circuit **o012 Test phase** Wait until the thyristor test and/or earth-fault test has been completed (Selection function: P353≠0 and/or P354≠0). Note: The thyristor test can only be conducted if the DC link voltage is less than 5% of 1.35∗P071. Following an ON command, therefore, wait in operating status o012 until this condition is satisfied! **o011 Wait for Run enable** Wait for Run enable **o010 Wait for system voltage** Wait until the system voltage has been checked. or Wait for voltage at power terminals X1-U1, X1-V1, X1-W1 (rectifier bridge) or Wait for voltage at power terminals X4-1U2, X4-1V2, X4-1W2 (regenerative bridge) or Wait for checkback signal "System contactor energized" or Waiting state before energizing the system contactor (Waiting time P409) **o009 Wait for Ready to Switch On** Wait for Ready to Switch On (OFF1 active) or Wait until internal OFF state is canceled by an external OFF command. **o008 Switch-on inhibit; isolation (OFF2)** Wait for acknowledgment of switch-on inhibit by activating the SWITCH-OFF command or Isolation implemented (OFF2) or Wait until a valid USS telegram to SST1 has been received (only if P687 is set to ≠0) or Wait until a valid peer-to-peer telegram to SST2 has been received (only for P688=1, when P687.i003 is set to ≠0) **o007 Fault** A fault message has been received. **o021 Download** A parameter download over SST1 can be executed **o005 Drive settings** **o004 Hardware settings** **o002 Electronics initialization** The option module electronics are initialized or The basic unit electronics are initialized **o001 Establish factory setting** **o000 Set MLFB** PNU=00Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 21	- -	1/UHABR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.2 General observation parameters

r001	**Status** Observation parameters for the current status of the S/F unit 0 = Enter MLFB (P070) (U) 1 = Establish factory setting 2 = Hardware initialization (H) 4 = Hardware settings (H) 5 = Drive system settings (A) 7 = Fault (B) 8 = Restart inhibit (B) 9 = Ready for turn-ON (B) 10 = Wait for system voltage (B) 11 = Ready for operation (B) 12 = Ground fault test (B) 14 = R/R unit is in operation (R) 15 = Ramp generator decelerating (OFF1) (R) 18 = Circuit identification or forming (R) 21 = Download of parameter settings (B) PNU=1Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 21 MLFB-Input Init. RFE InitHW Conf HW Config. System Set. Fault ON Locked Ready for ON Line Voltage Ready Oper GrndFltTest Operation OFF 1 Circuit ID Download	-	2/UHABR
r006	**DC Bus Volts** Actual DC link voltage PNU=6Hex; Type=I2; Scaling: 1Hex ≙ 1 V 0 - 100% ≙ 0 to 16384V	0 to 1000 [V]	- -	2/ BR
r011	**Heatsink Temp** Temperature of the heat sink PNU=0BHex; Type=I2; Scalling: 1Hex ≙ 1 °C PZD gr.: 1 Analog output: +/-100% ≙ +/-100 °C	-53 to 199 [°C]	- -	3/ BR
r012	**Base/Reserve** Base / reserve settings of the process data wiring for control word bits 0: Base setting 1: Reserve setting PNU=0CHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 1	- -	2/ BR
r013	**Operat. Hours** Display of operating hours with firing pulses enabled (Run status). All times > about 0.1s are taken into account. i001 = days (0..9999) i002 = hours (0..24) i003 = seconds (0..3600) The operating hours counter r013 is set to 0 when the factory setting is established (P052=1). PNU=0DHex; Type=O2;Scaling: 1Hex ≙ 1	 d h s	3 -	2/ BR
r030	**Rectifier Volts** Display of the system voltage at the rectifier bridge (phase W-U) PNU=1EHex; Type=O2;Scaling: 1Hex ≙ 0.1 V 0 - 100% ≙ 0 to 1638.4V	0.0 to 1000.0 [V]	- -	2/ BR
r031	**Inverter Volts** Display of the system voltage at the regenerative bridge (average value of the three phases) PNU=1FHex; Type=O2;Scaling: 1Hex ≙ 0.1 V 0 - 100% ≙ 0 to 1638.4V	0.0 to 1000.0 [V]	- -	2/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
r032	**Line Frequency** Display of the line frequency PNU=20Hex; Type=O2;Scaling: 1Hex ≙ 0.01 Hz, 0 - 100% ≙ 0 to 50 Hz PZD gr.: 1	0.01 to 65.00 [Hz]	- -	2/ BR
r033	**Firing Angle** Display of the firing angle PNU=21Hex; Type=O2;Scaling: 1Hex ≙ 0.1 °el, 0 - 100% ≙ 0°el -180°el PZD gr.: 1	0.0 to 165.0 [°el]	- -	2/ BR
r034	**DC Amps (set)** Display of DC link current setpoint PNU=22Hex; Type=I2; Scaling: 1Hex ≙ 0.1 %, ±100% ≙ ±P075 PZD gr.: 1	-150 to 150 [%]	- -	3/ BR
r035	**DC Amps (act)** Display of actual DC link current PNU=23Hex; Type=I2; Scaling: 1Hex ≙ 1 %, ± 100% ≙ ± P075 PZD gr.: 1	-199 to 199 [%]	- -	2/ BR
r036	**DC Volts (set)** Display of DC link voltage setpoint The setpoint 1.35∗r030, limited to values of P074 up to 106.8%. PNU=24Hex; Type=O2;Scaling: 1Hex ≙ 1 %, 100% ≙ 1.35∗P071 PZD gr.: 1	0 to 199 [%]	- -	3/ BR
r037	**DC Volts (act)** Display of actual DC link voltage PNU=25Hex; Type=O2; Scaling: 1Hex ≙ 1 %, 100% ≙ 1.35∗P071 PZD gr.: 1	0 to 199 [%]	- -	2/ BR
r038	**DC Volts Deviat.** Display of setpoint/actual-value deviation of DC link voltage controller PNU=26Hex; Type=I2; Scaling: 1Hex ≙ 1 %, 100% ≙ 1.35∗P071 PZD gr.: 1	-199.9 to 199.9 [%]	- -	3/ BR
r039	**AnalogOut Displ.** Display of terminal X102-14 (analog output) PNU=27Hex; Type=O2;Scaling: 1Hex ≙ 0.1, ± 100% ≙ ± 10V at terminal X102-14 PZD gr.: 1	-112.1 to 112.1 [%]	- -	2/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.3 General parameters

P050 *	**Language** Display language on the optional operation panel OP 0: German 3: Français 1: English 4: Italiano 2: Espanol PNU=32Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 4 German English Espanol Français Italiano	- 0	2/UHABR 2/ HABR
P051 *	**Access Level** Setting of access levels; with higher access levels more parameters can be read and/or written. 1: Operating via PMU or OP 2: Standard mode 3: Expert mode PNU=33Hex; Type=O2;Scaling: 1Hex ≙ 1	1 to 3 Operation Standard Expert	- 2	1/UHABR 1/UHABR
P052 *	**Function Select** Selection of several commissioning steps and special functions. (See Section 4.3.9 for details) 0 = Return from on of the functions described below to the previous status of the R/R unit 1 = Parameter-Reset: all parameters are reset to their original settings (factory settings). According to the Profibus profile for variable speed drives this function is also accessible via parameter P970. After finishing this function the parameter is automatically reset to 0. 2 = Release for MLFB setting (changing into the status 'MLFB input'). To exit this function the parameter must be reset to 0. 3 = Upread/Download (Changing into the status 'Upread/Download'). To exit this function the parameter must be reset to 0. 4 = Hardware configuration (Changing into the status 'Hardware settings'). To exit this function the parameter must be reset to 0. 5 = Drive setting (change to the status "Drive setting" for assigning the plant data parameters. To exit this function the parameter must be reset to 0. 20 = Forming of the DC link 21 = Circuit identification: Assigning the controller parameters of the R/R unit 22 = Display only parameters with modified values **Important**: This function can only be used in conjunction with operator control from the PMU. To exit this function the parameter must be reset to 0 (Return). PNU=34Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 22 Return Param.Reset Input MLFB Upread/Download HW Config. System Set. FormingCaps Circuit ID Changed Par	- 0	2/UHABR 2/UHAB

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P053 *	**Parameter Access** Release of interfaces for parameterization. This parameter is also available as P927 in keeping with Profibus Profile DVA. 0: none 1: COM BOARD (CB) 2: BASE KEYPAD (PMU) 4: BASE SERIAL (SST1) (SST1 and OP) 8: Serial I/O (SCB with USS)) (SCB) 16: TECH BOARD (TB) Description for Setting: Every interface is coded by a number. Input of the number or the total of several numbers which are related to interfaces, gives parameterization access to these interfaces. Example: The factory setting '6' (=4+2) means, that BASE KEYPAD (PMU) and BASE SERIAL (SST1) have parameterization access. PNU=35Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 31	- 6	1/UHABR 1/ HABR
P054	**Display Light** Backlight for the optional operation panel OP 0 = Backlight always ON 1 = Backlight only ON during operation PNU=36Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 1 always ON dur. operat.	- 0	3/ BR 3/ BR
P055 *	**Copy Parameters** This parameter permits the **copying** of data sets 1, 2, 3 or 4 to data sets 1, 2, 3 or 4. Only those parameters specified in Section 4.4 "Selecting the data sets" are affected by the copying process whereby each of these parameters has 4 indices that are assigned to the 4 data sets. Data set 1 can be set with the parameters Pxxx i001 Data set 2 can be set with the parameters Pxxx i002 Data set 3 can be set with the parameters Pxxx i003 Data set 4 can be set with the parameters Pxxx i004 0xy **Do nothing;** automatic reset value at the end of a copy operation 1xy The contents of data set x (x = 1, 2, 3 or 4) are **copied** to data set y (y = 1, 2, 3 or 4) (data set x remains unchanged; the original contents of data set y are overwritten). x and y are the respective data set numbers (1, 2, 3 or 4) of the source and destination data set. Each copy operation is started by changing P055 to parameter mode if P055 = xy and the unit is not in the "RUN" status. P555 is reset to P055 = 0xy at the end of the copy operation. **Important**: Once a copy operation has been started, the electronic power supply must not be switched off for at least 3 minutes to enable the copied parameters to be passed to the EEPROM. P055 is not stored in the EEPROM, and has the value "012" when the electronic power supply is switched on. PNU=37Hex; Type=L2; Scaling: 1Hex ≙ 1	011 to 144	- 012	3/ B 3/ B

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indies Factory-setting	See Modify (access / status

5.4 Drive data

P070 *	**MLFB(6SE70 ...)** MLFB (order number) of the rectifier/regenerating unit On POWER ON, the "Bootstrap" function is automatically selected as long as P070 has not been set! Enter the code of the corresponding MLFB here (see Section 4.3.9.2) PNU=46Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 120	- Depends on unit	3/U BR 3/U
P071 *	**Line Volts** Line voltage of the rectifier bridge RMS value of the rated voltage at which the power section is actually operated PNU=47Hex; Type=O2;Scaling: 1Hex ≙ 1	100 to 1000 [V]	- acc. to P070	2/ ABR 2/ A
P074	**Limit LowVoltage** Response threshold for undervoltage disconnection and phase failure monitoring and threshold for DC link voltage (ssee Section 4.3.10.1). PNU=4AHex; Type=O2;Scaling: 1Hex ≙ 1	10 to 100 [% of P071] or [% of 1.35*P071]	- 61	2/ BR 2/ BR
P075 *	**Rtd Amps** Rated DC voltage of the R/R unit Output DC current (average value) at the power terminals X1-C and X1-D. PNU=4BHex; Type=O2;Scaling: 1Hex ≙ 0.1	0.0 to 3276.7 [A]	- acc. to P070	2/U BR 2/U
P076 *	**Config. PCircuit** Configuration of the power section xx1 Motoring only xx2 Motoring and generating possible 00x No parallel power section connected x1x to x2x Number of additional parallel-connected power sections in feed direction 0xx to 2xx Number of additional parallel-connected power sections in recovery direction The number of parallel feed power sections must be greater than or equal to the number of parallel recovery power sections: Permitted configurations: **P076= 00x, 01x, 02x, 11x, 12x, 22x** Feed power section(s): **E EE EEE EE EEE EEE** Recovery power section(s): **R R R RR RR RRR** Correction factor: **1 2 3 1 3/2 1** In recovery direction, calculation of the effective U_d controller gain and determination of the effective DC link capacitance for the load current calculation take the above correction factor into account. PNU=4CHex; Type=L2; Scaling: 1Hex ≙ 1	001 to 222	- 002	3/ ABR 3/ A

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indies Factory-setting	See Modify (access / status
P077 *	**Factory set. type** Selective factory setting (see Section 4.3.9.1) The parameter can be modified in the state "MLFB input" (P052=2). There are two methods for setting the parameters dependent on P077: 1: If a MLFB is not entered (P070=0), once P077 has been entered and "MLFB input" has been terminated (P052=0), the selected parameter becomes valid immediately 2: Via the selection "Par.reset" (P052=1 or P970=0), "generate factory setting" is carried out and the setting of P077 is taken into account. The values of P070 and P077 will not be changed, but <u>all other parameters</u> are reset to their factory setting Parameter values: 0: Factory setting, acc. to "Parameter list", Chapter 5 1: With this setting, the following parameters are initialized differently as compared to "0" P554, P555 2: With this setting, the following parameters are initialized differently as compared to "0" P554, P555, P565, P566, P567, P575, P588, P607 4: With this setting, the following parameters are initialized differently as compared to "0" P554, P555, P565, P566, P575, P588, P607 5: With this setting, the following parameters are initialized differently as compared to "0" P486, P554, P555, P561, P565, P566, P567, P572, P575, P583, P587, P588, 607 6: With this setting, the following parameters are initialized differently as compared to "0" P486, P554, P555, P561, P565, P566, P572, P575, P583, P587, P588, P607 PNU=4DHex; Type=02; Scaling: 1Hex ≙ 1	0 to 6 RRU	- 0	3/U BR 3/U
r089	**Module slot1** Module in slot 1 (left) in the electronics box. 4 = Module CUR (Designation: RRU=Rectifying Regenerative Unit) PNU=59Hex; Type=02; Scaling: 1Hex ≙ 1	4 RRU	- -	3/ B

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.5 Hardware configuration

P090 *	**Board Position 2** PCB in position 2 (right) of the electronic box 0 = No optional PCBs 1 = CB Communication Board 2 = TB Technology Board 3 = SCB Serial Communication Board Description for Setting: Only the following combinations of PCBs and positions are admitted: Position 3(P091) Position 2(P090) - CB - TB - SCB SCB CB CB TB SCB TB CB SCB PNU=5AHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 3 none CB TB SCB	- 0	3/ HBR 3/ H
P091 *	**Board Position 3** PCB in position 3 (center) of the electronic box Description see P090(PCB position 2) PNU=5BHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 3 Text as for P090	- 0	3/ HBR 3/ H

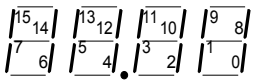
PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.6 Data of the DC link

P140	**Rectifier Resist** Circuit resistance in the rectifier bridge This parameter is automatically set when circuit identification takes place (P052=21) RDS parameter PNU=6EHex; Type=O2;Scaling: 1Hex ≙ 0.001	0.000 to 32.767 [Ω]	4 0.000	3/ BR 3/ BR
P141	**Rectifier Induct** Circuit inductance of the rectifier bridge This parameter is automatically set when circuit identification takes place (P052=21) RDS parameter PNU=6FHex; Type=O2;Scaling: 1Hex ≙ 0.01	0.00 to 327.67 [mH]	4 0.00	3/ BR 3/ BR
P142 **	**Inverter Resist.** Circuit resistance of the regenerative bridge This parameter is automatically set when circuit identification takes place (P052=21) RDS- parameter PNU=70Hex; Type=O2;Scaling: 1Hex ≙ 0.001	0.000 to 32.767 [Ω]	4 0.000	3/ BR 3/ BR
P143 **	**Inverter Induct.** Circuit inductance of the regenerative bridge This parameter is automatically set when circuit identification takes place (P052=21) RDS parameter PNU=71Hex; Type=O2;Scaling: 1Hex ≙ 0.01	0.00 to 327.67 [mH]	4 0.00	3/ BR 3/ BR
P144	**DC Bus Capacit.** Capacitance of the DC link This parameter is automatically set when circuit identification takes place (P052=21) RDS parameter PNU=72Hex; Type=O2;Scaling: 1Hex ≙ 0.01	0.00 to 327.67 [mF]	4 0.00	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.7 Control

r150	**Control Status** Status word of the control  Meaning of the individual segments 3 Rectifier current limit reached 4 Rectifier stability limit reached 11 Regerating current limit reached 12 Inverter stability limit reached Segment bright: corresponding limit reached Segment dark: corresponding limit not reached PNU=96Hex; Type=V2; Scaling: 1Hex ≙ 1	0 to 1818Hex	-	3/ BR
P160	**Motor Curr Limit** Motoring current limit The rectifier current is limited to the value set here RDS parameter PNU=0A0Hex; Type=O2;Scaling: 1Hex ≙ 0.1	0.0 to 150.0% of P075 [%]	4 150.0%	3/ ABR 3/ A
P161 ****	**Regen Curr Limit** Generating current limit The regenerating current is limited to the value set here. RDS parameter PNU=0A1Hex; Type=I2; Scaling: 1Hex ≙ 0.1	-150.0 to 0.0% of P075 [%]	4 -150.0%	3/ ABR 3/ A
P310	**DC Curr Reg Gain** Proportional gain of the DC link current controller This parameter is automatically set when circuit identification takes place (P052=21) RDS parameter PNU=136Hex; Type=O2;Scaling: 1Hex ≙ 0.01	0.01 to 1.00	4 0.15	3/ BR 3/ BR
P311	**DC Curr Reg Time** Integral-action (reset) time of the DC link current controller This parameter is automatically set when circuit identification takes place (P052=21) RDS parameter PNU=137Hex; Type=O2;Scaling: 1Hex ≙ 0.001	0.001 to 1.000 [s]	4 0.015	3/ BR 3/ BR
P313	**DC Volts RegGain** Proportional gain of the DC link voltage controller This parameter is automatically set when circuit identification takes place (P052=21) RDS parameter PNU=139Hex; Type=O2;Scaling: 1Hex ≙ 0.01	0.10 to 200.00	4 3.00	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P316	**DC V-Reg +Limit** Positive threshold for the dead band of the setpoint/actual-value difference of the U_d controller A setpoint/actual-value deviation signal for the DC link voltage is not applied to the U_d controller until the deviation of the DC link voltage exceeds the value set here. RDS parameter PNU=13CHex; Type=O2;Scaling: 1Hex ≙ 0.01	0.00 to 100.00 [%] of 1.35∗P071	4 0.01	3/ BR 3/ BR
P317	**DC V-Reg -Limit** Negative threshold for the dead band of the setpoint/actual-value difference of the U_d controller A setpoint/actual-value deviation signal for the DC link voltage is not applied to the U_d controller until the deviation of the DC link voltage drops below the value set RDS parameter PNU=13DHex; Type=I2; Scaling: 1Hex ≙ 0.01	-100.00 to 0.00 [%] of 1.35∗P071	4 -1.00%	3/ BR 3/ BR
P318	**DC V(set,red)** DC link voltage setpoint with active DC link reduction (i.e. upon request for U_d reduction via control word 1, Bit 11= 1 (control word-source selection via P571) or for internally generated U_d reduction command in event of released current-dependent U_d reduction (P323= 1)) With parameter setting P318 > 100.00 %, the Ud controller of the E unit or the E/R unit can be operated at full signal level with the recovery direction blocked (P076= xx1).After precharging, this leads to the control angle α=0. RDS parameter PNU=13EHex; Type=O2; Scaling: 1Hex ≙ 0.01	0.00 to 160.00 [%] of 1.35∗ Supply voltage at the rectifier bridge	4 80.00	3/ ABR 3/ ABR
P319	**DC V(set,red)Hys** Hysteresis for Ud < Ud(set,red) (message "Ud reduced") RDS parameter PNU=13FHex; Type=O2;Scaling: 1Hex ≙ 0.01	0.00 to 100.00 [%] of 1.35xP071	4 6.00%	3/ ABR 3/ ABR
P320	**Smooth Load Amps** Smoothing time for feedforward load current injection RDS parameter PNU=140Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 9999 [ms]	4 5	3/ BR 3/ BR
P321	**DC CurrThresVred** Current threshold for current-dependent DC link reduction If I_d (averaged over 3 current crests) falls below the value set here, the U_d setpoint is reduced over a ramp (discharge time P330 active) to the value in accordance with P318 when current-dependent U_d reduction (P323=1) is released. RDS parameter PNU=141Hex; Type=O2;Scaling: 1Hex ≙ 0.01	0.00 to 100.00 [%]	4 30.00	3/ BR 3/ BR
P322	**DC CurrHyst.Vred** Hysteresis for current-dependent DC link voltage reduction If I_d (averaged over 3 current crests) exceeds the sum of P321 and the value set here, the U_d setpoint increases over a ramp (precharge time P329 active) to the value 1.35∗ $U_{line,feed}$ when current-dependent U_d reduction is released (P323=1). RDS parameter PNU=142Hex; Type=O2;Scaling: 1Hex ≙ 0.01	0.00 to 100.00 [%]	4 20.00	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P323 *	**Rel.RedCD V(Cur)** Release of current-dependent DC reduction 0: current-dependent U_d reduction blocked 1: current-dependent U_d reduction released (see also P318, P321, P322) PNU=143Hex; Type=02; Scaling: 1Hex ≙ 1	0 to 1	- 0	3/ BR 3/ BR
P329	**PreCharge Time** DC link pre-charging time RDS parameter PNU=149Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 9999 [ms]	4 500	3/ BR 3/ BR
P330	**Discharge Time** DC link discharge time An even parameter value causes abrupt lowering. With effect from software version 4.5, an odd parameter value causes the Ud setpoint to ramp down with Ud reduction controlled by STW1, bit11 (see Section 4.3.1.1 and 4.3.10.2). With the command OFF1 and current-dependent Ud reduction, P330 is active in all cases. RDS parameter PNU=14AHex; Type=O2; Scaling: 1Hex ≙ 1	0 to 9999 [ms]	4 2000	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.8 Convenience functions

P353 *	**Thyristor Test** Function test of the S/F unit thyristors 0 Thyristor test inactive 1 Thyristors are tested when the first ON command is given after switching on the electronics power supply 2 Thyristors are tested at each ON command 3 Thyristors tested at the next ON command. If no fault occurs, parameter P353 is reset to 0. Important: When units are connected in parallel (see Section 3.7), the thyristor test results are only conditionally useful. Note: The thyristor test can only be carried out if the DC link voltage is less than 5% of 1.35∗P071. Following an ON command, therefore, the unit waits in operating status o012 until this condition is fulfilled! Exception: In slave mode (control word bit 27=1), the thyristor test is only carried out when U_d ≤5%. When U_d >5%, a selected thyristor test (P353>0) is ignored (with P353=3, P353 remains at 3). The thyristors of the regenerating bridge are also fired for the purposes of the thyristor test in the case of "regenerating inhibited" (control word 1, bit 12, corresponding source P572 selected). PNU=161Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 3 not active first ON every ON next ON	- 0	3/ BR 3/ B
P354 *	**Ground Fault Test** Checking the S/F unit for ground faults This is not a protective function as defined by the VDE guidelines! 0 Ground fault test inactive 1 Ground fault test when the first ON command is given after switching on the electronics power supply 2 Ground fault test at each ON command 3 Ground fault test at the next ON command. If no fault occurs, parameter P353 is reset to 0 Note: The ground fault test is only carried out if the DC link voltage is less than 50% of 1.35∗P071; otherwise it is automatically skipped! PNU=162Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 3 inactive First ON Any ON Next ON	- 2	3/ BR 3/ B

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P366 *	**Auto Restart** Auto restart after power outage If the power fails at one of the terminals U1/L1, V1/L2, W1/L3, 1U2/1T1, 1V2/1T2 1W2/1T3, X9.1 and X9.2, or if the voltage is not within the permissible tolerance range and the DC link voltage has dropped beneath the P074 * 1.35 * P071 threshold, the S/F unit responds as follows:: 0 Auto restart inhibited No automatic restart; the corresponding fault message (F003, F004, F005, F007, F009 or F010) is triggered. 1 Acknowledgment following power outage The rectifier/regenerating unit enters status o008 (switch-on inhibit) or o009 (switch on/off from the I/O keys of the PMU). On power recovery, a new ON command must be given to enable the DC link to re-charge. The inverter is not automatically restarted by the WEA (auto restart) function. 2 Restart following power recovery and pre-charging of the DC link During the power outage, the controllers and firing pulses of the PZD R/R are inhibited. The rectifier/regenerating unit enters status o010. On recovery of the voltage, the DC link is charged again as quickly as possible (see Section 4.3.10.1). **Important**: The necessary external measures must be taken to guarantee safety on an automatic restart! PNU=16EHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 2 OFF ON Reset ON Always	- 0	3/ BR 3/ BR
P408	**Caps FormingTime** Forming time of the DC link This parameter is used when forming the DC link (P052=20). RDS parameter PNU=198Hex; Type=O2;Scaling: 1Hex ≙ 0.1	1.0 to 600.0 [min]	4 10.0	2/ ABR 2/ AB
P409	**Contactor Delay** Closing delay of the line contactor Closing of the line contactor is delayed by the time set here with respect to the "Switch on" command. This parameter can be used to implement time grading when energizing the line contactors of several drive units in order to prevent the inrush currents of the autotransformers for regenerative mode overloading a supply transformer. PNU=199Hex; Type=O2;Scaling: 1Hex ≙ 0.1	0.0 to +120.0 [s]	- 0.0	3/ BR 3/ B

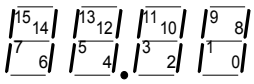
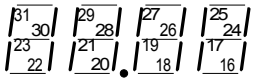
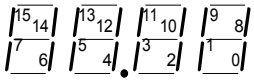
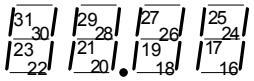
PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.9 Setpoint channel

P486 *	**Src Current Setp** Setpoint source Parameter values: As per PZD wiring of the setpoint channel (see Section 4.3.1.3) Only effective if slave drive (control word 2, bit 27 =1) G/R parameter PNU=1E6Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 (0)	3/ BR 3/ BR
P517	**DC Volts Dev Lim** Setpoint/actual-value deviation of Ud: If the deviation between the Ud setpoint and the actual Ud is considerable, the "Setpoint/actual-value deviation" message is generated (status word 1 Bit 8 (r552)) Compare P518 (min. duration of deviation) RDS- parameter PNU=205Hex; Type=O2;Scaling: 1Hex ≙ 0.01	0.00 to 100.00 [%] of 1.35*P071	4 2.00	3/ BR 3/ B
P518	**Deviation Time** Min. deviation time: If there is a deviation (P517), the "Setpoint/actual-value deviation" message (status word 1 bit 8 (r552)) is generated after this minimum time has elapsed RDS parameter PNU=206Hex; Type=O2;Scaling: 1Hex ≙ 0.01	0.00 to 10.00 [s]	4 0.10	3/ BR 3/ B

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.10 Control and status word

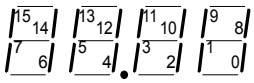
r550	**Control Word 1** Display of the control word 1 bits 0 to 15, see Section 4.3.1.1.2  PNU=226Hex; Type=V2; Scaling: 1Hex ≙ 1		-	2/ BR
r551	**Control Word 2** Display of the control word 2 bits 16 to 31, see Section 4.3.1.1.2  PNU=227Hex; Type=V2; Scaling: 1Hex ≙ 1		-	2/ BR
r552	**Status Word 1** Display of the status word 1 bits 0 to 15, see Section 4.3.1.2.2  PNU=228Hex; Type=V2; Scaling: 1Hex ≙ 1		-	2/ BR
r553	**Status Word 2** Display of the status word 2 bits 16 to 31, see Section 4.3.1.2.2  PNU=229Hex; Type=V2; Scaling: 1Hex ≙ 1		-	2/ BR
P554 *	**Src ON/OFF1** Source of the 'ON/OFF1' command (control word 1, bit 0) 0: OFF1 1: Not allowed 1001: CUR, binary input 1 1010: PMU ON/OFF keys Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R Parameter PNU=22AHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 (i001=1010) (i002=1001)	2/ BR 2/ BR
P555 *	**Src1 OFF2** Source 1 of the 'OFF2' command (control word 1, bit 1) 0: Not allowed 1: Condition for operation 1002: binary input 2 of the CUR board Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R Parameter PNU=22BHex; Type=L2; Scaling: 1Hex ≙ 1	1 to 6005	2 (i001=1010) (i002=1002)	2/ BR 2/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P556 *	**Src2 OFF2** Source 2 of the 'OFF2' command (control word 1, bit 1) Description see P555 B/R Parameter PNU=22CHex; Type=L2; Scaling: 1Hex ≙ 1	1 to 6005	2 1	2/ BR 2/ BR
P557 *	**Src3 OFF2** Source 3 of the 'OFF2' command (control word 1, bit 1) Description see P555 B/R Parameter PNU=22DHex; Type=L2; Scaling: 1Hex ≙ 1	1 to 6005	2 1	2/ BR 2/ BR
P561 *	**Src InvRelease** Source for the "Run enable" command (control word 1, bit 3) 0: Pulse inhibit 1: Automatic "Run enable" at end of waiting times Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R Parameter PNU=231Hex; Type=L2; Scaling: 1Hex ≙ 1	1 to 6005	2 (1)	2/ BR 2/ BR
P565 *	**Src1 Fault Reset** Source 1 of the 'Reset' command (control word 1, bit 7) 0: No source selected 1: Not allowed 1003: Binary input 3 of the CUR board Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) whereby "Reset" from the PMU is always possible Note: The "Acknowledge" control command is edge-triggered B/R parameter PNU=235Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 (i001=0) (i002=1003)	2/ BR 2/ BR
P566 *	**Src2 Fault Reset** Source 2 of the 'Reset' command (control word 1, bit 7) Description see P565 B/R parameter PNU=236Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 (0)	2/ BR 2/ BR
P567 *	**Src3 Fault Reset** Source 3 of the 'Reset' command (control word 1, bit 7) Description see P565 B/R parameter PNU=237Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 (2001)	2/ BR 2/ BR
P568 *	**Src Jog1 ON** Source of the 'Jog 1' command (control word 1, bit 8) 0: No Jog operation 1: Not allowed Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R-Parameter PNU=238Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 0	2/ BR 2/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P569 *	**Src Jog2 ON** Source of the 'Jog 2' command (control word 1, bit 9) Description see P568 B/R parameter PNU=239Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 0	2/ BR 2/ BR
P571 *	**Src Reduce DC V** Source for the "Reduce U_d" control command (control word 1, bit 11) Wait for U_d reduction 0: U_d reduction inactive 1: U_d reduction requested (permanent U_d reduction) other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R parameter PNU=23BHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 0	2/ ABR 2/ ABR
P572 * **	**Src RegenRelease** Source for the "Regenerating enable" control command (control word 1, bit 12) 0: Regenerating inhibited 1: Regenerating enabled Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R parameter PNU=23CHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 (1)	2/ BR 2/ BR
P573 *	**Src No ExtFault3** Source for the "External fault 3" control command (control word 1, bit 13) L signal causes disconnection of the faulted drive. 0: Not allowed 1: No external fault 3 1003: Binary input 3 of the CUR board Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R parameter PNU=23DHex; Type=L2; Scaling: 1Hex ≙ 1	1 to 6005	2 1	2/ BR 2/ BR
P574 *	**Src Motor/Regen** Source for the "Generating/motoring" control command (control word 1, bit 14) 0: Control command ineffective (motoring and generating mode permitted 1: Not allowed Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) During circuit identification parameter value 0 must be set. If a rectifier unit is present, this parameter is visible with effect from software version * 4.4. B/R parameter PNU=23EHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 0	2/ BR 2/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P575 *	**Src No ExtFault1** Source for the "External fault 1" control command (control word 1, bit 15) L signal causes disconnection of the faulted drive. 0: Not allowed 1: No external fault 1 1003: Binary input 3 of the CUR board Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R parameter PNU=23FHex; Type=L2; Scaling: 1Hex ≙ 1	1 to 6005	2 (1)	2/ BR 2/ BR
P578 *	**Src RDataSetBit0** Source for bit 0 (control word 2, bit 18) for selecting the reserve data set (RDS) 0: RDS bit 0 has the value 0 1: RDS bit 0 has the value 1 Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R parameter PNU=242Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 0	3/ BR 3/ BR
P579 *	**Src RDataSetBit1** Source for bit 1 (control word 2, bit 19) for selecting the reserve data set (RDS) 0: RDS bit 1 has the value 0 1: RDS bit 1 has the value 1 Other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R parameter PNU=243Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 0	2/ BR 2/ BR
P583 *	**Src 12-Pulse Mode** Source for control command "12-pulse mode is selected" (control word 2, bit 23) 0: No 12-pulse mode 1: 12-pulse mode is selected Other values: see allowed settings in section 4.3.1.1 (process data wiring of the control word) B/R parameter PNU=247Hex; Type=L2; Scaling: 1Hex ≙ 1	1 to 6005	2 (0)	3/ BR 3/ BR
P586 *	**Src No ExtFault2** Source of the 'External fault 2' message (control word 2, bit 26) L signal causes disconnection of the faulted unit after a pre-charging time of + 200ms if the rectifier/regenerating unit is in the "RUN" status. 0: Not allowed 1: No external fault 1004: Binary input 4 of the CUR board Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R parameter PNU=24AHex; Type=L2; Scaling: 1Hex ≙ 1	1 to 6005	2 1	2/ BR 2/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P587 *	**Src Master/Slave** Source for the master/slave drive changeover (control word 2, bit 27) 0: Master drive: The control works with an internal current setpoint 1: Slave drive: The control works with an external current setpoint Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R parameter PNU=24BHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	2 (0)	2/ BR 2/ BR
P588 *	**Src No Ext Warn1** Source of the 'External warning 1' message (control word 2, bit 28) 0: Not allowed 1: No external warning Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R- parameter PNU=24CHex; Type=L2; Scaling: 1Hex ≙ 1	1 to 6005	2 (1)	3/ BR 3/ BR
P589 *	**Src No Ext Warn2** Source of the 'external warning 2' message (control word 2, bit 29)) 0: Not allowed 1: No external warning Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) B/R parameter PNU=24DHex; Type=L2; Scaling: 1Hex ≙ 1	1 to 6005	2 1	3/ BR 3/ BR
P590 *	**Src Base/Reserve** Source of the 'Base / reserve settings' switching command (control word 2, bit 30) 0: Base setting 1: Reserve setting 1005: Binary input 5 of the CUR board Other values: see allowed settings in Section 4.3.1.1 (process data wiring of the control word) No base/reserve changeover possible PNU=24EHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	- 1005	3/ BR 3/ BR
P591 *	**Src ContactorMsg** Source of the 'Main contactor energized' message(control word 2, bit 31) 0: Not allowed 1: No main contactor checkback signal 1001 to 1005: CUR terminals 4101 to 4116: SCB-SCI1- terminals (serial I/O) 4201 to 4216: SCB-SCI2- terminals (serial I/O) For details see Section 4.3.1.1 Notes: If the function is active, pulses are released as soon as the message is available. No base / reserve settings possible PNU=24FHex; Type=L2; Scaling: 1Hex ≙ 1	1 to 4216	- 1	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
r599	**CW/SW 12-Pulse** Display of control/status word for 12-pulse mode, bit 0 to 15, see Section 3.8.4.  PNU=257Hex; Type=V2; Scaling: 1Hex ≙ 1		-	2/ BR
P600 *	**Trg Bit Ready On** Destination of the status bit 'ready for turn ON' (status word 1, bit 0) Power is ON, the drive may be turned on. Depending on the selected index all settings according to Section 4.3.1.2 (process data wiring of the status word) may be selected. i01: GG: selection of a base drive terminal i02: SCI : selection of a SCI1/2 terminal PNU=258Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P601 *	**Trg Bit Rdy Oper** Destination of the status bit 'Ready for operation' (status word 1, bit 1) All the settings specified in Section 4.3.1.2 (process data wiring of the status word) are permissible, depending on the index selected Parameter values, indices: as P600 PNU=259Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P602 *	**Trg Bit Operat** Destination of the status bit 'Run' (status word 1, bit 2) The unit is in operation. Parameter values, indices: as P600 PNU=25AHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	2/ BR 2/ BR
P603 *	**Trg Bit Fault** Destination of the status bit 'Fault' (status word 1, bit 3) Note: For issuing the fault message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, indices: as P600 PNU=25BHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 i001=1002 i002=0	2/ BR 2/ BR
P604 *	**Trg Bit No OFF2** Destination of the status bit 'No OFF2 command' (status word 1, bit 4) Parameter values, indices: as P600 PNU=25CHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P606 *	**Trg BitONblocked** Destination of the status bit 'Turn-ON locked' (status word 1, bit 6) Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, indices: as P600 PNU=25EHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P607 *	**Trg Bit Warning** Destination of the status bit 'Warning' (status word 1, bit 7) Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, indices: as P600 PNU=25FHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 (0)	2/ BR 2/ BR
P608 *	**Trg Bit Deviat.** Destination wiring of the status bit "U_d set = U_d act" (status word 1, bit 8) - cf. P517 Parameter values, indices: as P600 PNU=260Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P610 *	**Trg Regen Ready** Destination wiring of the status bit "Regenerating ready" (status word 1, Bit 10) Parameter values, indices: as P600 PNU=260Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P611 *	**Trg Low Voltage** Destination of the status bit 'Undervoltage' (status word 1, bit 11) Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, indices: as P600 PNU=263Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P612 *	**Trg Bit Contact** Destination of the status bit 'Energize main contactor' (status word 1, bit 12) H level: energize contactor! **Important:** Relay X9-4/5, whose function cannot be programmed, is provided for controlling the main contactor. Parameter values, indices: as P600 PNU=264Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P613 *	**Trg DC V reduced** Destination wiring for the status bit "U_d reduced" (status word 1, bit 13) Parameter values, indices: as P600 PNU=265Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ ABR 3/ ABR
P614 * **	**Trg Motor/Regen** Destination wiring for the status bit "Regenerative/motoring mode" (status word 1, bit 14) Parameter values, Indices: as P600 PNU=266Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P618 *	**Trg Current Lim.** Destination wiring of the status bit "Current limit active" (status word 2, bit 18) Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken-wire proof). Parameter values, indices: as P600 PNU=26AHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P619 *	**Trg Bit Ext Flt1** Destination of the status bit 'External fault 1' (status word 2, bit 19) Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, indices: as P600 PNU=26BHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P620 *	**Trg Bit Ext Flt2** Destination of the status bit 'External fault 2' (status word 2, bit 20) Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). If an ON command is active, L-level causes fault trip after 200 msec. Parameter values, indices: as P600 PNU=26CHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P621 *	**Trg Bit ExtWarn** Destination of the status bit 'External warning' (status word 2, bit 21) Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, indices: as P600 PNU=26DHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P622 *	**Trg Bit i2t Inv** Destination of the status bit 'Warning unit overload' (status word 2, bit 22); Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, indices: as P600 PNU=26EHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P623 *	**Trg BitFltTmpInv** Destination of the status bit 'Fault unit overtemperature' (status word 2, bit 23 Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, Indices: as for P600 PNU=26FHex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P624 *	**Trg BitWarTmpInv** Destination of the status bit 'Warning unit overtemperature' (status word 2, bit 24 Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, indices: as P600 PNU=270Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR
P631 *	**Trg Bit Charging** Destination of the status bit 'Charging active' (status word 2, bit 31) Note: For issuing the message via a terminal the active status (bit has H-level) is inverted (broken wire proof). Parameter values, indices: as P600 PNU=277Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 4212	2 0	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.11 Analog input/output

P655	**CUR AnaOutActVal** Number of the parameters whose value is to be output at the analog output of the CUR, (terminal X102-14). PNU=28FHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 999	- 37	2/ BR 2/ BR
P656	**CUR AnaOut Gain** Gain for the analog output of the CUR (terminal X102-14) P656 = desired analog output voltage at PWE=100%, if offset=0 The output voltage is calculated with the following formula: U(out)= [(PWE/100%) * P656] + P657 PNU=290Hex; Type=I2; Scaling: 1Hex ≙ 0.01 V	±320,00 [V]	- 10.00	2/ BR 2/ BR
P657	**CUR AnaOutOffset** Offset for the analog output on the CUR (terminal X102-14) The analog output can represent voltages of -10V to +10V. PNU=291Hex; Type=I2; Scaling: 1Hex ≙ 0.01 V	-100.00 to 100.00 [V]	- 0.00	2/ BR 2/ BR
P658 *	**AnaOut Conf Curr** Configuration of terminal X102-16 (actual current display) 0 Output with correct sign (positive voltage: motoring current) (negative voltage: regenerative current) 1 Output absolute value (positive voltage only) 2 Signed output, inverted (positive voltage: regenerative current) (negative voltage: motoring current) 3 Output of absolute value, inverted (negative voltage only) PNU=292Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 3 signed absoluteVal inverted inv. absVal	- 0	2/ BR 2/ BR
P660	**SCI AnalogInConf** Configuration of the SCI analog inputs; defines the kind of the input signals Parameter values / Terminals X428/3, 6, 9 / Terminals X428/5, 8, 11 0: -10 V ... + 10 V / - 20 mA ... + 20 mA 1: 0 V ... + 10 V / 0 mA ... + 20 mA 2: / 4 mA ... + 20 mA Notes: Only one signal can be wired per input; alternatively voltage or current signals can be evaluated. Voltage and current signals must be connected to different terminals. Settings 1 and 2 only allow unipolar signals, i. e. the internal process data are also unipolar. At setting 2 an input current < 2 mA causes a fault trip (broken wire proof) The offset scaling of the analog inputs is done via P662. i001: SI11 Slave 1, analog input 1 i002: SI12 Slave 1, analog input 2 i003: SI13 Slave 1, analog input 3 i004: SI21 Slave 2, analog input 1 i005: SI22 Slave 2, analog input 2 i006: SI23 Slave 2, analog input 3 Condition: The related SCB board must be reported via P090 and P091, respectively PNU=294Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 2	6 0	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P661	**SCI AnaInSmooth** Filter time constant of the SCI analog inputs i001: SI11 Slave 1, analog input 1 i002: SI12 Slave 1, analog input 2 i003: SI13 Slave 1, analog input 3 i004: SI21 Slave 2, analog input 1 i005: SI22 Slave 2, analog input 2 i006: SI23 Slave 2, analog input 3 PNU=295Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 15	6 2	3/ BR 3/ BR
P662	**SCI AnalogInOffs** Offset scaling of the SCI analog inputs Description for setting see SCI manual i001: SI11 Slave 1, analog input 1 i002: SI12 Slave 1, analog input 2 i003: SI13 Slave 1, analog input 3 i004: SI21 Slave 2, analog input 1 i005: SI22 Slave 2, analog input 2 i006: SI23 Slave 2, analog input 3 PNU=296Hex; Type=I2; Scaling: 1Hex ≙ 0.01 V	-320.00 to 320.00 [V]	6 0.00	3/ BR 3/ BR
P664	**SCI AnaOutActVal** Actual value output via SCI analog outputs Description for setting: Enter the parameter number of the quantities, which are to be issued; for details see SCI manual. i001: SI11 Slave 1, analog output 1 i002: SI12 Slave 1, analog output 2 i003: SI13 Slave 1, analog output 3 i004: SI21 Slave 2, analog output 1 i005: SI22 Slave 2, analog output 2 i006: SI23 Slave 2, analog output 3 Condition: The related SCB board must be reported via P090 and P091, respectively PNU=298Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 999	6 0	3/ BR 3/ BR
P665	**SCI AnaOut Gain** Proportional gain of the SCI analog outputs Description for setting: see SCI manual i001: SI11 Slave 1, analog output 1 i002: SI12 Slave 1, analog output 2 i003: SI13 Slave 1, analog output 3 i004: SI21 Slave 2, analog output 1 i005: SI22 Slave 2, analog output 2 i006: SI23 Slave 2, analog output 3 PNU=299Hex; Type=I2; Scaling: 1Hex ≙ 0.01 V	-320.00 to 320.00 [V]	6 10.00	3/ BR 3/ BR
P666	**SCI AnaOut Offs** Offset of the SCI analog outputs i001: SI11 Slave 1, analog output 1 i002: SI12 Slave 1, analog output 2 i003: SI13 Slave 1, analog output 3 i004: SI21 Slave 2, analog output 1 i005: SI22 Slave 2, analog output 2 i006: SI23 Slave 2, analog output 3 PNU=29AHex; Type=I2; Scaling: 1Hex ≙ 0.01 V	-320.00 to 320.00 [V]	6 0.00	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.12 Communications

P680 *	**Scom1 Act Value** Process data assignment for actual-value output over serial interface SST1. Defines the parameter positions in the telegram. Notes: Word 1 should be assigned status word 1 (r552=r968). The length (number of words) of the process data part in the telegram is set with P686, Index i001. i001=Word 01 of the (process data part of the) telegram i002=Word 02 of the (process data part of the) telegram ... i016=Word 16 of the (process data part of the) telegram PNU=2A8Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 999	16 i001=968 i002=0 . . . i016=0	3/ BR 3/ B
P681 *	**Scom2 Act Value** Selection of the process data to be transmitted over serial interface SST2 (actual values) with peer-to-peer protocol selected (P688=1). Defines the parameter positions in the telegram. Notes: The length (number of words) of the process data part in the peer-to-peer telegram is set with P686, Index i003. i001=Word 1 of the (process data part of the) telegram i002=Word 2 of the (process data part of the) telegram ... i005=Word 5 of the (process data part of the) telegram PNU=2A9Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 999	5 i001=599 i002=34 i003=0 i004=0 i005=0	3/ BR 3/ B
P682 *	**SCB Protocol** SCB can be operated as master for the SCI boards or as serial communications board (see SCB manual). 0 = SCI-Module: Master for SCI boards 1 = 4 wire USS 2 = 2 wire USS 3 = Peer to Peer 4 = Option-1: not used 5 = Option-2; not used Condition: SCB board must be reported via P090 and 0P91, respectively PNU=2AAHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 5 SCI-Module 4 wire USS 2 wire USS Peer 2 Peer Option 1 Option 2	- 0	3/ HBR 3/ H
P683 *	**SCom/SCB BusAddr** Bus address of the serial communication interfaces i001 = SST1: bus address of serial comm. interface 1 (CUR) i002 = SCB: SCB baud rate, if P682=1, 2 PNU=2ABHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 30	2 0	3/ BR 3/ B

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P684 *	**SCom/SCB Baud** Serial interfaces baud rate 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 57650 Baud 10 76800 Baud 11 93750 Baud 12 115200 Baud 13 187500 Baud i001 = SST1: serial comm. interface 1 (CUR) i002 = SCB: SCB, if P682=1, 2, 3 i003 = SST2: serial comm. interface 2 (CUR with PTP1 option) PNU=2ACHex; Type=O2;Scaling: 1Hex ≙ 1	1 to 813 300 Bd 600 Bd 1200 Bd 2400 Bd 4800 Bd 9600 Bd 19200 Bd 38400 Bd 57650 Bd 76800 Bd 93750 Bd 115200 Bd 187500 Bd	2 i001=6 i002=6 i003=13	3/ BR 3/ B
P685 *	**SCom/SCB #PKWDat** Number of words (16 bit) of the parameter data part in the net data block of the telegram. 0: No parameter data part in the telegram 3, 4 Parameter data part is 3 (parameter identifier, Ind, parameter value), 4 words long 127 Variable parameter data length for the transfer of parameter description and texts i001 = SST1: serial comm. interface 1 (CUR) i002 = SCB: SCB, if P682=1, 2 PNU=2ADHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 127	2 i001=127 i002=127	3/ BR 3/ B
P686 *	**SCom/SCB # PrDat** Number of words (16 bits) of the process data part in the net data block of the telegram. i001 = SST1: serial comm. interface 1 (CUR) i002 = SCB: SCB, if P682=1, 2, 3 PWE=0 means that no process data are expected in the USS protocol and that none are sent. i003 = SST2: serial comm. interface 2 (CUR with PTP1 option), if Peer-to-Peer protocol is selected (P688=1), from 1 to 5 net data words can be sent. PNU=2AEHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 16	3 2	3/ BR 3/ B

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P687 *	**SCom/SCB TlgOFF** Telegram OFF time of CUR and SCB If no correct telegram is received within the parameterized time a fault trip is set. Description for setting: Value 0: No monitoring, no fault trip; must be parameterized for sporadic (acyclic) telegrams, e. g. operator panel OP at serial comm. interface 1. i001 = SST1: serial comm. interface 1 (CUR) i002 = SCB: SCB, if P682=1, 2, 3 i003 = SST2: serial comm. interface 2 (CUR with PTP1 option), if Peer-to-Peer protocol is selected (P688=1). With active Peer-To-Peer protocol (P688 = 1) and telegram failure time P687.i003 ≠ 0, the unit remains in operating state o008 until telegram traffic is correct (see P688). With P687.i003 = 0 AND P681.i001 = 599 in the case of telegram failure, bits 3 and 6 of the first SST2 Peer-to-Peer receive data (the control/status word sent from the partner unit in 12-pulse mode) are set to 0. PNU=2AFHex; Type=O2;Scaling: 1Hex ≙ 1ms	0 to 6500 [ms]	3 i001=0 i002=0 i003=1	2/ BR 2/ BR
P688 *	**SST2 Protocol** Selection of the protocol for SST2 (serial interface 2 (CUR with PTP1 option)) 0 Interface is provided for factory-internal diagnostics purposes (7 data bits + 1 parity bit, even parity,1 stop bit) 1 Peer-to-Peer protocol (8 data bits + 1 parity bit, even parity,1 stop bit) With active Peer-To-Peer protocol (P688 = 1) and telegram failure time P687.i003 ≠ 0, the unit remains in operating state o008 until telegram traffic is correct. PNU=2B0Hex; Typ=O2; Normierung: 1Hex ≙ 1	0 to 1 factory-internal Peer to Peer	- 0	3/ BR 3/ B
P689	**SCB Peer2PeerExt** Immediate transfer on of data received via the peer to peer protocol of SCB. Mark of these words of the received peer to peer telegram which are to be transferred on immediately. 0: No immediate transfer (only to CUR) 1: Immediate transfer (and passing to CUR) i001 = W01: Word 01 of the (process data part of the) telegram i002 = W02: Word 02 of the (process data part of the) telegram . . . . . i005 = W05: Word 05 of the (process data part of the) telegram Condition: P682 = 3 (peer to peer protocol) PNU=2B1Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 1 CUR only Transfer	5 0	3/ BR 3/ BR
P690 *	**SCB Act Values** Actual value output via the serial communications interface of the SCB board. Defines, which parameter is to be transferred at which telegram address. Notes: Word 1 should be set for status word 1 (r552=r968) The length (number of words) of the process data part of the telegram is set with P686, Index 02 i001 Word 01 of the (process data part of the) telegram i002 Word 02 of the (process data part of the) telegram ... i016 Word16 of the (process data part of the) telegram PNU=2B2Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 999	16 i001=968 i002=0 . . . i016=0	3/ BR 3/ B

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P694 *	**CB/TB Act Values** Actual-value output over the serial interface of the CB and/or TB module Defines which parameter is to be transferred at which telegram address. Note: Word 1 should be set for status word 1 (r552=r968) If the value "0" is entered (factory settings from i002 to i016), the constant value "0" is passed on. i001 Word 01 of the (process data part of the) telegram i002 Word 02 of the (process data part of the) telegram ... i016 Word16 of the (process data part of the) telegram PNU=2B6Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 999	16 i001=968 i002=0 . . . i016=0	3/ BR 3/ B
P695 *	**CB/TB TlgOFFTime** Telegram lag time of CB and TB If no correct telegram is received within the parameterized time a fault trip is set. Monitoring is carried out at intervals of 20 ms, therefore it is only appropriate to set values that are multiples of 20 ms. Description for setting: 0: no monitoring, no fault trip; must be parameterized for sporadic (non-cyclic) telegrams, e. g. operator panel OP at serial comm. interface 1. PNU=2B7Hex; Type=O2; Scaling: 1Hex ≙ 1 ms	0 to 6500 [ms]	- 20	3/ BR 3/ BR
P696	**CB Parameter 1** Communication board parameter 1. See manual of the used communication board. Parameter is only needed if a communication board is reported (P090 or P091 = 1) The communication board checks, if the set value is valid. If the value is not accepted, the fault message 80 is issued with fault value 5 PNU=2B8Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/ HBR 3/ H
P697	**CB Parameter 2** Communication board parameter 2 see P696 PNU=2B9Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/ HBR 3/H
P698	**CB Parameter 3** Communication board parameter 3 See P696 PNU=2BAHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/ HBR 3/ H
P699	**CB Parameter 4** Communication board parameter 4 See P696 PNU=2BBHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/ HBR 3/ H
P700	**CB Parameter 5** Communication board parameter 5 See P696 PNU=2BCHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/ HBR 3/ H
P701	**CB Parameter 6** Communication board parameter 6 See P696 PNU=2BDHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/ HBR 3/ H

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P702	**CB Parameter 7** Communication board parameter 7 See P696 PNU=2BEHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/ HBR 3/ H
P703	**CB Parameter 8** Communication board parameter 8 See P696 PNU=2BFHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/ HBR 3/ H
P704	**CB Parameter 9** Communication Board Parameter 9 See P696 PNU=2C0Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/ HBR 3/ H
P705	**CB Parameter 10** Communication board parameter 10 See P696 PNU=2C1Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/ HBR 3/ H
P706	**CB Parameter 11** Communication board parameter 11 See P696 PNU=2C2Hex; Type=L2; Scaling: 1Hex ≙ 1	0	5 0	3/ HBR 3/ H

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.13 Diagnostics

r720	**SW Version** Software version of the PCBs in positions 1, 2 and 3 of the electronic box. Indices: i001: Pos1: Software version of the PCB in position 1 i002: Pos2: Software version of the PCB in position 2 i003: Pos3: Software version of the PCB in position 3 PNU=2D0Hex; Type=O2;Scaling: 1Hex ≙ 0.1		3 Pos1 Pos2 Pos3	3/U BR
r721	**SW Generat. Date** Software generation date of the CUR board. Indices: i001= Year i002= Month i003= Day PNU=2D1Hex; Type=O2;Scaling: 1Hex ≙ 1	 Year Mon Day	3	3/U BR
r722	**SW ID** Extended software version ID of the modules in slots 1, 2 and 3 of the electronic box for internal purposes. Indices: i001: SPL1: Software code of the PCB in position 1 i002: SPL2: Software code of the PCB in position 2 i003: SPL3: Software code of the PCB in position 3 PNU=2D2Hex; Type=O2;Scaling: 1Hex ≙ 0.1		3	3/U BR
r723	**PCB Code** Identification code of the PCBs in positions 1, 2 and 3 of the electronic box Indices: i001: SPL1: PCB code of the PCB in position 1 i002: SPL2: PCB code of the PCB in position 2 i003: SPL3: PCB code of the PCB in position 3 PCB codes: CUR: 105 CB: 140 - 149 TB: 130 - 139 SCB: 120 - 129 PNU=2D3Hex; Type=O2;Scaling: 1Hex ≙ 1		3	3/U BR
r725	**HeadroomCalcTime** Headroom of the CPU on the CUR module. PNU=2D5Hex; Type=O2;Scaling: 1Hex ≙ 1 % PZD gr.: 1 Analog output: 100% ≙ 100% computer time free	0 to 100% [%]	- -	3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
r730	**SCB Diagnostics** SCB diagnostics All values in HEX display If a quantity is represented, overflow takes place at FF Hex. The meaning of several Indices depends of the selected SCB protocol (P682). i001: flTC Number of error-free telegrams i002: Terr Number of error telegrams i003: Ferr Number of byte frame-errors i004: Orun Number of overrun errors i005: Prty Parity error i006: STX STX error i007: ETX ETX error i008: BCC Block check error i009: L/KL USS/Peer to Peer: incorrect telegram length SCI modules: required maximum number of terminals according to process data wiring (P554 to P631). i010: T/An USS: Timeout SCI Modules: required analog inputs / outputs according to process data wiring of the setpoint channel and actual value output via SCI (P664) . i011: BCd0 PCB code word 0 i012: BCd1 PCB code word 1 i013: Warn SCB-DPR- warning word i014: SI1? Information, if slave 1 needed and if yes, which type. 0: no slave needed 1: SCI1 2: SCI2 i015: SI2? Information, if slave 2 needed and if yes, which type. 0: no slave needed 1: SCI1 2: SCI2 i016: IniF: with 'SCI modules': initialization fault PNU=2DAHex; Type=L2; Scaling: 1Hex ≙ 1		16	3/ HBR
r731	**CB/TB Diagnostics** For detailed information see manuals of the used communication boards (CB) or technology boards (TB). PNU=2DBHex; Type=L2; Scaling: 1Hex ≙ 1		32	3/ HBR
r748	**Fault Time** The instants at which faults occur (reading of the hours counter r013 at the instant the fault occurs) See parameter r947 for details Trip description by: r947 Fault number r949 Fault value r951 List of fault texts P952 Number of faults PNU=2ECHex; Type=O2;Scaling: 1Hex ≙ 1		24	2/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.14 Modulator

P773	**Deadband Convert** The reversing threshold of the auto-reversing module (in rectifier direction) If the (signed) setpoint of the DC link current (output of the DC link voltage controller on the output side of the limiting module) exceeds the value of + 0.05% set with this parameter, the firing pulses of the rectifier bridge are enabled. These pulses are inhibited if the setpoint of the DC link current drops below the value set here. RDS parameter PNU=305Hex; Type=O2;Scaling: 1Hex ≙ 0.01 %	0.01 to 100.00 [%]	4 0.01	3/ BR 3/ BR
P774 **	**Deadband Invert** The reversing threshold of the auto-reversing module (in regenerating direction) If the (signed) setpoint of the DC link current (output of the DC link voltage controller on the output side of the limiting module) exceeds the value of -0.05% set with this parameter, the firing pulses of the rectifier bridge are enabled. These pulses are inhibited if the setpoint of the DC link current drops below the value set here.. RDS parameter PNU=306Hex; Type=O2;Scaling: 1Hex ≙ 0.01	-100.00 to -0.01 [%]	4 -3.00	3/ BR 3/ BR
P775	**Min Gating Angle** Alpha G limit (rectifier stability limit) RDS parameter PNU=307Hex; Type=O2;Scaling: 1Hex ≙ 1 °el	0 to 120 [°el]	4 0	3/ BR 3/ BR
P776	**Max Gating Angle** Alpha W limit (inverter stability limit) RDS parameter PNU=308Hex; Type=O2;Scaling: 1Hex ≙ 1 °el	120 to 165 [°el]	4 150	3/ BR 3/ B
P777	**Max Gating Angle Ramp** Transition ramp of the alpha W limit from pulsating to continuous DC (for currents < pulsating threshold, the control angle is limited to 165°, for currents > (pulsating threshold+P777) to P776 with linear interpolation inbetween) RDS parameter PNU=309Hex; Type=O2;Scaling: 1Hex ≙ 1 %	0.00 to 100.00 [%] of P075	4 20.00	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

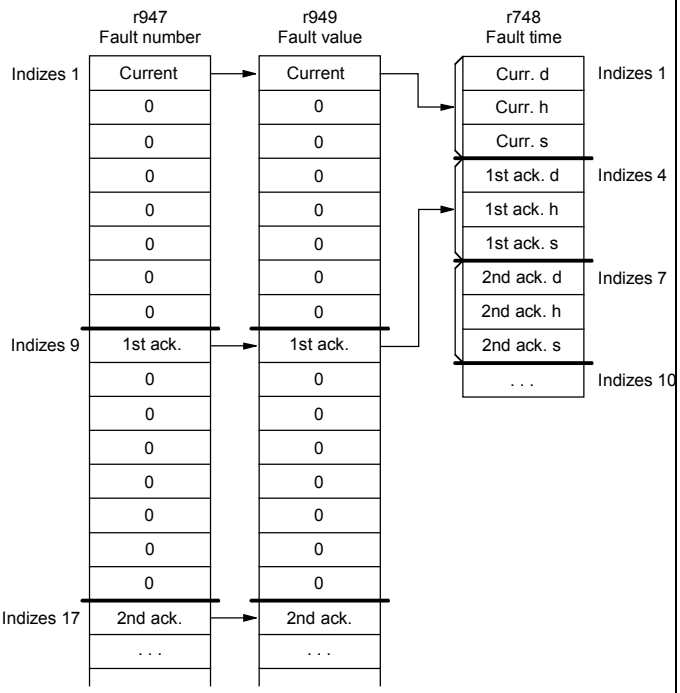
5.15 Factory parameters

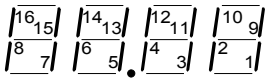
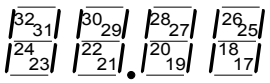
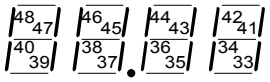
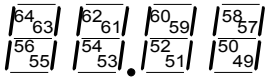
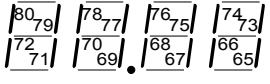
P785 *	**I2t Control Word** Control word for the i^2t power section 0 Response of the i^2t monitor for the power section (i.e. 100% of the i^2t value has been reached) results in an automatic reduction of the limit for the current setpoint to the rated DC current (in infeed direction or at 92% of the rated direct current in regenerative feedback direction) until the absolute value of the current setpoint has dropped below the rated DC current before its limit (or 92% of that in regenerative feedback direction) and the calculated equivalent junction temperature rise is again below the unit-specific response threshold. The current setpoint limit is then raised again. 1 Response of the i^2t monitor for the power section (i.e. 100% of the i^2t value has been reached) results in fault F022 and disconnection. PNU=311Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 1	- 1	3/ HBR 3/ B
P793	**Line Voltage Delay** Stabilizing time for the line voltage If the "Switch-on" command is given, the unit waits in status o010 for voltage to be applied to the power section. The line voltage is not assumed to be applied to the power terminals until amplitude, frequency and phase symmetry lie within the permissible tolerance range for longer than the time set with this parameter. The parameter applies to both the rectifier and regenerative power terminals. PNU=319Hex; Type=O2;Scaling: 1Hex ≙ 0.01 s	0.01 to 1.00 [s]	- 0.03	3/ BR 3/ BR
P799	**Special Access** Parameter for special access PNU=31FHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 65535	- 0	3/U BR 3/ BR

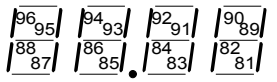
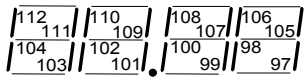
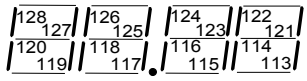
PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)

5.16 Profile parameters

P917 *	**Change Reports** Control word for spontaneous messages If the value of an active parameter is changed, the new value is reported to the programmable controller connected by means of the spontaneous reporting mechanism. This function can be activated and de-activated for each interface. **Important**: When the control word is modified, spontaneous message buffers can be deleted with the loss of spontaneous messages! 0 No spontaneous messages 1 Output of spontaneous messages over the DPR interface (TB/CB) 2 Output of spontaneous messages over the BASE SERIAL interface (SST1) 4 Output of spontaneous messages over SCB with USS protocol Setting help: Each interface is coded with a number. Enter the number and/or the sum of several numbers assigned to the interfaces to enable the spontaneous message mechanism for the relevant interface(s). PNU=395Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 7 inactive TB/CB SCom SCB (USS)	- 0	3/ BR 3/ B
P918	**CB Bus Address** Protocol depending bus address for communication board; see manual of this board. Notes: The communication board checks, if the set value is valid. (Bus addresses 0 to 2 are reserved for master stations). If the value is not accepted, the fault message 80 is issued with fault value 5 Condition: P090=1 or P091=1 (communication board installed) PNU=396Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 200	- 3	3/ HBR 3/ H
P927 *	**Parameter Access** Release of interfaces for the parameterization. This parameter performs the same function as P053. Parameter P053 can always be modified. For description, see P053. PNU=39FHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 31	- 6	3/ BR 3/ BR
P928 *	**Src Base/Reserve** Source of the switching command 'base / reserve settings' (control word 2, bit 30) This parameter performs the same function as P590. For description, see P590. PNU=3A0Hex; Type=L2; Scaling: 1Hex ≙ 1	0 to 6005	- 1005	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
r947	**Fault Memory** Display of the faults which have occurred at the last trips. Each fault number has a fault value and a fault time assigned to it (see Chapter 7 for details of fault numbers and fault values). The relationship between the responsible parameters is shown in the diagram below. The fault numbers for the last (8 max.) faults are stored under the indices of parameter r947. The fault number for the current (not yet reset) trip is indicated by r947.001, the fault number for the last reset fault is indicated by index 9, the fault number of the last-but-one reset fault is indicated by index 17, etc. The entry "0" here means that no previous fault has occurred. In contrast to the converter (SIMOVERT Master Drive FC, VC, SC), in the case of the rectifier/regenerating unit only one fault can occur for each trip, therefore the only significant indices are 1, 9, 17, 25, 33, 41, 49 and 57. A fault value in the appropriate index of parameter r949 is assigned to every fault number. This provides more detailed information on the type of fault. Apart from this, for each trip, the fault time which is the actual value of the operating hours counter (r013) is stored in parameter r748. The data for the current (not yet reset) trip is present as "day", "hours" and "seconds" in indices 1 to 3. The data for the already reset, previous trips is present in groups of 3 elements on the following indices.  Plain text describing the fault numbers is available under the corresponding index of parameter r951. If the electronics supply voltage fails, all fault numbers are saved, but only those fault values and fault times relating to the last trip are stored. After the supply voltage has been restored, the other indices have the value "0". PNU=3B3Hex; Type=O2;Scaling: 1Hex ≙ 1		64	2/ BR
r949	**Fault Value** Interference value of the faults, permits a more precise diagnosis for many fault numbers. The fault values are saved in the same indices as the related fault numbers (r947) - see parameter P947. PNU=3B5Hex; Type=O2;Scaling: 1Hex ≙ 1		64	2/ BR
r951	**Fault Texts List** List of fault texts; every fault text is saved in the index equivalent to its fault number. PNU=3B7Hex; Type=O2;Scaling: 1Hex ≙ 1		103	2/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
P952	**# of Faults** Number of faults stored in the fault memory (max. 8). If the parameter is set to '0', the diagnosis memory (r748 - trip times, r947 - fault number, r949 fault value) is cleared. PNU=3B8Hex; Type=O2;Scaling: 1Hex ≙ 1	0 to 8	- 0	2/ BR 2/ BR
r953	**Warning Param 1** Warning Parameter 1 If a warning (numbers 1 to 16) is active, the related bar in the display is ON  For the meaning of the individual warnings, see Chapter 7. PNU=3B9Hex; Type=V2; Scaling: 1Hex ≙ 1		-	3/ BR
r954	**Warning Param 2** Warning Parameter 2 If a warning (numbers 17 to 32) is active, the related bar in the display is ON  PNU=3BAHex; Type=V2; Scaling: 1Hex ≙ 1		-	3/ BR
r955	**Warning Param 3** Warning Parameter 3 If a warning (numbers 33 to 48) is active, the related segment in the display is ON  PNU=3BBHex; Type=V2; Scaling: 1Hex ≙ 1		-	3/ BR
r956	**Warning Param 4** Warning Parameter 4 If a warning (numbers 49 to 64) is active, the related segment in the display is ON  PNU=3BCHex; Type=V2; Scaling: 1Hex ≙ 1		-	3/ BR
r957	**Warning Param 5** Warning Parameter 5 If a warning (numbers 65 to 80) is active, the related segment in the display is ON  PNU=3BDHex; Type=V2; Scaling: 1Hex ≙ 1		-	3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
r958	**Warning Param 6** Warning Parameter 6 (CB-warnings) If a warning (numbers 80 to 96) is active, the related segment in the display is ON  PNU=3BEHex; Type=V2; Scaling: 1Hex ≙ 1		-	3/ BR
r959	**Warning Param 7** Warning Parameter 6 (TB-warnings 1) If a warning (numbers 97 to 112) is active, the related segment in the display is ON  PNU=3BFHex; Type=V2; Scaling: 1Hex ≙ 1		-	3/ BR
r960	**Warning Param 8** Warning Parameter 6 (TB-warnings 2) If a warning (numbers 113 to 128) is active, the related segment in the display is ON  PNU=3C0Hex; Type=V2; Scaling: 1Hex ≙ 1		-	3/ BR
r967	**Control Word 1** Display parameter of control word 1 (bit 0-15) Identical with r550 (control word 1) PNU=3C7Hex; Type=V2; Scaling: 1Hex ≙ 1		-	2/ BR
r968	**Status Word 1** Display parameter of status word 1 (bit 0-15) Identical with r552 (status word 1) PNU=3C8Hex; Type=V2; Scaling: 1Hex ≙ 1		-	2/ BR
P970 *	**Factory Settings** Parameter reset to factory settings 0: Parameter reset: all parameters are reset to their original values (factory settings). After this the parameter is reset to '1'. 1: no parameter reset Note: This function can also be selected via P052=1. PNU=3CAHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 1 Param.Reset Return	- 1	3/ B 3/ B
P971 *	**EEPROM Storing** Passing of the parameter values of the RAM to the EEPROM on a change from 0 auf 1. It takes about 15s to process all of the values. During this time, the PMU stays in the Values mode. PNU=3CBHex; Type=O2;Scaling: 1Hex ≙ 1	0 to 1	- 0	3/ BR 3/ BR

PNU *: Conf. Par.	OP1S parameter name Description	Value range [phys. unit] Selection text	Display Indices Factory-setting	See Modify (access / status)
r980	**PNU-Lst. 1 avail** List of the available parameter numbers; part 1. The parameter numbers are listed in a positive sequence. The first existing '0' shows, that no more parameter numbers are available. Index range: 1 to 101. As special function the value of i101 is the number of the parameter which contains the next following part of the list. If i101 has a value of '0' then there are no more parts of the list. PNU=3D4Hex; Type=O2;Scaling: 1Hex ≙ 1		101	3/ BR
r981	**PNU-Lst. 2 avail** List of the available parameter numbers; part 2 See r980. PNU=3D5Hex; Type=O2;Scaling: 1Hex ≙ 1		101	3/ BR
r982	**PNU-Lst. 3 avail** List of the available parameter numbers; part 3 See r980. PNU=3D6Hex; Type=O2;Scaling: 1Hex ≙ 1		101	3/ BR
r990	**PNU-Lst.1 chnged** List of the changed parameter numbers; part 1. The parameter numbers are listed in a positive sequence. The first existing '0' shows, that no more parameter numbers are changed. Index range: 1 to 101. As special function the value of i101 is the number of the parameter which contains the next following part of the list. If i101 has a value of '0' then there are no more parts of the list. PNU=3DEHex; Type=O2;Scaling: 1Hex ≙ 1		101	3/ BR
r991	**PNU-Lst.2 chnged** List of the changed parameter numbers; part 2 See r990. PNU=3DFHex; Type=O2;Scaling: 1Hex ≙ 1		101	3/ BR
r992	**PNU-Lst.3 chnged** List of the changed parameter numbers; part 3 See r990 PNU=3E0Hex; Type=O2;Scaling: 1Hex ≙ 1		101	3/ BR

6 Operator control

The rectifier/regenerating unit can be controlled via:

- the PMU (Parameterization Unit) on the CUR module
- the control terminal strip on the CUR (Section 3.3 “Control terminal strip“)
- the OP1S operator control panel (Section 9.4 “Options/Operator control“)
- the SST1 serial interface (RS485 and RS232) on PMU-X300
- the optional SST2 serial interface (RS485) for peer-to-peer coupling

Operator control using the PMU (see diagram below) is described in this section.

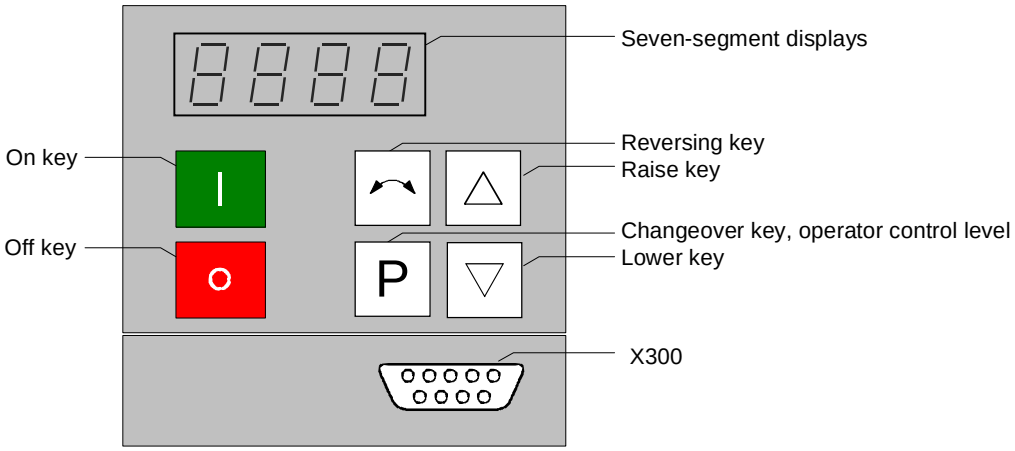


Figure 6.1 Parameterization unit

6.1 Operator control elements

Operator control elements	Function
I	Rectifier/regenerating unit switch on (standard). For faults: Return to the fault display.
O	Rectifier/regenerating unit shutdown depending on the parameterization of OFF1 or OFF2 (P554 to P557).
	No function
P	1) Changeover between parameter number, index and parameter value levels (see Figure 6.2), whereby the command only becomes effective when the key is released. 2) Resetting the current fault message (see Figure 6.3) 3) In conjunction with the arrow keys <raise> and <lower>, additional functions are possible (refer to Figs. 6.2 and 6.3), whereby <P> is pressed first followed by the other key. This command becomes effective once the other key has been pressed.
,	Changing the parameter number when the parameter number level is displayed, changing the index when the index level is displayed, or the parameter value when the parameter value level is displayed.

Table 6.1 Function of the operator control elements on the PMU

6.2 Displays 8.8.8.8.

Tables 6.2 and 6.3 below give an overview of the displays that can be shown on the PMU:

		Parameter number e.g.	Index e.g.	Parameter value e.g.
Visualization parameters	**Basic converter**	r000	001	009
	Technology board	d000		
Setting parameters	**Basic converter**	P051	001	-2.08
	Technology board	H002		

Table 6.2 Displaying visualization and setting parameters on the PMU

	Actual value	Parameter value not (yet) possible	Alarm	Fault
Display	-2.08	----	A022	F006

Table 6.3 Status display on the PMU

NOTE
The parameters are described in Chapter 5 and the fault and alarm messages are described in Chapter 7.

Once the electronics supply voltage has been switched on, either the PMU operating display shows the current operating state of the rectifier/regenerating unit (e.g. o009) or a fault or alarm message is displayed (e.g. F060). The operating states are described in Section 5.1 and the fault and alarm messages are described in Sections 7.1 and 7.2.

As described in Section 6.3 (Figures 6.2 and 6.3), it is possible to change over from one display level to another.
By pressing <P>, it is possible to change from the status display (e.g. o009) to the parameter number level in which the separate parameters can be selected via <raise> or <lower>. The selected access level (P051) and the operating state (r000, r001) determine here which parameters are displayed. All parameters are not always visible (see Chapter 5/overview of the abbreviations/footnotes 5 to 8)!

Pressing <P> again switches to the index level for indexed parameters (see Section 4.1.2) but directly to the parameter value level for all other parameters and the index or the value can be modified via <raise> and <lower>. The same conditions apply for changing a parameter value as were described for the parameter number, i.e. a parameter value can only be modified under an appropriate access level and an appropriate operating state.

If the 4 characters of the seven-segment display are insufficient for displaying a parameter value, only 4 figures will be displayed initially (see Figure 6.4). The presence of further figures to the right or left of this "window" is indicated by flashing of the left-hand or right-hand figure. If <P>+<lower> or <P>+<raise> are pressed simultaneously, this "window" can be moved to view the parameter value.

By pressing <P> again, it is possible to switch back to the parameter number level..

6.3 Structure

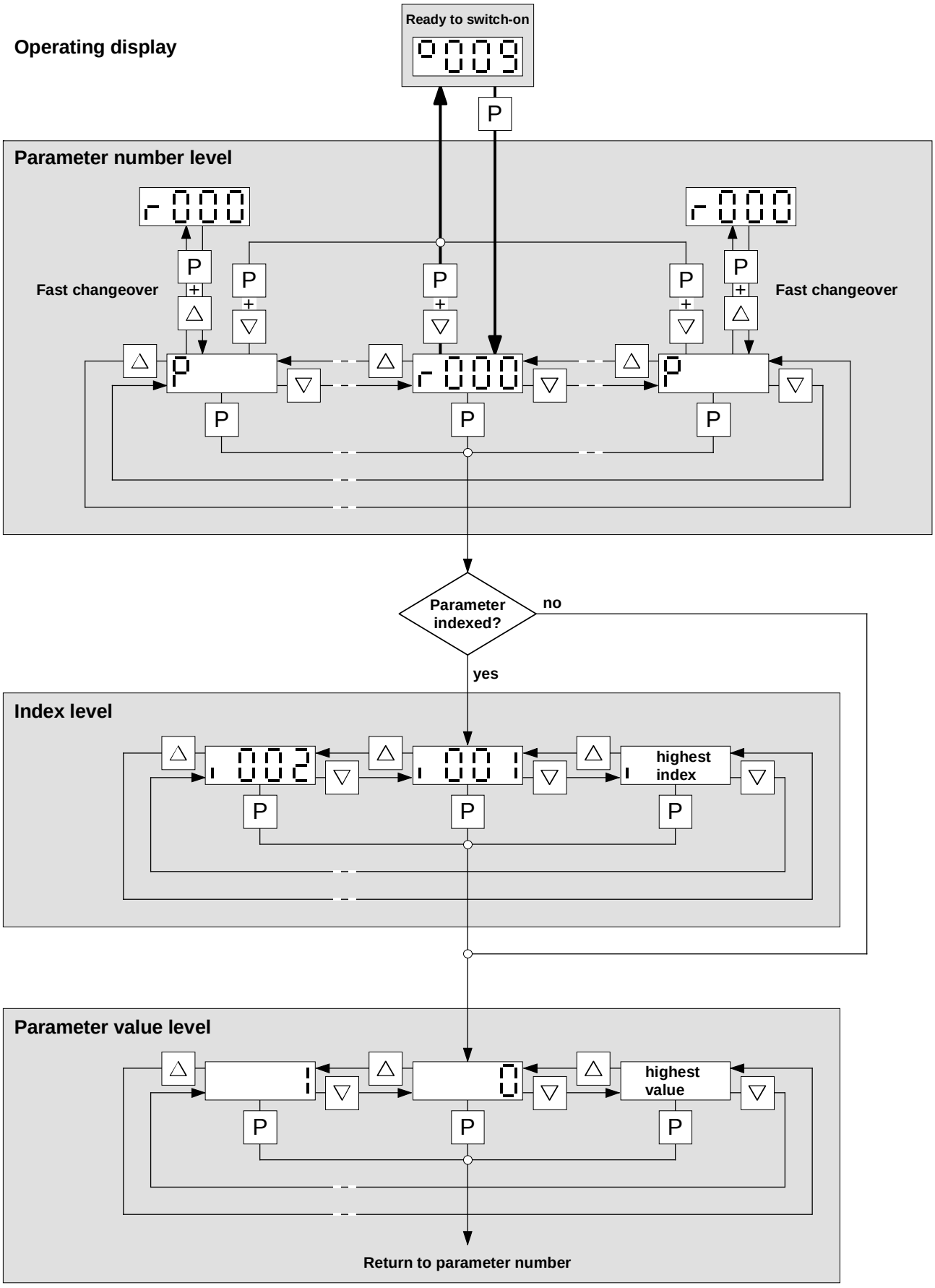


Figure 6.2 Operator control structure using the PMU

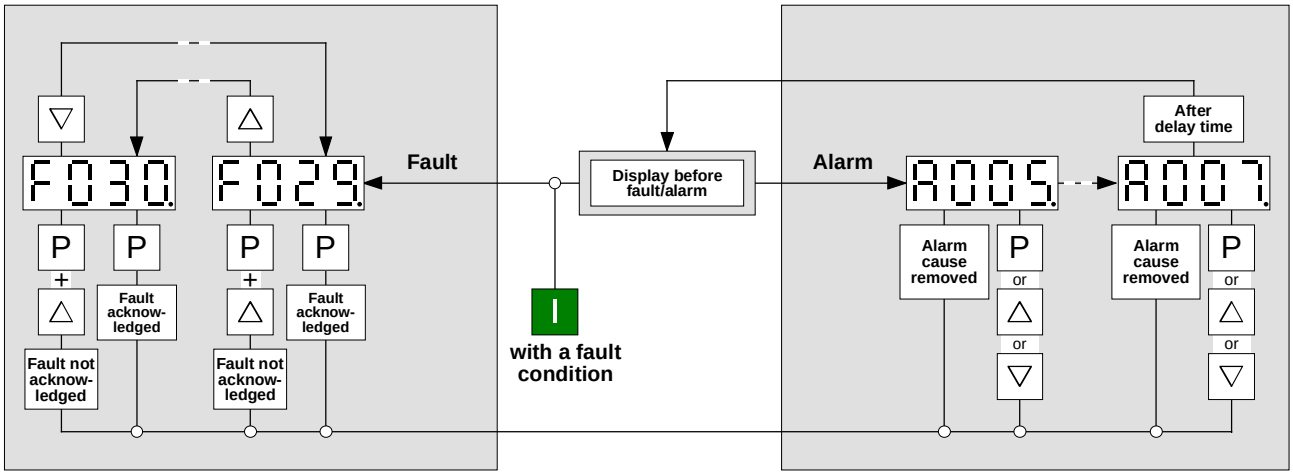


Figure 6.3 Operator control structure of the PMU for alarms and faults

Handling of fault and alarm messages (reset, move into the "background" in order to parameterize) is described in Chapter 7 in detail.

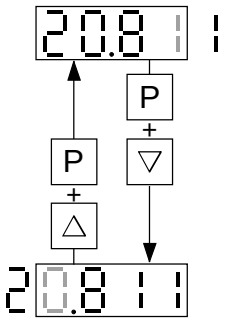


Figure 6.4 Shifting the PMU display for parameters values with more than 4 digits

7 Fault and Alarm Messages

When a fault or alarm is generated, it is displayed immediately on the PMU as well as on the optional OP1S (see Section 6.3, Figure 6.3). An alarm disappears automatically from the display when the problem has been corrected. A fault message must be reset by pressing the P key on the PMU or the reset key on the OP1S after the problem has been corrected, before it is possible to return to a normal operating state.

NOTE
A current fault message or alarm can be "moved into the background" by pressing the P +↑ keys on the PMU simultaneously, in order to parameterize or to read the fault value via r949.001. Acknowledgment of a fault message "placed in the background" is not possible via OP1S either. You must have the fault message displayed on the display of the PMU again by pressing P + ↓ before you can acknowledge it. Via the optional operator panel OP1S, in spite of an active fault message or alarm it is still possible to parameterize. If no key is pressed on the PMU for 30 s, the fault message which was moved into the background or active alarm appears automatically on the PMU. The message can be brought back into the foreground by simultaneously pressing the P + ↓ keys on the PMU at the parameter number level.

7.1 Fault messages

General information on faults

The following information is available for each fault:

Parameter	r947	Fault number
	r949	Fault value
	r951	Fault text list
	P952	Number of faults
	r748	Time of fault

For detailed information on the organization of the fault memory, see r947 in Section 5.16.

If a fault message is not acknowledged before the electronics power supply is switched off, this fault message will appear again the next time the power supply is switched on. The unit will not start up unless this message is acknowledged (except if auto restart has been selected; see under P366 and Section 4.3.10.1).

Fault No.	Fault description	Fault value	Meaning	Possible causes Countermeasures
F001	**Feedb Cont.** No checkback signal from main contactor If a main contactor checkback signal is configured and is not received within 500 ms after the power-up command.	-	-	- Check P591 Q.HS checkback signal. The parameter value must match the main contactor checkback signal connection - Check the main contactor checkback signal circuit.
F003	**Line Over V** Network overvoltage of the infeed supply Voltage at the terminals X1-U1/L1, and X1-W1/L3 are greater than the response threshold (120% of P071).	-	-	- Line overvoltage - P071 set to wrong value
F004	**Line Under V** Line undervoltage Voltage at terminals X1-U1/L1, or X1-W1/L3 and/or X4-1U2/1T1, X4-1V2/1T2 or X4-1W2/1T3 lower than the response threshold (P074 and P071).	-	-	- Line undervoltage - Monitoring too finely or wrongly set (P074, P071)
F005	**Line Frequ.** Line frequency outside permissible range This fault message is generated if the line frequency is lower than 45 Hz or higher than 65Hz (or greater than 68.665Hz on Software Version 4.4 and higher).	1 2 3 4	Frequency of the regenerative bridge < 45Hz Frequency of the rectifier bridge < 45Hz Frequency of the regenerative bridge > 65Hz Frequency of the rectifier bridge > 65Hz	-Line frequency < 45Hz or > 65Hz
F006	**Bus Over V** DC link voltage The unit was shutdown due to an excessive DC link voltage. Line voltage-range | Shutdown threshold 380 V to 460 V | 835 V 500 V to 575 V | 1042 V 660 V to 690 V | 1244 V	-	-	-
F007	**AuxPowerOFF** Failure or overvoltage of the electronics supply voltage in "Run" status or at least one power section connected in parallel reports "Power supply faulted"	1, 2, 3 5	Electronics supply voltage of the rectifier/regenerating unit too low Power interface module of the rectifier/regenerating unit or parallel power section reports "Power supply faulted"	- Check electronics power supply - Power supply fuse for parallel units blown - Internal fault on the power interface module of a slave unit
F009	**Rec PhaseFlt** Phase failure in the rectifier bridge The rms line voltage calculated from the area of each line voltage half-wave (average rectification value * peak value) must be greater than the response value for phase-failure monitoring The interval between two identical line voltage zeros of the voltage for the infeed converter must not be greater than 450 deg.	1 2	Voltage failure in the rectifier bridge (X1-U1/L1, X1-V1/L2 or X1-W1/L3) Waiting time in status o010 elapsed	- Parameter P074 wrongly set - Phase failure in the rectifier bridge - Line contactor dropped out in operation - Fuse blown on three-phase side of rectifier bridge
F010	**Inv PhaseFlt** Phase failure in regenerative bridge The rms line voltage calculated from the area of each line voltage half-wave (average rectification value x peak value) must be greater than the response value for phase-failure monitoring The interval between two identical line voltage zeros of the voltage for the regenerating converter must not be greater than 450 deg..	1 2	Voltage failure in the regenerative bridge (X4-1U2/1T1, X4-1V2/1T2 or X4-1W2/1T3) Waiting time in status o010 elapsed	- Parameter P074 wrongly set - Phase failure in the rectifier bridge - Line contactor dropped out in operation - Fuse blown on three-phase side of rectifier bridge

Fault No.	Fault description	Fault value	Meaning	Possible causes Countermeasures
F022	**I^2t Overload** I^2t monitor of the power section has responded The monitor responds when 100 % of the calculated I^2t value of the power section is reached.	-	-	- Drive operated too long under overload conditions - Check to see whether the rated current of the R/G unit is adequate for the specific application - See also P785
F023	**LT-Temp.** Temperature of the power section too high A check is made to see whether the heat sink temperature measured using thermistor(s) is > 95 °C (or 123,9°C)	1	Heat sink temperature > 95 °C or with water-cooled units: heat sink temperature > 123,9 °C	- Heat sink (air inlets and outlets) contaminated - Heat sink temperature sensor not connected to X31, X32 on A1681 and/or A1682 module (“slave unit”) - Fan has no voltage - Fan faulted - Fan running in the wrong direction - Fan fuse (F3, F4) defective NOTE: - Measure inlet air ambient temperature. If ϑ > 40 ºC, note reduction curves. See Section 14.1. With water-cooled units: - Water inlet temperature too high, cooling circuit interrupted or cooling water pump faulty
	Temperature of the power section too low	2	Heat sink temperature ≤ -45 °C	- Heat sink temperature sensor not connected to X30 module on A1681 and/or A1682
F029	**Measure Flt** Fault in line voltage measurement An offset > 5% has been detected when attempting to compensate for the offset of the line voltage measurement	1 2 3 4	Channel V-U faulted (regenerative feedback direction) Channel V-W faulted (regenerative feedback direction) Channel W-U faulted (regenerative feedback direction) Channel W-U faulted (infeed direction)	- Fault in the voltage path on the power interface module (A1681 and/or A1682 and/or A1685) or on the electronic module (CUR)
F030	**DC Bus Short** DC link short-circuit The monitor responds if the following conditions obtain for longer than 0.5 sec: - The current limit of the rectifier/regenerating unit is reached (this condition does not apply during circuit identification or during DC link forming) - The rectifier or regenerative current is greater than 10% of the rated DC current (P075) - The DC link voltage is less than 5% of 1.35*P071	-	-	- Short-circuit in the DC link
F031	**Fuse Blown** Fuse blown in a thyristor branch of the rectifier/regenerating unit or of a parallel power section.	-	-	- Thyristor branch fuse faulted
F032	**Phase Sequ.?** Wrong phase sequence A check is make to see whether the phase sequence of the rectifier bridge is the same as that of the regenerative bridge.	-	-	- Phase sequence of the rectifier bridge different from that of the regenerative bridge

Fault No.	Fault description	Fault value	Meaning	Possible causes Countermeasures
F033	**DC Bus Open** The monitor responds if the following conditions obtain for longer than 30sec in the "RUN" status: - DC link current <1% - Output voltage of the thyristor bridge oscillates severely	-	-	- Rectifier fuse defective - No inverter connected
F034	**Par PwrSectF** Fault in power sections connected in parallel At least one parallel power section is connected, has been selected with parameter P076 and reports the fault message "Current asymmetry between rectifier/regenerating unit and parallel power section".	1	Current asymmetry (overcurrent or undercurrent in the parallel power section compared with the current in the rectifier/regenerating unit) $\|I_{basic}\| - \|I_{parallel}\| > 21\ \%$ $\|I_{parallel}\| - \|I_{basic}\| > 14\ \%$ for 300 ms	- One of the thyristors is not firing - Different current ripple in the rectifier/regenerating unit and parallel power section due to different commutating reactors - Cable connection between the rectifier/regenerating unit and a parallel power section is interrupted or faulted
F035	**Ext Fault 1** External fault 1 A parameter-programmable fault input has become active.	-	-	- There is an "External fault 1" signal at the selected binary input (P575/source for "Ext. fault 1") - The line to the corresponding binary input is interrupted.
F036	**Ext Fault 2** External fault 2 Active in the "RUN" when the pre-charging time (P329) + 3s (200 ms for SW<3.0) has elapsed. A parameter-programmable fault input has been activated.	-	-	- There is an "External fault 2" signal at the selected binary input (P586/source for "Ext. fault 2") - The line to the corresponding binary input is interrupted..
F038	**Ext Fault 3** External fault 3 A parameter-programmable fault input has been activated.	-	-	- There is an "External fault 3" signal at the selected binary input (P573/source for "Ext. fault 3") - The line to the corresponding binary input is interrupted..
F041	**EEprom-Fault** Parameter range fault Software monitoring of the permissible value range of the parameters and the functionality of the EEPROM chip (permanent memory) on electronic module CUR (type: X28C64, 8192 bytes)	1	"Parameter value outside the permissible range".	- Software has been replaced - Excessive interference (e.g. by contactors without RC elements, unshielded cables, faulty shielding connections ...) - Countermeasures: Acknowledge the fault Check EMC measures Set MLFB (Section 4.3.9.2) Establish factory setting (Section 4.3.9.1) Repeat system start-up (Section 4.2.3)
		2	"EEPROM location defective"	- Hardware defect - Severe EMC noise - Countermeasures: Replace the CUR module Check EMC measures.
		3	"EEPROM fault"	- As for 1
F042	**Buffer OFlow** Internal buffer overflow Software monitoring of various software buffers.	-	-	- CUR module faulted - Excessive interference (e.g. by contactors without RC elements, unshielded cables, faulty shielding connections ...)
F047	**Int Fault** Non-permissible microprocessor status The microprocessor is monitored by internal hardware for non-permissible states	-	-	- CUR module faulted - Excessive interference (e.g. by contactors without RC elements, unshielded cables, faulty shielding connections ...)

Fault No.	Fault description	Fault value	Meaning	Possible causes Countermeasures
F048	**RAM Fault** RAM defective Software-based checking of the functionality of the RAM chips on the CUR module	-	-	- RAM defective (replace the CUR module)
F049	**Watchdog!** Watchdog timer has triggered a Reset An internal hardware counter in the microprocessor checks to see whether the program for calculating the firing pulses is executed at least about every 400 ms (on average, it is executed every 2.7 to 3.3 ms). If this is not the case, the counter triggers a Reset. F047 then appears.	-	-	- CUR module defective - Excessive interference (e.g. by contactors without RC elements, unshielded cables, faulty shielding connections)
F060	**No MLFB** P070=0	-	-	- After acknowledging in BOOTSTRAP, enter a suitable parameter value for the unit with **P070 MLFB (6SEE70..)** (only possible with the corresponding access stages of the two access parameters; see Section 4.3.9.2).
F061	**WrongPar Set** Parameter wrong or not yet set Note about fault value 4, 5: The U_d reduction is then considered to be "selected" if while the basic setting P571.i001 ≠ 0 active or while the standby setting P571.i002 ≠ 0 active, or if P323=1.	3	P141 (Rectifier Induct.), P143 (Inverter Induct.) or P144 (C of DC link) are = 0.00	- Carry out circuit identification (P052 = 21)
		4	P318 is too large (with U_d reduction selected) or P776 is set too small to facilitate constant regenerative operation with continuous DC link current for the current ratio of rectifier/regenerating supply voltage.	As the inverter step limit P776 with respect to the commutation duration (depending on u_K value of the network) has an upper limit, P318 has to be set lower, or U_d reduction has to be activated via P571if it is not currently active. The following must apply: $P318 \le \frac{U_{Supply,reg.}}{U_{Supply,rect.}} 100\% \lvert \cos P776 \rvert$ or. if operating without U_d reduction: $100\% \le \frac{U_{Supply,reg.}}{U_{Supply,rect.}} 100\% \lvert \cos P776 \rvert$
		5	P318 is too large (with U_d reduction selected) to facilitate constant regenerative operation with pulsating DC link current for the current ratio of rectifier/regenerating supply voltage.	P318 has to be set lower, or U_d reduction has to be activated via P571if it is not currently active. The following must apply: $P318 \le \frac{U_{Supply,regenerating}}{U_{Supply,rectifier}} 87{,}62\%$ or if operating without U_d reduction: $100\% \le \frac{U_{Supply,regenerating}}{U_{Supply,rectifier}} 87{,}62\%$
	Autotransformer connected incorrectly	6	$\frac{U_{Supply,regenerating}}{U_{Supply,rectifier}} < \frac{1}{1{,}1}$	
		7	P076 ≠ 0xx UND Unit is an E unit (P070 ≥ 101)	- Set P076 correctly
		8	P076 = 10x, 20x or 21x (i.e. more parallel recovery power sections are parameterized than parallel feed power sections)	- Set P076 correctly
F065	**SST1 Telegr.** USS telegram to SST1 failed Active from the first reception of a valid protocol in all operating states Following receipt of a valid telegram, no further telegrams were received for longer than the time set with parameter P687.i001	-	-	- Cable break - Fault in the USS master

Fault No.	Fault description	Fault value	Meaning	Possible causes Countermeasures
F066	**SST2 Telegr.** Peer-to-peer telegram to SST1 failed Following receipt of a valid telegram, no further telegrams were received for longer than the time set with parameter P687.i003	-	-	- Cable break
F070	**SCB Initial** SCB initialization error An error has occurred when initializing the SCB.	1 2 5 6 10	SCB not plugged in or SCB module code wrong SCB not compatible Wrong initialization data Timeout when initializing Error in the configuration channel	- Plug in the SCB - Check the SCB and/or replace it - Correct the initialization data
F072	**SCB Heartb.** SCB heartbeat SCB no longer processes the heartbeat counter.	-	-	- Replace the SCB - Check the connection between the module rack and the option module
F073	**SI1 AnaIn1** Current at analog input 1, slave 1, under 4 mA	-	-	- Check the connection between the signal source and the SCI1-module (slave 1) -X428:4, 5
F074	**SI1 AnaIn2** Current at analog input 2, slave 1, under 4 mA	-	-	- Check the connection between the signal source and the SCI1-module (slave 2) -X428:7, 8
F075	**SI1 AnaIn3** Current at analog input 3, slave 1, under 4 mA	-	-	- Check the connection between the signal source and the SCI1-module (slave 3) -X428:10, 11
F076	**SI2 AnaIn1** Current at analog input 1, slave 2, under 4 mA	-	-	- Check the connection between the signal source and the SCI1-module (slave 3) -X428:4, 5
F077	**SI2 AnaIn2** Current at analog input 2, slave 2, under 4 mA	-	-	- Check the connection between the signal source and the SCI1-module (slave 3) -X428:7, 8
F078	**SI2 AnaIn3** Current at analog input 3, slave 2, under 4 mA	-	-	- Check the connection between the signal source and the SCI1-module (slave 3) -X428:10, 11
F079	**SCB Telegr.** SCB telegram failure Following a correctly received telegram, no further telegram has been received within the time set with parameter P687.i002.	-	-	- Check connection to the SCB
F080	**TB/CB Init.** An error has occurred when initializing the module at the DPR interface.	1 2 5 6 7	TB/CB not plugged in TB/CB not compatible Error in initializing data Timeout when initializing TB/TC module code wrong	- Contact problem in connection between module rack and TB and/or CB - Slot does not agree with assignment (P090, P091) - Wrong module code r723 - Wrong module compatibility r724
F081	**TB/CB Heartb** TB/CB heartbeat error TB or CB has stopped processing the heartbeat counter.	-	-	- Contact problem in connection between module rack and TB and/or CB - Hardware fault (replace TB and/or CB)

Fault No.	Fault description	Fault value	Meaning	Possible causes Countermeasures
F082	**TB/CB Telegr** TB/CB telegram failure The exchange of data has been interrupted. P695 defines the telegram failure time	1 2 3 4 5 6 7 8 9 10 11 12 21 22	CB alarm channel faulty TB alarm channel faulty TB error channel faulty CB task channel (CB → CUR) faulty CB answer channel (CUR → CB) faulty Internal error TB task channel (TB → CUR) faulty TB answer channel (CUR → TB) faulty Internal error CB/TB Telegram failure PMU task channel (CUR → TB) faulty PMU answer channel (TB → CUR) faulty CB/TB setpoint channel faulty CB/TB actual value channel faulty	-
F090	**Circuit ID F** Circuit identification not possible	1	If generating mode is inhibited (P076 = xx1), circuit identification is not possible!	- Set P076 = x2
		2	If α = 30°, not enough rectifier current flows (less than 25% of the rated DC current with P160=150.0% or less than 10% with P160=60.0%)	- Connection to DC link interrupted
		3	P141 (Rectifier Induct.) and/or P143 (Inverter Induct.) and/or P144 (C for DC link) could not be identified	- Commutating inductance too low (see Section 3.1) - Connection to DC link interrupted
		4	A waiting time of 20s has already elapsed but the circuit identification cannot be carried out because the DC link voltage is too high (Ud>20% of 1.35*P071)	- Another unit is supplying the DC link - Wait until the DC link has discharged sufficiently, then start circuit identification again
F091	**Circuit ID C** Circuit identification or forming aborted due to external cause. If circuit identification is aborted, only those parameters are modified whose assignment was completed before this fault occurred.	1 2 3 4 5	The abort took place because the RUN or "R" status was exited for some reason (e.g. brief power outage) during forming or circuit identification. The abort took place because the reserve data set selection changed during forming or circuit identification. The abort took place because the OFF command was given. The abort took place because an ON command was not given within 20 sec after selecting the forming function (P052=20) or the circuit identification function (P052=21) The abort took place because the "Inhibit regenerating" command was given during circuit identification (see control word 1, bit 12 and P572)	-

Fault No.	Fault description	Fault value	Meaning	Possible causes Countermeasures
F103	**Thy/Grnd Flt** Fault when conducting the thyristor/ground-fault test This fault message can only occur if the thyristor/ground-fault test is activated with parameters P353 / P354. A software check is made to see whether all thyristors have blocking capability, whether they can be fired, and whether there is a ground fault Identification of the firing lines and the associated thyristors should always be made with the aid of the relevant wiring diagram (see Section 3-5 "Power terminals").	1 2 3 4 5 6	Short-circuit of thyristor V11 or V24 Short-circuit of thyristor V12 or V25 Short-circuit of thyristor V13 or V26 Short-circuit of thyristor V14 or V21 Short-circuit of thyristor V15 or V22 Short-circuit of thyristor V16 or V23	- Thyristor defective - Thyristor externally shorted (e.g. by ground fault in grounded system and ground fault in the motor) - Connection to DC link interrupted (e.g. fuse blown) Possible reasons for the thyristor being defective: - Interruption in the RC circuit - Converter and compensation control not optimized (excessive current peaks) - Cooling not guaranteed (e.g. fan not running, ambient temperature too high, to little air intake, heat sink severely contaminated) - Excessive voltage peaks in supply system
		8	Ground fault in DC link or in motor / **rectifier fuse defective**	- Ground fault - Connection to DC link interrupted (e.g. fuse blown)
		9	I = 0 - Message defective	- CUR module defect
		11 12 13 14 15 16	Thyristor cannot be fired (X11) Thyristor cannot be fired (X12) Thyristor cannot be fired (X13) Thyristor cannot be fired (X14) Thyristor cannot be fired (X15) Thyristor cannot be fired (X16)	- Firing pulse line to relevant thyristor interrupted - Ribbon cable X109 not correctly plugged in or interrupted (and ribbon cable X27 in the case of power section connected in parallel) - Defect in electronics and/or power interface module - internal interruption on the gate line in the thyristor module
		17	2 or more thyristors of the rectifier bridge cannot be fired	- Connection to DC link interrupted (e.g. fuse blown) - As under 11 to 16
		21 22 23 24 25 26	Thyristor cannot be fired (X21) Thyristor cannot be fired (X22) Thyristor cannot be fired (X23) Thyristor cannot be fired (X24) Thyristor cannot be fired (X25) Thyristor cannot be fired (X26)	- As under 11 to 16
		27	2 or more thyristors of the regenerative bridge cannot be fired	- Parameter P076 wrong - As under 11 to 16
		31 32 33 34 35 36	Thyristor cannot block (gate X11 or X21) Thyristor cannot block (gate X12 or X22) Thyristor cannot block (gate X13 or X23) Thyristor cannot block (gate X14 or X24) Thyristor cannot block (gate X15 or X25) Thyristor cannot block (gate X16 or X26)	- As under 1 to 6
F116 to F150	**Fault on the intelligent I/O module** See User's Manual of the TB module	-	-	-

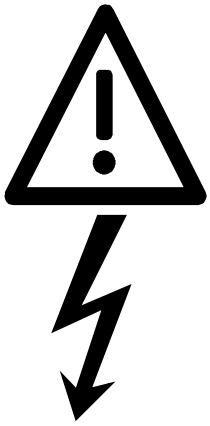
7.2 Alarm messages

The warning message appears periodically as A=Alarm/Warning and a three-digit in the display of the PMU A warning cannot be acknowledged. It extinguishes automatically when the cause of the warning is eliminated. Several messages may occur at the same time, in which case they appear one after the other in the display If the rectifier/regenerating unit is operated with the OP1S operator panel, the warning appears in the bottom line of the display. The red LED starts blinking first (see the operating instructions for the OP1S)

Alarm No.	Parameter No. ——— Bit No.	Description	Countermeasures
A015	**P953** ——— 14	**ext.Warn 1** Parameter-programmable external warning input 1 has been activated	External warning arrived! Check whether the line to the relevant binary input is interrupted. Check parameter **P588 Src No Ext Warn 1**. See also Section 4.3.2.
A016	**P953** ——— 15	**ext. Warn 2** Parameter-programmable external warning input 1 has been activated	External warning arrived! Check whether the line to the relevant binary input is interrupted. Check parameter **P589 Src No Ext Warn 2**. See also Section 4.3.2.
A022	**P954** ——— 5	**LT-Temp.** The heat sink temperature is > 90 °C or with water-cooled units: The heat sink temperature is > 118 °C	Measure inlet air and/or ambient temperature. If ϑ > 40°C, note the reduction curves. See Section 14.1. Check - whether fan -E1(-E2) is connected and rotating in the right direction. - whether the air inlet and outlet openings are clean and clear. - the connection of the temperature sensor to -X30 (-X31, -X32). With water-cooled units: - Water inlet temperature too high, cooling circuit interrupted or cooling water pump faulty
A025	**P954** ——— 8	**I^2t Warning** The I^2t value of the power section is too high. The warning is triggered when 90% of the permissible I^2t value is reached. See also under fault F022 and parameter P785. The permissible I^2t value is reached at the maximum permissible load cycle (see Section 14, Figure 14.1)	Check whether the rated DC current of the rectifier/regenerating unit is adequate for the specific application.

Alarm No.	Parameter No. —— Bit No.	Description	Countermeasures
A049	**P956** —— 0	**no Slave** In the case of serial I/O (SCB1 with SCI1/2), no slave is connected and/or the fiber optic conductor is interrupted or the slaves have no voltage.	**P660 SCI AnalogInConf** Check the slave. Check the cable.
A050	**P956** —— 1	**Slave not ok** In the case of serial I/O, the slaves required according to the parameter settings are not available (slave number an/or slave type).	Check **P660 SCI AnalogInConf**
A051	**P956** —— 2	**Peer Bdrate** In a peer-to-peer connection, the baud rate selected is too high and/pr different	Match the baud rates of the SCB modules connected to each (**P684 SST/SCB Baudrate)**
A052	**P956** —— 3	**Peer PrD-L** In a peer-to-peer connection, an excessive process data length has been set (>5).	Reduce the number of words **P686 SCom/SCB # PrDat**.
A053	**P956** —— 4	**Peer Lng f.** In a peer-to-peer connection, the process data length of the sender and receiver do not agree	Match the word lengths of the sender and receiver **P686 SCom/SCB # PrDat**
A065	**P957** —— 0	**Auto Restart** The line voltage is outside the tolerance band at the moment (e.g. power outage). The firing pulses are therefore inhibited. On power recovery, however, the WEA option (P366) implements an auto restart.	Important An auto restart may constitute a danger for persons and property. Make sure you really want to have auto restart (WEA). If necessary, change **P366 WEA**.
A081.. **A096**	**r958** —— 0...15	**CB Warning 1...16** See user's manual for the CB module	
A097.. **A112**	**r959** —— 0...15	**TB Warning 1 16** See user's manual for the TB module	
A113.. **A128**	**r960** —— 0...15	**TB Warning 17...32** See user's manual for the TB module	

8 Maintenance



WARNING
The rectifier/regenerating units are operated with high voltages. All work on the unit must be carried out in agreement with the national electrical regulations (in Germany: VBG 4). Maintenance and repair work must only be carried out by qualified personnel.
Use must only be made of the spare parts approved by the manufacturer. It is imperative to observe the prescribed maintenance intervals and the repair and replacement instructions. As the result of the dc link capacitors in the connected SIMOVERT Master Drives, the unit still contains a hazardous voltage up to 5 min. after isolation (power terminal and electronic power supply). This is why it is only permitted to open the unit after observing an appropriate waiting time. Even after isolation of the cable terminals and discharge of the DC link, the snubber capacitors remain charged if the trigger modules A23 are separated. The power and control terminals may still be live even in the event of motor standstill. Despite disconnecting the power terminals from the supply, terminal X19 may still be live due to the external fan supply.
If work on the activated unit is necessary: ♦ do not touch any live parts. ♦ use only proper measuring equipment and protective work clothing. ♦ stand or sit on an unearthed and isolated surface that does justice to ESD requirements. Non-observance of warning notices can result in death, severe personal injury or considerable property damage.

You should know the order and factory numbers of your unit when consulting the service department. You will find these numbers and other important data on the rating plate of the unit.

8.1 Maintenance recommendations

The fans are designed for a service life of 35,000 hours (Size C) and 40,000 hours (Size E, H and K) at an ambient temperature of T_A = 40 °C. To guarantee the availability of the unit at all times, the fans must be replaced in good time.

8.2 Replacing components

8.2.1 Replacing the fan

	WARNING
	The fan must only be replaced by qualified personnel. Because of the DC link and snubber capacitors in the connected inverters, a hazardous voltage is present for another 5 min after isolation. Non-observance of warning notices can result in death, severe personal injury or considerable property damage.

Size C

The fan is located on the underside of the unit

- Undo both M4 x 49 Torx screws
- Remove the protective grille
- Pull the fan down and extract the connector X20
- Install a new fan in reverse order
- Before commissioning the unit, check that the fan does not rub and also check the air flow direction (arrow pointing upward). The air must be discharged from the unit in the upward direction.

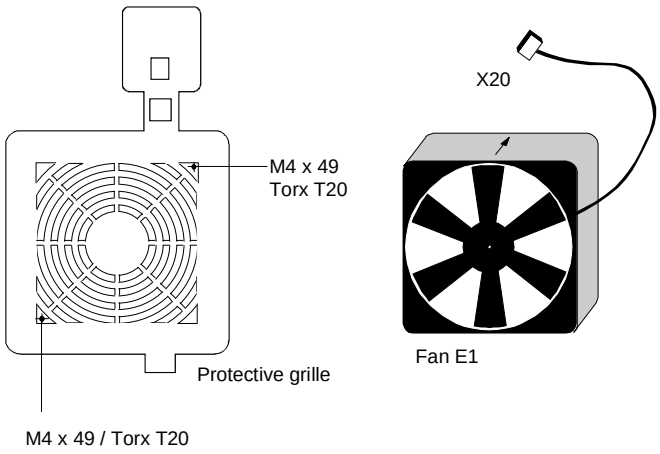


Figure 8.1 Protective grille and fan (24 V) for size C

Size E

The fan is located on the right underside of the unit.

- Undo the M4 x 8/T20 Torx screw securing the fan
- Extract the plug-in terminal X29
- Undo the M4 x 8/T20 Torx screw for earth connection
- Pull the fan out of the unit towards the front left
- Install a new fan in reverse order
- Before commissioning the unit, check that the fan does not rub and also check the air flow direction. The air must be discharged from the unit in the upward direction.

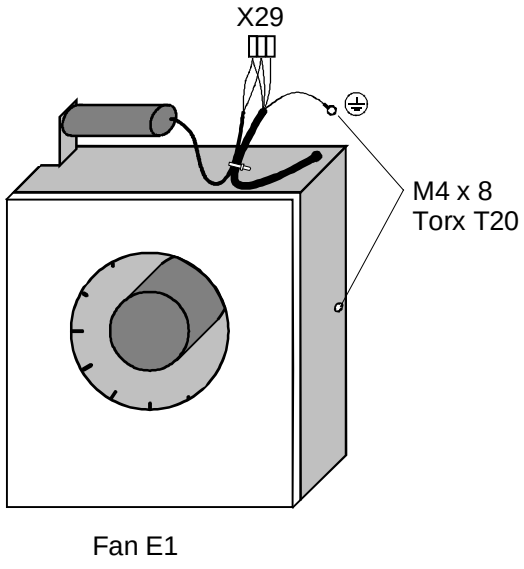


Figure 8.2 Fan (AC 230V) for size E

Size H

The fan is located in the fan box on the top of the unit.

- Unplug X20.
- Undo both M8 (SW 13) fixing screws.
- Loosen the two M4 fixing screws and swing the plastic cover out sideways..
- Pull the fan box out of the unit forwards as far as the stop.
- Then lift it up over the stop (at the back) and remove it completely from the unit.
- Installation is carried out in reverse order.
  Important!
  The two M8 fixing screws are used to earth the fan box, so they must be screwed down firmly.

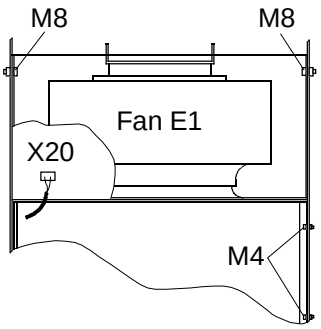


Figure 8.3 Fan (AC 230V) for size H

Size K

The two fans are located in the fan box on the top of the unit.

- Unplug X20.
- Undo both M8 (SW 13) fixing screws.
- Pull the fan box out of the unit forwards.
- Installation is carried out in reverse order.

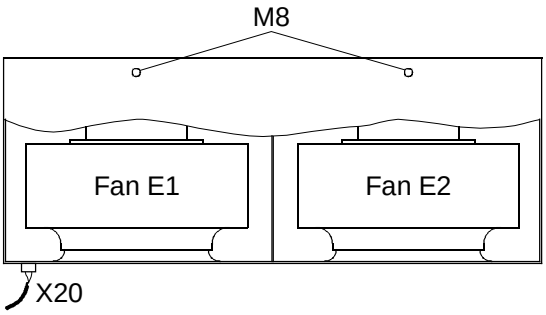


Figure 8.4 Fan (AC 230V) for size K

WARNING

The fan box weighs approx. 16 kg for size H, and approx. 32 kg for size K. This must be taken into account when removing the fan box.

Non-observance of warning notices can result in severe personal injury or considerable property damage.

8.2.2 Replacing modules

	WARNING
	Modules must only be replaced by qualified persons. Modules must not be removed or inserted under a live voltage. Non-observance of warning notices can result in death, severe personal injury or considerable property damage.

	CAUTION
	The modules contain electrostatically sensitive devices. You must discharge your own body before touching an electronic module. This is best done by touching a conductive earthed object (e.g. a bare metal part of the control cabinet) directly beforehand.

Replacing modules in the electronics box (option)

- Undo the securing screws of the modules above and below the insertion /removal aids
- By means of the insertion /removal aids, carefully pull the module out of the electronics box, making sure that the module does not get stuck
- Carefully insert the new module in the guide rails until it moves no further in the electronics box
- Firmly screw down the module with the securing screws above and below the insertion / removal aids.

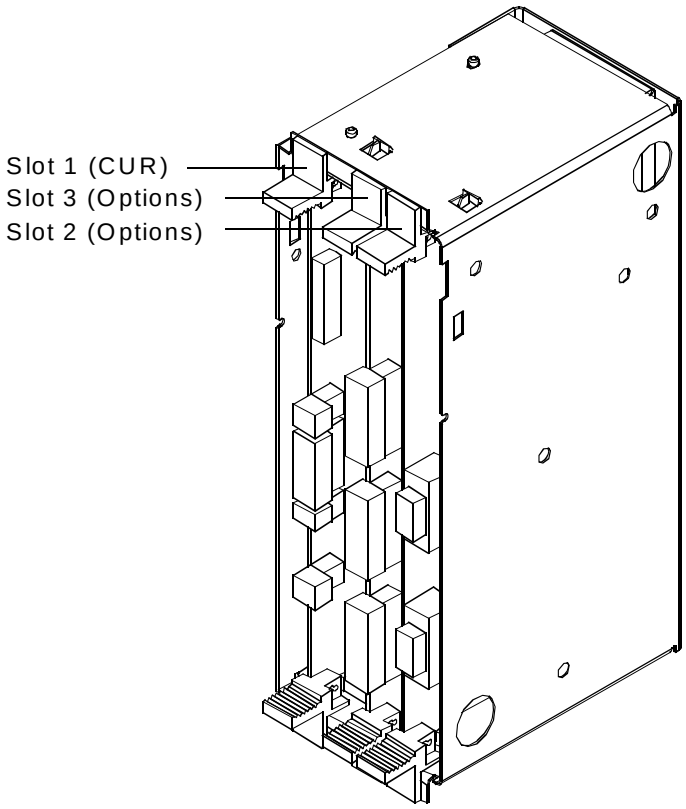
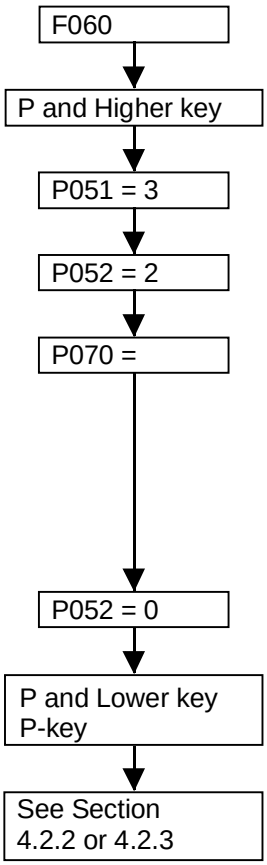


Figure 8.5 Electronics box, equipped with CUR (slot 1) and options (slots 2 and 3)

NOTE	
When replaced under MLFB 6SE7090-0XX85-1DA0, the PCB electronics CUR (C98043-A1680) is supplied programmed without EPROM (software). The EPROM programmed (last state) must be ordered separately, as must the operating instructions for a new software version. Example of replacement part ordering of a CUR with accessories:	
PCB electronics (CUR)	6SE7090-0XX85-1DA0
EPROM programmed	6SW1701-0DA14
Operating instructions rectifier/regenerating Unit unit e.g. English	6SE7087-6AK85-1AA0

Assigning the "Start-up" parameters for the CUR option module (A10)

For general information see Chapter 4



Switch over from fault display to parameterization

Access stage "**Expert mode“**

MLFB setting (initialization)

	WARNING
	Initialization is mandatory. Specify the ID number of the MLFB in P070 of the rectifier/regenerating unit (rating plate on the unit) as per MLFB table Section 4.3.9.2.

Return from setting MLFB

Change back to fault display and acknowledge F060

	WARNING
	Replacing firing-circuit module A23 Carry out circuit identification after replacing the A23 (see Chapter 4). Sizes H and K The earth connection must be restored by tightening the screws marked with an earthing sign on the electronics box (size H) or on the electronics slide-in unit (size K).

Replacing the PMU for size C

- Release the snaps on the front cover
- Open-up the front cover
- Withdraw connector X108 on the CUR
- Carefully depress the latch upwards on the inner side of the front cover using a screwdriver
- Remove the PMU board
- Install the new PMU board in the inverse sequence.

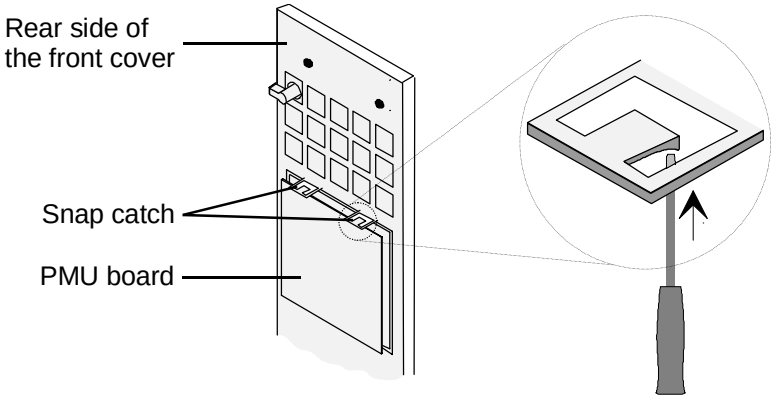
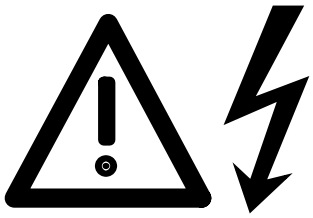


Figure 8.6 Rear side of the front cover with PMU board

Replacing the EPROM on the CUR module (upgrading to a new software version)

On setup and during servicing work, the current parameter settings in the logbook in Chapter 12 should be saved For information on reading out the parameters changed from the factory settings easily, see Section 4.3.9.3 (saving the parameter values using DriveMonitor) and Section 4.3.9.8 (displaying modified parameters). It should be checked that these entries are up-to-date before the EPROM is replaced because when the electronics supply voltage is switched on again, the function "generate factory settings" is carried out automatically (see Section 4.3.9.1). Then only the values of parameters P070 and P077 are retained.



WARNING

The EPROM must only be replaced by qualified persons. The EPROM must not be removed or inserted under a live voltage.
Non-observance of warning notices can result in death, severe personal injury or considerable property damage.

The EPROM is located in slot D14 of module CUR.

CAUTION

The modules contain electrostatically sensitive devices. You must discharge your own body before touching an electronic module. This is best done by touching a conductive earthed object (e.g. a bare metal part of the control cabinet) directly beforehand.

Procedure for replacing EPROMs:

- Switch off electronics supply voltage
- Undo fixing screws for module CUR above and below the insertion/removal aids.
- Remove the module from the electronics box carefully with the help of the insertion/removal aids.
- Remove old EPROM carefully from the socket and replace it with a new EPROM. It is important to ensure that the EPROM is mounted the right way round (pin 1 aligned correctly) and that pins are not bent.
- Slide module into the electronics box carefully in the guide rails as far as the stop.
- Screw the module into place again using the fixing screws.
- After switching the electronics supply voltage on again, wait until the function "generate factory setting" is complete. Then restore the parameter values in accordance with the logbook or reload the values saved using DriveMonitor into the unit.
- If the parameters are restored in accordance with the logbook, circuit identification (see Section 4.3.9.7) must be carried out (due to special parameter P772).

8.2.3 Replacing thyristor modules with sizes C and E

The thyristor modules are secured with self-tapping screws. When replacing the thyristor modules, it is imperative to use original-length screws with locking elements to secure them.
Also use original-length screws when screwing the thyristor modules to the busbars.

8.2.4 Power interface module spare parts

Load resistors (sizes C to K):

NOTE
Replacement modules are supplied without load resistors (e.g. take them over from the original module)!
No liability will be accepted for damage caused by the installation of incorrect load resistors.
If the load resistors (R75 to R78) are not installed, the converter will be destroyed.

Dimensioning of the load resistors:

I_{dav} [A] Rating plate	R75 R76 [Ω]	R77 R78 [Ω]	R79 R80 [Ω]
Voltage class 480V			
21	150	270	-
41	51	1300	-
86	43	51	-
173	15	51	-
222	10	91	-
310	10	18	-
375	8.2	15	-
463	12	910	6.8
605	10	18	6.8
821	4.7	10	10
1023	4.7	4.7	12
1333	18	12	12
1780	8.2	11	12

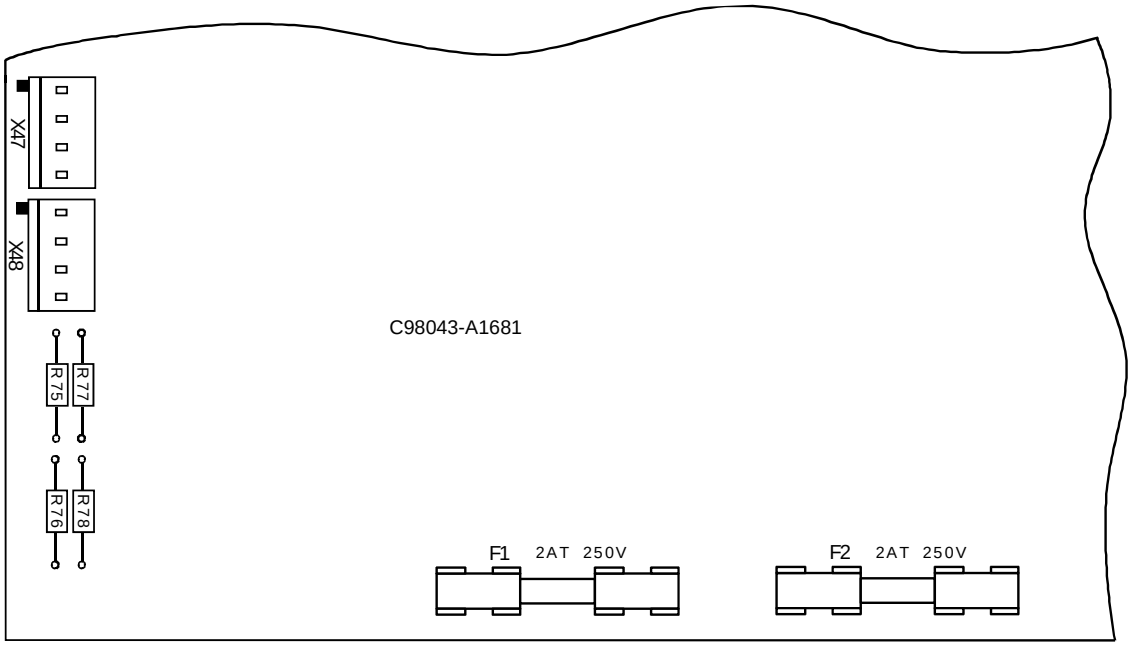
I_{dav} [A] Rating plate	R75 R76 [Ω]	R77 R78 [Ω]	R79 R80 [Ω]
Voltage class 600V			
27	75	27000	-
41	51	1300	-
72	36	120	-
94	39	47	-
151	22	33	-
235	16	18	-
270	11	22	-
354	10	13	-
420	18	130	6.8
536	12	27	6.8
774	4.7	11	12
1023	4.7	4.7	12
1285	10	33	12
1464	12	12	13
1880	8.2	10	11
Voltage class 690V			
140	27	30	-
222	10	91	-
270	11	22	-
420	18	130	6.8
536	12	27	6.8
774	4.7	11	12
1023	4.7	4.7	12
1285	10	33	12
1464	12	12	13
1880	8.2	10	11

Resistors of **series** W97041.. **tolerance:** 0.50% for $R \leq 10\Omega$
0.25% for $10\Omega < R < 47\Omega$ R_{79} and R_{80} not envisaged on A1681 .
0.10% for $R \geq 47\Omega$

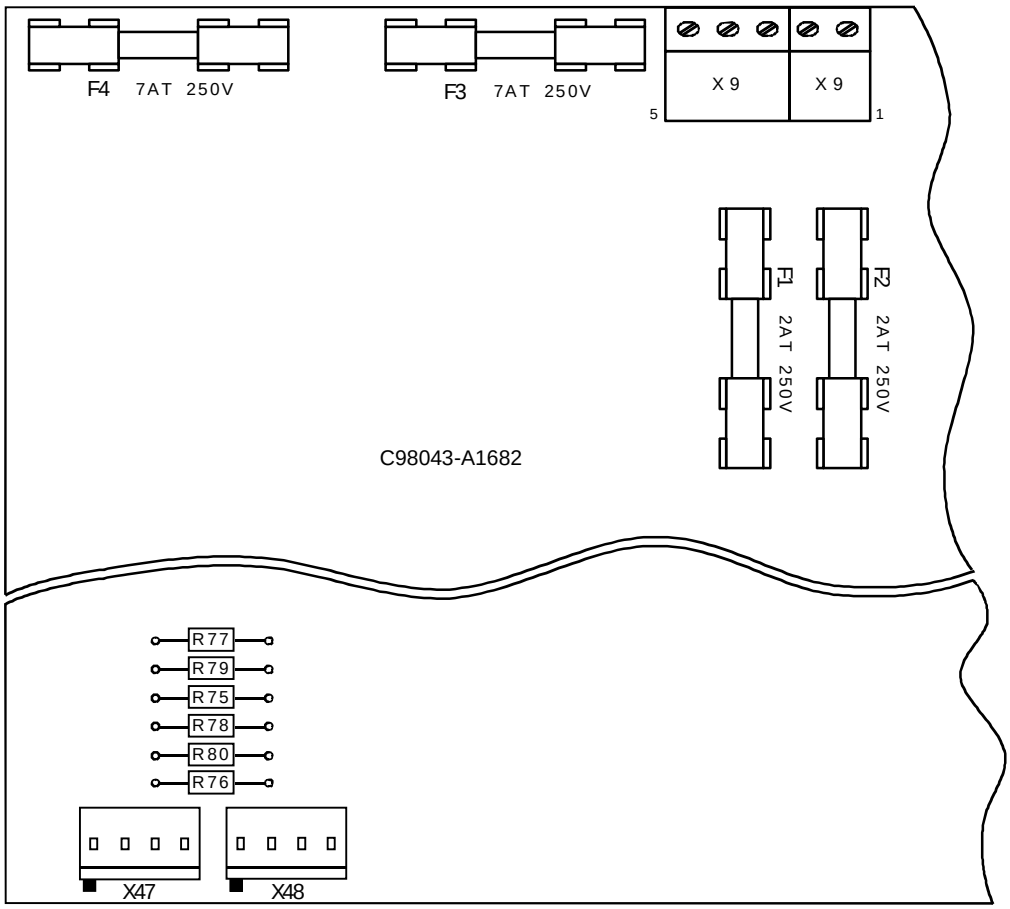
The load resistance setpoint refers to the DC link current I_{dav} stated on the rating plate.

Position of the load resistors:

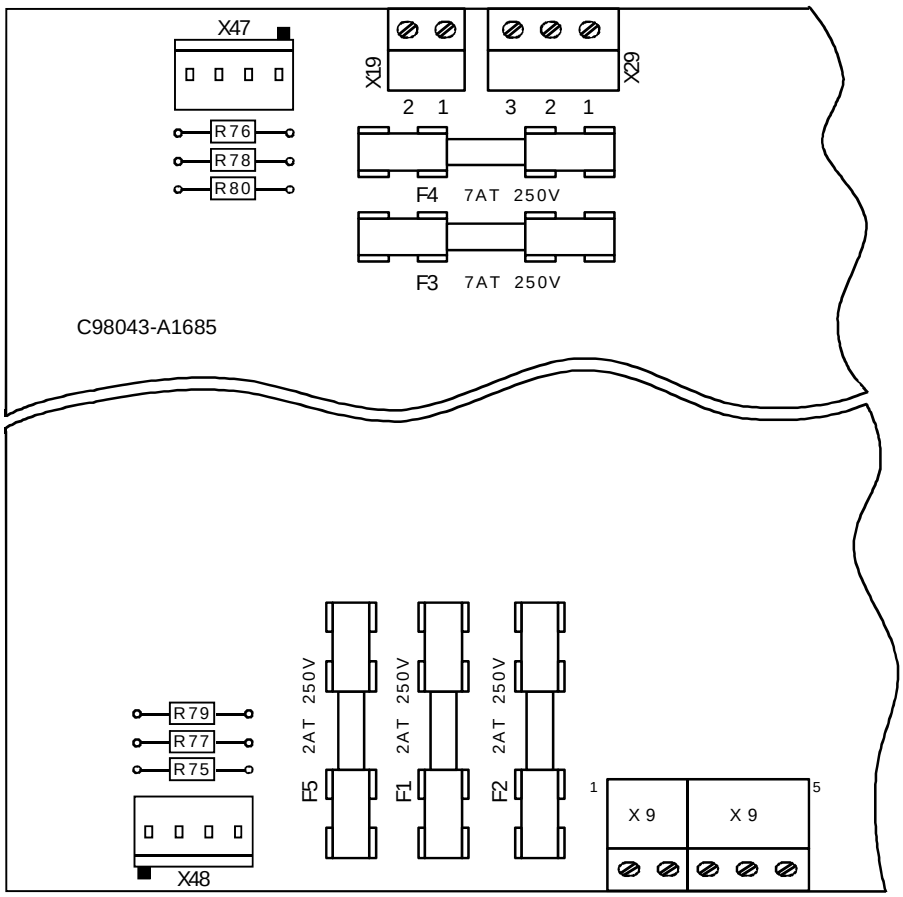
Size C



Size E:

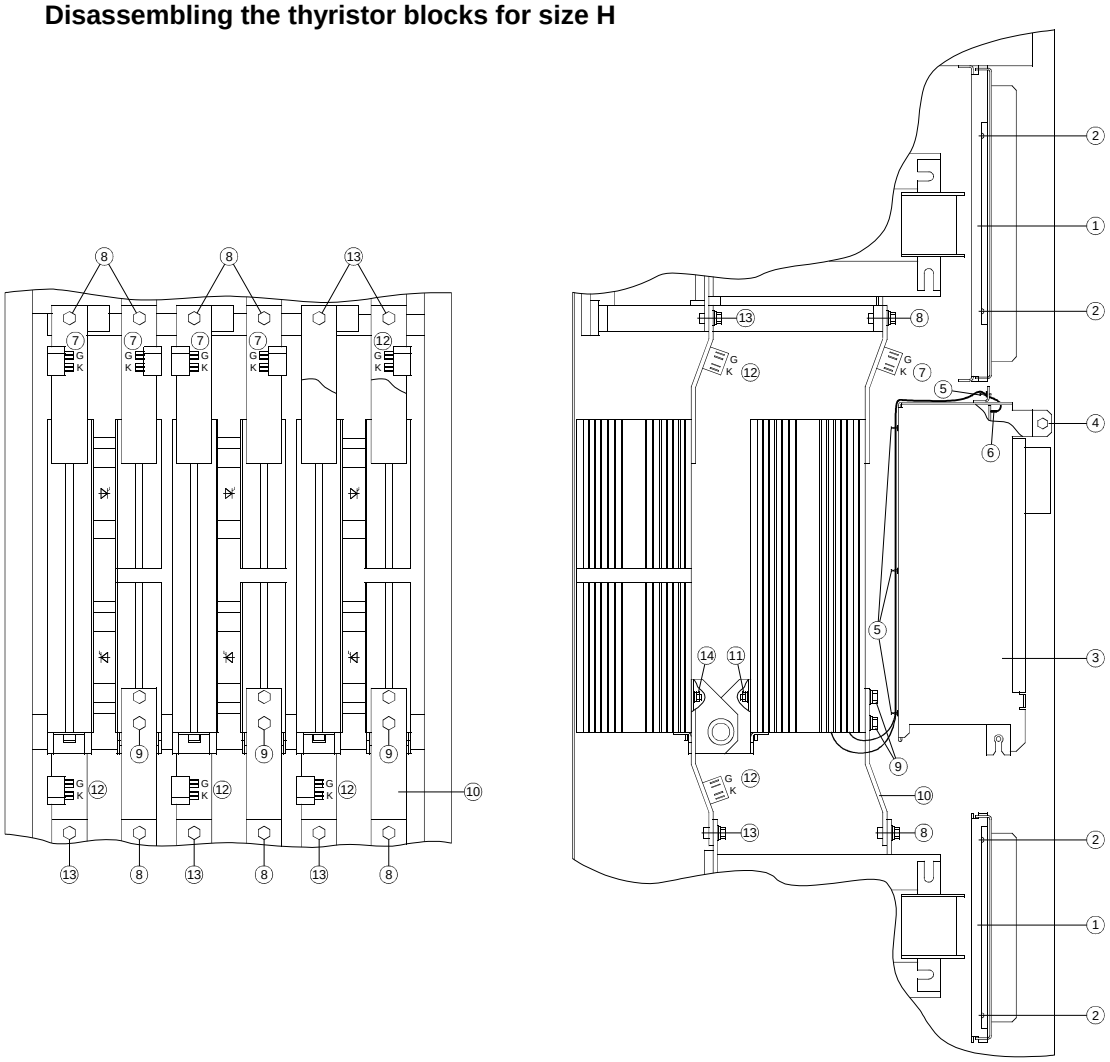


Sizes H and K:


X47
X19
X29
2 1
3 2 1
R76
R78
R80
F4 7AT 250V
F3 7AT 250V
C98043-A1685
R79
R77
R75
X48
F5 2AT 250V
F1 2AT 250V
F2 2AT 250V
1
5
X 9
X 9

8.2.5 Replacing thyristor blocks

8.2.5.1 Disassembling the thyristor blocks for size H



Front thyristor block, level A (weight of a thyristor block, approx. 9.5 kg)

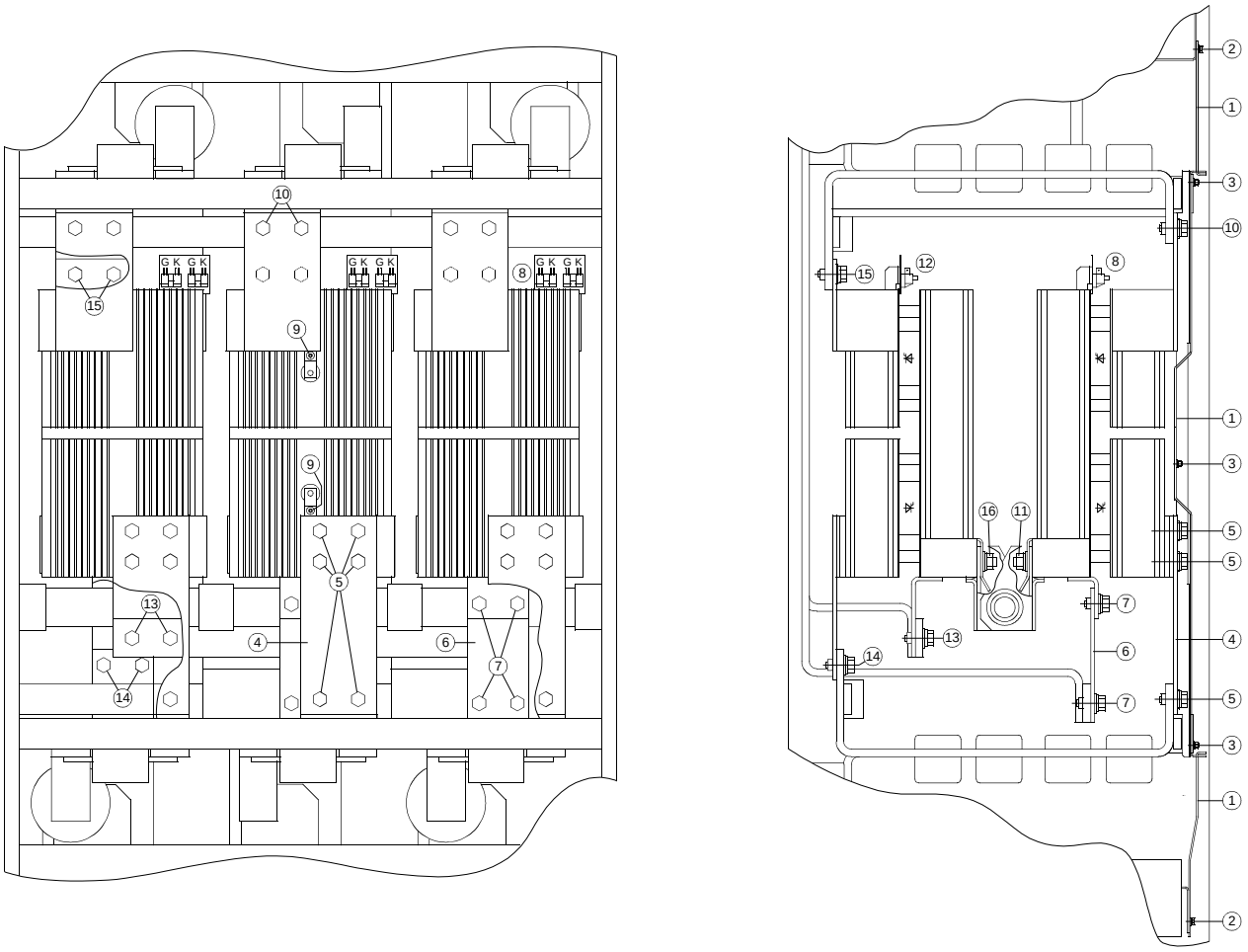
- Swing out the two doors ① by removing two M4 slit Torx screws ② in each case.
- Detach cable ③ from the modules and the screen fixture.
- Remove 2 M6 hexagon-head bolts ④ and swing out electronics box as far as the stop.
- Only on disassembling the central thyristor block, open 4 twisted cables ⑤ and detach cable ⑥ for the two thermistors that are only located on the central thyristor block.
- Unplug the gate and cathode cables (G, K) ⑦.
- Remove 3 M8 hexagon-head bolts ⑧
- Loosen the two M8 hexagon-head screws ⑨, push rail ⑩ approx. 150 mm upwards and swing the thyristor block out forwards.
- Loosen M6 nut ⑪ and pull the thyristor block out upwards at an angle.

Rear thyristor block, level B (weight of a thyristor block, approx. 9.5 kg)

- Unplug the gate and cathode cables(G, K) ⑫ .
- Remove 3 M8 hexagon-head bolts ⑬ .
- Loosen M6 nut ⑭ and pull the thyristor block out upwards at an angle.

The thyristor blocks are installed in the reverse order.

8.2.5.2 Disassembling the thyristor blocks for size K



Front thyristor block, level A (weight of a thyristor block, approx. 25 kg)

- Remove the 3 covers ① by removing 7 M4 hexagon-head bolts ② and 3 M4 nuts ③.
- Remove the copper plate ④ by removing 6 M10 hexagon-head bolts ⑤.
- Remove the copper plate ⑥ by removing 4 M10 hexagon-head bolts ⑦.
- Unplug the gate and cathode cables ⑧ (G, K).
- Only on disassembling the central thyristor block, remove the two thermistors that are only located on the central thyristor block by removing the screws ⑨ (Torx drive T25).
- Loosen the two M10 hexagon-head screws ⑩ and swing the thyristor block out forwards.
- Loosen M10 nut ⑪ and pull the thyristor block out upwards at an angle.

Rear thyristor block, level B (weight of a thyristor block, approx. 25 kg)

- Unplug gate and cathode cables (G, K) ⑫.
- Remove 2 M10 hexagon-head screws ⑬.
- Remove 2 M10 hexagon-head screws ⑭.
- Remove 2 M10 hexagon-head screws ⑮.
- Loosen M10 nut ⑯ , swing the thyristor block out forwards and pull the thyristor block out upwards at an angle.

The thyristor blocks are installed in the reverse order.

9 Options

9.1 Options which can be integrated into the electronics box

One or two option boards, listed in Table 9.1, can be inserted in the electronics box using the LBA option (Local Bus Adapter, backplane wiring).

For use of modules CBC and CBP2, an ADB (adapter board) is required in addition to the LBA. These modules must be plugged into an ADB because of their smaller mechanical dimensions before they can be plugged into an electronics box.

Desig-nation	Description	Codes	Order No.
LBA	Local bus adapter for the electronics box LBA is always needed to install supplementary boards	K11	6SE7090-0XX84-4HA0
ADB	Adapter board ADB is always needed to install CBC, CBP, EB1, EB2, SBP and SLB boards	K01, K02	6SX7010-0KA00
CBC	Communications board with interface for CAN protocol (miniature-format board; ADB required)		6SX7010-0FG00
CBP2	Communications board with interface for SINEC- L2-DP (PROFIBUS) (miniature-format board; ADB required)	G94, G95 G96, G97	6SX7010-0FF05
SCB1	Serial communications board with fiber-optic cable for serial I/O system and peer-to-peer connection		6SE7090-0XX84-0BC0
	Description		6SE7080-0CX84-0BC0
SCB2	Serial communications board for peer-to-peer connection and USS protocol via RS485		6SE7090-0XX84-0BB0
	Description		6SE7080-0CX84-0BB0
	Use of the serial interface with USS protocol		6SE7087-6CX87-4KB0
T100	Module incl. hardware operating instructions without software module		6SE7090-0XX87-0BB0
	Hardware operating instructions for T100		6SE7080-0CX87-0BB0
MS100	MS100 "Universal Drive“ software module for T100 (EPROM) without manual		6SE7098-0XX84-0BB0
	Manual for MS100 "Universal Drive" software module		
	German		6SE7080-0CX84-0BB1
	English		6SE7087-6CX84-0BB1
	French		6SE7087-7CX84-0BB1
	Spanish		6SE7087-8CX84-0BB1
	Italian		6SE7087-2CX84-0BB1
T300	Technology board with 2 connecting leads, SC58 and SC60, terminal block SE300 and hardware operating instructions		6SE7090-0XX87-4AH0
T400	Technology board (incl. short description)		6DD1606-0AD0
	Hardware and configuring manual		6DD1903-0EA0

Table 9.1 Option boards and bus adapter

Codes:

The last figure in the order code identifies the module location or slot of the electronic box (see below):

1 . . . Board location 2
2 . . . Board location 3
4 . . . Slot D
5 . . . Slot E
6 . . . Slot F
7 . . . Slot G

The following additional modules can be supplied under two order numbers

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

Board	Order number of board (w/o accessories)	Order number of retrofit kit
ADB	6SE7090-0XX84-0KA0	6SE7010-0KA00
CBC	6SE7090-0XX84-0FG0	6SE7010-0FG00
CBP2	6SE7090-0XX84-0FF5	6SE7010-0FF05

Slots in the electronics box		Boards
Left	Slot 1 (CUR)	CUR
Center	Slot 3 (options)	SCB1 / SCB2 / CBC (with ADB) / CBP2 (with ADB)
Right	Slots 2 (options)	CBC (with ADB) / CBP2 (with ADB) / SCB1 / SCB2 / T100 / T300 / T400

NOTE

Only one of each option board type may inserted in the electronics box.

TB (technology boards, e.g. T400) must always be inserted at slot 2.

If only one option board is used it must always be inserted at slot 2.

Small format modules (CBP and CBC) must be plugged in on the adapter board on the right or below (in Slot E or if a technology module is also used in Slot G).

Use of Slots D and F on adapter boards is not possible because the module plugged in there is not detected by the basic device.

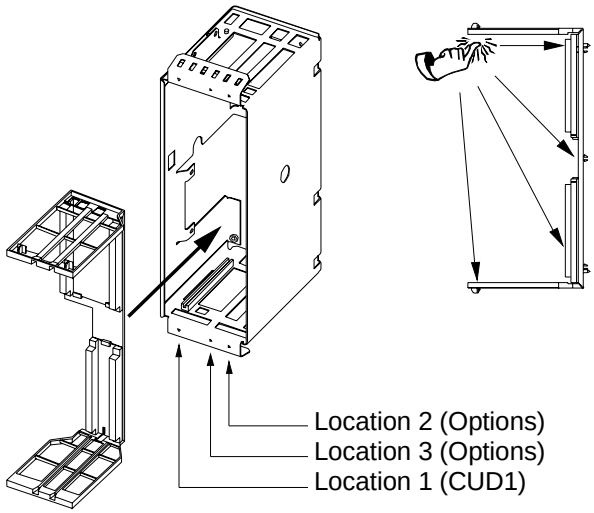
Table 9.2 Slots in the electronics box

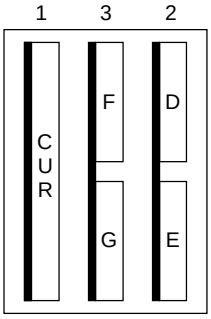
Local bus adapter (LBA) for mounting optional supplementary boards

Optional supplementary boards can be installed only in conjunction with the LBA option. If an LBA is not already fitted in the SIMOVERT 6SE70, 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 CUR 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 CUR board in left-hand board location again and tighten fixing screws in handles.





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

Current input of DC 24V power supply (X9):

The figures are required in addition to the 1A consumed by the basic unit.

Boards	**Current drain** (mA) 24V DC supply
CBC	100
CBP2	130
SCB1	50
SCB2	150
T100	550
T300 without tacho	620
T400 without tacho and terminal wiring	400

Table 9.3 Current drain of the option boards

9.2 Interface boards

The boards listed in the following table must be installed externally and connected to the installation side (for start-up, see Section 4.4.4 “Procedure for commissioning the serial I/O board SCB1” and the description of the board).

Desig-nation	**Description**	**Order No.**	
SCI1	Serial I/O board (only in conjunction with SCB1). Analog and binary input and outputs for coupling to the SCB1 via fiber-optic cable	Board description	6SE7090-0XX84-3EA0 6SE7080-0CX84-0BC0
SCI2	Serial I/O board (only in conjunction with SCB1) Binary inputs and outputs for coupling to the SCB1 via fiber-optic cable.	Board description	6SE7090-0XX84-3EF0 6SE7080-0CX84-0BC0

Table 9.4 Interface boards

9.3 Power Supply

A SITOP power supply as described in Catalog KT10 is recommended for the rectifier/regenerating unit (connector X9).

9.4 Operator control panel OP1S

Option	Description
OP1S	User-friendly operator control panel with plain text display Order No.: 6SE7090-0XX84-2FK0

Table 9.5 Operator control options

The optional comfort version of the operator panel with a plaintext display is plugged into the position in the device door intended for that purpose.

It is thus connected to the serial basic device interface SST1.

If the UP or DOWN keys of the OP1S is used to select adjacent parameter numbers, the missing numbers are skipped in the range of the basic device parameters.

With parameters of a technology module, this automatic skipping of missing numbers is not possible. In that case, the numbers of the existing parameters must be entered directly.

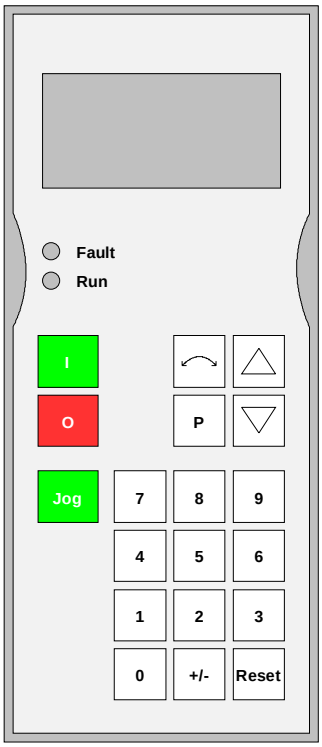


Figure 9.1 OP1S

The OP1S provides the option of selecting parameters directly by entering their number on the keyboard. The following applies:

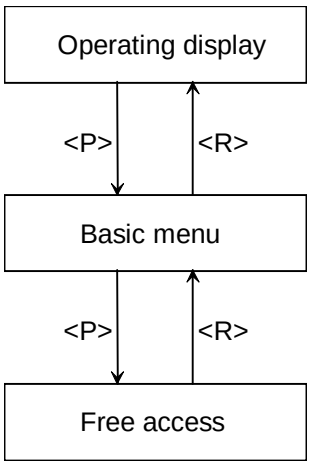
	Displayed number	Number to be entered on the OP1S
Basic device parameter	**r**xxx, **P**xxx	(0)xxx
Parameter of a technology module	**H**xxx, **d**xxx	**1**xxx

A few seconds after initialization of the OP1S, the display automatically switches to the **operating display**.

From the operating display, you can enter the **basic menu** by pressing the <P> key. Here either "free access" to all parameters or different functions can be selected. Details of the functions can be found in the OP1S operating instructions.

In the state "f**ree access**", parameterization of the device is possible.

If you press the <R> key (several times if necessary), you can return to the operating display.



With SIMOVERT 6SE70 the following values are displayed on the operating display:

1st line		DC link current actual value r035 [%]	DC link voltage r006 [V]	Bus addr.
2nd line	#	DC link voltage actual value r037 [%]		
3rd line	*	DC link voltage setpoint r036 [%]		
4th line		Operating state r001		

The following parameters affect the function of the OP1S or of the interface SST1:
P050 (language selection), P051 (access level), P053 (parameterization enable), P054 (OP backlighting), P683 to P687 (interface settings)

Control bits of the operator panel OP1S:

(See also the operating instructions for the OP1S)

Communication between the OP1S and the SIMOVERT device is performed via the interface G-SST1 (RS485) using the GPI protocol.

By pressing the appropriate key on the OP1S, it is possible to execute functions. The OP1S sets the appropriate control word bit in PZD word 1 by means of transmission by the GPI protocol. (For details of the control word bits, see Chapter 4.3.1.1)

For activation of the required function, parameterization as shown in the table below is required.

Key on OP1S	Function	Bit in PZD word 1	Activation by
On/off key (I / 0)	ON / OFF1	Bit 0	P554 = 2001
Reset	Acknowledgment *)	Bit 7	P565, P566, or P567 = 2001
Jog	Jogging	Bit 8	P568 = 2001
Reversal	U_d reduction	Bit 11	P571 = 2001
	Regenerative feedback enable	Bit 12	P572 = 2001

*) Acknowledgment of the fault messages using the <Reset> key of the OP1S is only possible in the operating display, i.e. the operating display must first have been selected by pressing the <Reset> key (several times). Independently of that, acknowledgment is always possible by pressing the <P> key on the PMU.

NOTE
The predecessor of the OP1S (the OP1) cannot be used with software version V4.0 and higher because of its differing coupling mechanisms! The OP1S, however, is a suitable replacement for the OP1 if used with older device software.

9.5 Mechanical design

Option	Description
Busbar option Size E	For interconnecting the rectifier and regenerative bridges in operation without autotransformer (see Chapter 2, Figure 2.6)
Front door, bottom and cover plates, and PC covers for Size E	Increases degree of protection to IP20
EMC screened housing	For screened cables

Table 9.6 Mechanical options

9.6 RS485 interface (PTP1)

The SST2 serial interface for the basic unit is not available until submodule A2 (C98043-A1690-L1) has been plugged into the CUR electronics module (A10).

With the parameterization P688=1, the peer-to-peer transmission protocol is implemented on SST2.

The RS485 interface cable required for peer-to-peer coupling to a second unit is described in Section 3.8.7.

9.6.1 Order designation

Three different versions of this module (short designation PTP1, item number C98043-A1690-L1, equipment identifier A2) can be ordered. The order numbers (MLFB) for these versions are:

1. Module PTP1 with two spacers (1 module) MLFB: 6SE7090-0XX85-1NA0

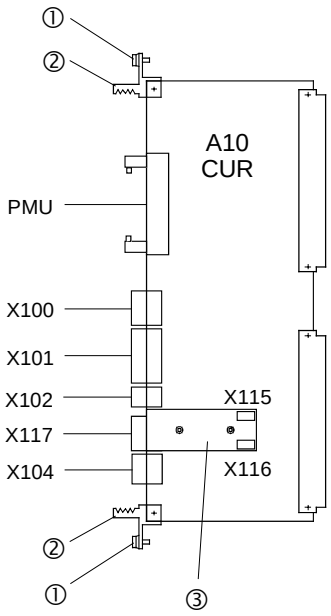
2. Standard package for 12-pulse mode (2 PTP1 modules with two spacers for each of two units) MLFB: 6SE7090-0XX85-1TA0

3. Retrofitting package for 12-pulse mode (2 PTP1 modules with two spacers, 2 CUR control electronics modules and two EPROMs with up-to-date software for two units) MLFB: 6SE7090-0XX85-1TB0

Versions 1 and 2 require a CUR control electronics module of hardware version 06 or higher (indicated on the fourth number block of the item number on the module: C98043-A1680-L1-06, C98043-A1680-L1-07, ...) and software version 3.0 or higher (see the label on the EPROM, fourth number block must be 30 or higher: V98113-A1800-A001-30, V98113-A1800-A001-31, ... The software version can also be read from parameter r720.01. The contents must be 3.0 or greater).

9.6.2 Installation

- Undo the fixing screws ① of the CUR (A10) above and below the removal handles ②.
- Remove the module carefully from the electronics box using the handles ②.
- Versions 1 and 2: Module PTP1 is a submodule ③ of the CUR. The PTP1 is fitted to the electronics module using the preassembled spacers. The female rods X115 and X116 must be fitted onto the corresponding male pins on the CUR.
- Version 3: The PTP1 and EPROM are already fitted to the CUR.
- Slide CUR module (A10) with PTP1 (A2) into the electronics box carefully along the guide rails as far as the stop.
- Screw the module into position with the fixing screws ① above and below the removal handles ②.



9.6.3 Function and terminal description

See circuit diagram in Section 3.5 "Single-line diagrams with suggested circuit arrangements".

Function	Terminal	Connected values / Description
RS485 serial interface (SST2)	X117-1	RS485R + receive cable RS485 positive
	X117-2	RS485R - receive cable RS485 negative
	X117-3	RS485T+ send cable RS485 positive
	X117-4	RS485T- send cable RS485 negative
	X117-5	Signal earth

The bus termination resistors required for peer-to-peer mode are installed on the module:

- 150Ω between terminal X117-1 and terminal X117-2
- 390Ω from terminal X117-1 to +5V supply
- 390Ω from terminal X117-2 to ground

9.6.4 Parameterization

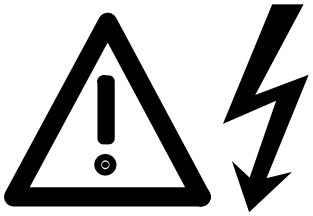
The following parameters influence the function of the SST2 interface for the basic unit (for details see Section 5.12):

P681 (i001 to i005)	Selection of process data for transmission
P684.i003	Baudrate
P686.i003	Number of net data words for peer-to-peer link
P687.i003	Telegram failure time
P688	Selection of the protocol

Parameterization for "12-pulse mode" see Section 3.8.3.

9.7 DriveMonitor

The DriveMonitor software tool is provided for commissioning, parameterizing and diagnosing the rectifier/regenerating unit via a PC.



WARNING

Only qualified personnel who are familiar with the DriveMonitor operating instructions and with the operating instructions of the connected devices and their safety instructions are permitted to intervene at the drive using the PC.

Incorrect use of the software can result in death, severe personal injury or considerable property damage.

DriveMonitor is supplied on the same CD-ROM as the operating instructions for the 6SE70 converter used in conjunction with the rectifier/regenerating unit.

Order-No.: 6SX7010-0FA10

9.7.1 Installing the software

You can find a brief overview of the CD contents in START.HTM. If you have installed an HTML browser (e.g. Internet Explorer or Netscape Navigator) on your PC, you can open the overview by double clicking on START.HTM. If you do not have an HTML browser, you can find similar information in text format in file README.TXT.

After you have chosen an installation language by selecting links DriveMonitor – Installation of DriveMonitor- Start Installation, you can call the DriveMonitor installation routine.

Some Internet Browsers are not capable of starting programs directly. If this is the case on your PC, a "Setup.exe - Save as" dialog appears after you select Start Installation.

You can then start the Setup program manually in sub-catalog

DriveMonitor\setup\setup.exe

Then follow the instructions displayed by the installation routine.

The default installation path for DriveMonitor is C:\DriveMon\P7VRVISX\System. A "DriveMonitor" icon is also placed on your desktop.

9.7.2 Connection of rectifier/regenerating unit to a PC

The DriveMonitor software on the PC and the rectifier/regenerating unit are connected via the serial interface (X300 on the PMU or X100 on the CUR board) and the USS protocol

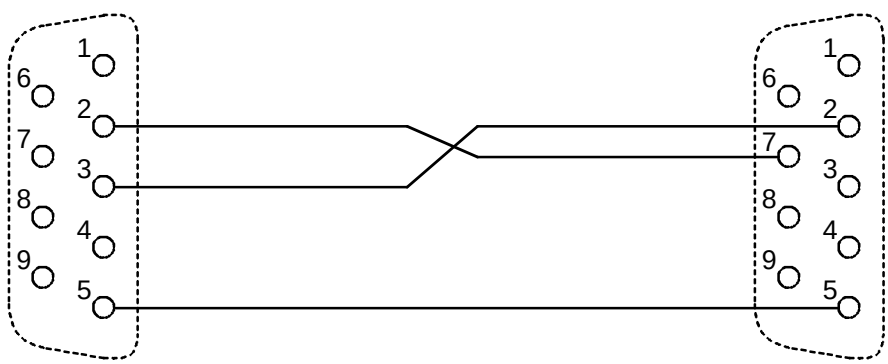
NOTE

Communication can be effected either via the terminal strip of the CUR-X100 (RS485 interface) or the interface connector of the PMU-X300 (9-way SUB D connector, RS485-/RS232 interface).

It is only possible to operate one of the two possible connections (X100 or X300)!

X100 is only implemented as an RS485 interface.
On hardware version 07 and higher of the electronics board (C98043-A1680-L1-07), X300 is implemented as a combined RS485/RS232 interface. This makes it possible to establish the connection between the X300 and the serial interface on the PC (COM1 or COM2) also using the RS232 .
Up to hardware version 06 and higher, X300 was only a RS485 interface. An interface adapter must therefore be used for the connection between X300 and the serial interface on the PC, if the PC does not have an RS485 interface.
An RS485/RS232 adapter is available under order number 6SX7005-0AA00.

The simplest method of making the link is to connect plug X300 on the front of the rectifier/regenerating unit to a COM port on the PC using a cable which is available under order number 6SX7005-0AB00.



X300
1
2 RxD (RS232)
3 Rx+/Tx+ (RS485)
4
5 Ground
6 +5V (OP1S)
7 TxD (RS232)
8 Rx-/Tx- (RS485)
9 Ground

at the PC COMx
Socket connector

at the 6SE70 X300
Plug connector

9.7.3 Creating an online link to the rectifier/regenerating unit

DriveMonitor always starts in offline mode. For this reason, you must open or create an offline file which has been set up specifically for the device and software version:

To open an existing offline file:

- File - Open *<select parameter file>*
  (if the parameter file has been created in SIMOVIS, the drive type MASTERDRIVES RRU and the software version used must then be set (≤ V4.5). If you want to set up an online link to the drive, you must click the ONLINE button and enter the bus address set in the device)

To create a new offline file:

- File - New - Based on Factory Setting <select drive type and software version> *. (If you want to set up an online link to the drive, you must click the ONLINE button and enter the bus address set in the device) <enter file name>*
- File - New - Empty Parameter Set <select drive type and software version> *(If you want to set up an online link to the drive, you must click the ONLINE button and enter the bus address set in the device) <enter file name>*

The data regarding drive type and software version are stored in the DNL file. You can then start the program in future by the normal Windows method, i.e. by double clicking on a DNL file, without further system queries.

You can open the ONLINE Settings screen under Options to check, and if necessary change, the interface parameters such as COM port and baud rate.

You can set the bus address and number of transmitted process data under File - Drive Settings.

To switch to online mode, select View - Online or the appropriate button on the toolbar. If the message "Device is not networked" then appears, then "Offline mode" is currently selected. You can switch to online mode under File - Drive Settings.

9.7.4 Further information

The engineering tool Drive ES is available for the diagnosis of complex installations containing several drives as well as Profibus-based drive communication.

Several different packages of Drive ES are available:

- Drive ES Basic Data management in Step 7 projects, drive communications via Profibus or USS
  Order No.: 6SW1700-5JA00-1AA0
- Drive ES Graphic Interconnection of Option S00 free functions blocks using the CFC interconnection editor
  Order No.: 6SW1700-5JB00-1AA0
- Drive ES Simatic Provides function blocks for SIMATIC CPUs and sample projects for communication with the SIMOVERT 6SE70
  Order No.: 6SW1700-5JC00-1AA0

NOTICE
DriveMonitor will run under Windows 95/98/Me or Windows NT4 / Windows 2000, but not under Windows 3.x.

10 Spare-parts

For rectifier/regenerating units sizes C to K

Equipment identifier	Designation	Order number	Used in
A10	PCB electronics (CUR) **without EPROM**	6SE7090-0XX85-1DA0	all unit types - 1AA0
D14	Software (EPROM)	6SW1701-0DA14	all unit types
A23	PCB- Power Interface	6SE7028-6EC85-1HA0	6SE7022-1EC85-1AA0 6SE7024-1EC85-1AA0 6SE7028-6EC85-1AA0
A23	PCB- Power Interface	6SE7036-1EE85-1HA0	6SE7031-7EE85-1AA0 6SE7032-2EE85-1AA0 6SE7033-1EE85-1AA0 6SE7033-8EE85-1AA0 6SE7034-6EE85-1AA0 6SE7036-1EE85-1AA0
A23	PCB- Power Interface	6SE7028-8FC85-1HA0	6SE7022-7FE85-1AA0 6SE7024-1FC85-1AA0 6SE7027-2FC85-1AA0 6SE7028-8FC85-1AA0
A23	PCB- Power Interface	6SE7035-4FE85-1HA0	6SE7031-5FE85-1AA0 6SE7032-4FE85-1AA0 6SE7032-7FE85-1AA0 6SE7033-5FE85-1AA0 6SE7034-2FE85-1AA0 6SE7035-4FE85-1AA0
A23	FBG- Power Interface	6SE7034-2HE85-1HA0	6SE7031-4HE85-1AA0 6SE7032-2HE85-1AA0 6SE7032-7HE85-1AA0 6SE7034-2HE85-1AA0 6SE7035-3HE85-1AA0
A23	PCB- Power Interface	6SE7041-8EK85-1HA0	6SE7038-2EH85-1AA0 6SE7041-0EH85-1AA0 6SE7041-3EK85-1AA0 6SE7041-8EK85-1AA0
A23	PCB- Power Interface	6SE7041-8HK85-1HA0	6SE7037-7FH85-1AA0 6SE7041-0FH85-1AA0 6SE7041-3FK85-1AA0 6SE7041-5FK85-1AA0 6SE7041-8FK85-1AA0 6SE7037-7HH85-1AA0 6SE7041-0HH85-1AA0 6SE7041-3HK85-1AA0 6SE7041-5HK85-1AA0 6SE7041-8HK85-1AA0
A23	PCB- Power Interface	6SE7041-8EK85-1MA0	6SE7041-3EK85-1AD0 6SE7041-8EK85-1AD0
A23	PCB- Power Interface	6SE7041-8HK85-1MA0	6SE7041-3FK85-1AD0 6SE7041-5FK85-1AD0 6SE7041-8FK85-1AD0 6SE7041-3HK85-1AD0 6SE7041-5HK85-1AD0 6SE7041-8HK85-1AD0
PMU	Parameterization unit	6SE7090-0XX84-2FA0	all unit types - 1AA0

Equipment identifier	Designation	Order number	Used in
A601	PCB -snubber RC network	6SE7032-2EE85-1JA0	6SE7031-7EE85-1AA0 6SE7032-2EE85-1AA0
A601	PCB -snubber RC network	6SE7034-6EE85-1JA0	6SE7033-1EE85-1AA0 6SE7033-8EE85-1AA0 6SE7034-6EE85-1AA0
A601, A602	PCB -snubber RC network	6SE7034-6EE85-1JA0	6SE7036-1EE85-1AA0
A601	PCB -snubber RC network	6SE7031-4FE85-1JA0	6SE7031-5FE85-1AA0
A601, A602	PCB -snubber RC network	6SE7031-4FE85-1JA0	6SE7032-4FE85-1AA0 6SE7032-7FE85-1AA0 6SE7033-5FE85-1AA0 6SE7034-2FE85-1AA0
A601	PCB -snubber RC network	6SE7035-4HE85-1JA0	6SE7035-4FE85-1AA0
A601	PCB -snubber RC network	6SE7031-4HE85-1JA0	6SE7031-4HE85-1AA0 6SE7035-3HE85-1AA0
A601, A602	PCB -snubber RC network	6SE7031-4HE85-1JA0	6SE7032-2HE85-1AA0 6SE7032-7HE85-1AA0 6SE7034-2HE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA13	6SE7022-1EC85-1AA0 6SE7022-7FC85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA15	6SE7024-1EC85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA16	6SE7024-1FC85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA06	6SE7028-8FC85-1AA0 6SE7031-5FE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA18	6SE7028-6EC85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA01	6SE7031-7EE85-1AA0
V11 to V16-	Thyristor module	6SY7010-0AA07	6SE7032-4FE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA02	6SE7033-1EE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA03	6SE7033-8EE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA05	6SE7034-6EE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA22	6SE7034-2FE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA04	6SE7036-1EE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA21	6SE7035-4FE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA24	6SE7027-2FC85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA30	6SE7031-4HE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA08	6SE7032-2HE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA25	6SE7032-7FE85-1AA0 6SE7033-5FE85-1AA0
V11 to V16	Thyristor module	6SY7010-0AA10	6SE7032-7HE85-1AA0
V11 to V26	Thyristor module	6SY7010-0AA07	6SE7032-2EE85-1AA0
V11 to V26	Thyristor module	6SY7010-0AA28	6SE7034-2HE85-0AA0
V11 to V26	Thyristor module	6SY7010-0AA32	6SE7035-3HE85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA14	6SE7022-1EC85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA16	6SE7024-1EC85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA06	6SE7028-6EC85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA17	6SE7033-1EE85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA07	6SE7031-7EE85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA20	6SE7033-8EE85-1AA0

Equipment identifier	Designation	Order number	Used in
V21 to V26	Thyristor module	6SY7010-0AA22	6SE7034-6EE85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA21	6SE7036-1EE85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA12	6SE7035-4FE85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA30	6SE7022-7FC85-1AA0 6SE7024-1FC85-1AA0 6SE7027-2FC85-1AA0 6SE7028-8FC85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA08	6SE7031-5FE85-1AA0 6SE7032-4FE85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA10	6SE7033-5FE85-1AA0 6SE7034-2FE85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA26	6SE7032-7FE85-1AA0
V21 to V26	Thyristor module	6SY7010-0AA27	6SE7031-4HE85-1AA0 6SE7032-2HE85-1AA0 6SE7032-7HE85-1AA0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB01	6SE7038-2EH85-1AA0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB02	6SE7038-2EH85-1AA0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB03	6SE7041-0EH85-1AA0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB04	6SE7041-0EH85-1AA0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB05	6SE7041-3EK85-1AA0 6SE7041-3EK85-1AD0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB06	6SE7041-3EK85-1AA0 6SE7041-3EK85-1AD0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB07	6SE7041-8EK85-1AA0 6SE7041-8EK85-1AD0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB08	6SE7041-8EK85-1AA0 6SE7041-8EK85-1AD0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB12	6SE7037-7FH85-1AA0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB13	6SE7037-7FH85-1AA0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB15	6SE7041-0FH85-1AA0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB16	6SE7041-0FH85-1AA0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB17	6SE7041-3FK85-1AA0 6SE7041-3FK85-1AD0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB18	6SE7041-3FK85-1AA0 6SE7041-3FK85-1AD0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB20	6SE7041-5FK85-1AA0 6SE7041-5FK85-1AD0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB21	6SE7041-5FK85-1AA0 6SE7041-5FK85-1AD0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB22	6SE7041-8FK85-1AA0 6SE7041-8FK85-1AD0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB23	6SE7041-8FK85-1AA0 6SE7041-8FK85-1AD0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB26	6SE7037-7HH85-1AA0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB27	6SE7037-7HH85-1AA0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB28	6SE7041-0HH85-1AA0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB30	6SE7041-0HH85-1AA0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB31	6SE7041-3HK85-1AA0 6SE7041-3HK85-1AD0

Equipment identifier	Designation	Order number	Used in
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB32	6SE7041-3HK85-1AA0 6SE7041-3HK85-1AD0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB33	6SE7041-5HK85-1AA0 6SE7041-5HK85-1AD0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB34	6SE7041-5HK85-1AA0 6SE7041-5HK85-1AD0
Ebene A	Thyristor block with snubber RC network	6SY7010-0AB35	6SE7041-8HK85-1AA0 6SE7041-8HK85-1AD0
Ebene B	Thyristor block with snubber RC network	6SY7010-0AB36	6SE7041-8HK85-1AA0 6SE7041-8HK85-1AD0
F1	Fuse link	6SY7010-2AA01	all unit types
F2	Fuse link	6SY7010-2AA02	6SE7022-1EC85-1AA0 6SE7024-1EC85-1AA0 6SE7028-6EC85-1AA0 6SE7022-7FC85-1AA0 6SE7024-1FC85-1AA0 6SE7027-2FC85-1AA0 6SE7028-8FC85-1AA0 6SE7031-7EE85-1AA0 6SE7032-2EE85-1AA0 6SE7033-1EE85-1AA0 6SE7033-8EE85-1AA0 6SE7034-6EE85-1AA0 6SE7036-1EE85-1AA0 6SE7031-5FE85-1AA0 6SE7032-4FE85-1AA0 6SE7032-7FE85-1AA0 6SE7033-5FE85-1AA0 6SE7034-2FE85-1AA0 6SE7035-4FE85-1AA0 6SE7031-4HE85-1AA0 6SE7032-2HE85-1AA0 6SE7032-7HE85-1AA0 6SE7034-2HE85-1AA0 6SE7035-3HE85-1AA0
F5	Fuse link	6SY7010-2AA01	6SE7038-2EH85-1AA0 6SE7041-0EH85-1AA0 6SE7037-7FH85-1AA0 6SE7041-0FH85-1AA0 6SE7037-7HH85-1AA0 6SE7041-0HH85-1AA0 6SE7041-3EK85-1AA0 6SE7041-3EK85-1AD0 6SE7041-8EK85-1AA0 6SE7041-8EK85-1AD0 6SE7041-3FK85-1AA0 6SE7041-3FK85-1AD0 6SE7041-5FK85-1AA0 6SE7041-5FK85-1AD0 6SE7041-8FK85-1AA0 6SE7041-8FK85-1AD0 6SE7041-3HK85-1AA0 6SE7041-3HK85-1AD0 6SE7041-5HK85-1AA0 6SE7041-5HK85-1AD0 6SE7041-8HK85-1AA0 6SE7041-8HK85-1AD0

Equipment identifier	Designation	Order number	Used in
F3, F4	Fuse link	6SY7010-2AA03	6SE7031-7EE85-1AA0 6SE7032-2EE85-1AA0 6SE7033-1EE85-1AA0 6SE7033-8EE85-1AA0 6SE7034-6EE85-1AA0 6SE7036-1EE85-1AA0 6SE7031-5FE85-1AA0 6SE7032-4FE85-1AA0 6SE7032-7FE85-1AA0 6SE7033-5FE85-1AA0 6SE7034-2FE85-1AA0 6SE7036-4FE85-1AA0 6SE7031-4HE85-1AA0 6SE7032-2HE85-1AA0 6SE7032-7HE85-1AA0 6SE7034-2HE85-1AA0 6SE7035-3HE85-1AA0
F2, F3, F4	Fuse link	6SY7010-2AA23	6SE7038-2EH85-1AA0 6SE7041-0EH85-1AA0 6SE7037-7FH85-1AA0 6SE7041-0FH85-1AA0 6SE7037-7HH85-1AA0 6SE7041-0HH85-1AA0 6SE7041-3EK85-1AA0 6SE7041-3EK85-1AD0 6SE7041-8EK85-1AA0 6SE7041-8EK85-1AD0 6SE7041-3FK85-1AA0 6SE7041-3FK85-1AD0 6SE7041-5FK85-1AA0 6SE7041-5FK85-1AD0 6SE7041-8FK85-1AA0 6SE7041-8FK85-1AD0 6SE7041-3HK85-1AA0 6SE7041-3HK85-1AD0 6SE7041-5HK85-1AA0 6SE7041-5HK85-1AD0 6SE7041-8HK85-1AA0 6SE7041-8HK85-1AD0
F10	Fuse link	6SY7010-2AA04	6SE7022-1EC85-1AA0
F10	Fuse link	6SY7010-2AA05	6SE7024-1EC85-1AA0 6SE7024-1FC85-1AA0
F10	Fuse link	6SY7010-2AA06	6SE7028-6EC85-1AA0
F10	Fuse link	6SY7010-2AA07	6SE7031-7EE85-1AA0 6SE7032-2EE85-1AA0
F10	Fuse link	6SY7010-2AA08	6SE7033-1EE85-1AA0
F10	Fuse link	6SY7010-2AA10	6SE7033-8EE85-1AA0 6SE7034-2FE85-1AA0
F10	Fuse link	6SY7010-2AA11	6SE7034-6EE85-1AA0 6SE7034-2HE85-1AA0
F10	Fuse link	6SY7010-2AA12	6SE7036-1EE85-1AA0
F10	Fuse link	6SY7010-2AA13	6SE7022-7FC85-1AA0
F10	Fuse link	6SY7010-2AA14	6SE7027-2FC85-1AA0
F10	Fuse link	6SY7010-2AA15	6SE7028-8FC85-1AA0
F10	Fuse link	6SY7010-2AA16	6SE7031-5FE85-1AA0 6SE7031-4HE85-1AA0

Equipment identifier	Designation	Order number	Used in
F10	Fuse link	6SY7010-2AA17	6SE7032-4FE85-1AA0 6SE7032-2HE85-1AA0
F10	Fuse link	6SY7010-2AA18	6SE7032-7FE85-1AA0 6SE7032-7HE85-1AA0
F10	Fuse link	6SY7010-2AA20	6SE7033-5FE85-1AA0
F10	Fuse link	6SY7010-2AA21	6SE7035-4FE85-1AA0 6SE7035-3HE85-1AA0
F11 to F26	Fuse link	6SY7010-2AA22	6SE7038-2EH85-1AA0
F111 to F262	Fuse link	6SY7010-2AA22	6SE7041-3EK85-1AA0 6SE7041-3EK85-1AD0
F11 to F26	Fuse link	6SY7010-2AA12	6SE7041-0EH85-1AA0 6SE7041-0FH85-1AA0 6SE7041-0HH85-1AA0
F111 to F262	Fuse link	6SY7010-2AA12	6SE7041-8EK85-1AA0 6SE7041-8EK85-1AD0 6SE7041-8FK85-1AA0 6SE7041-8FK85-1AD0 6SE7041-8HK85-1AA0 6SE7041-8HK85-1AD0
F11 to F26	Fuse link	6SY7010-2AA11	6SE7037-7FH85-1AA0 6SE7037-7HH85-1AA0
F111 to F262	Fuse link	6SY7010-2AA11	6SE7041-3FK85-1AA0 6SE7041-3FK85-1AD0 6SE7041-3HK85-1AA0 6SE7041-3HK85-1AD0
F111 to F262	Fuse link	6SY7010-2AA21	6SE7041-5FK85-1AA0 6SE7041-5FK85-1AD0 6SE7041-5HK85-1AA0 6SE7041-5HK85-1AD0
R100	NTC thermistor	6SY7010-6AA01	6SE7022-1EC85-1AA0 6SE7024-1EC85-1AA0 6SE7028-1EC85-1AA0 6SE7022-7FC85-1AA0 6SE7024-1FC85-1AA0 6SE7027-2FC85-1AA0 6SE7028-8FC85-1AA0 6SE7031-7EE85-1AA0 6SE7032-2EE85-1AA0 6SE7033-1EE85-1AA0 6SE7033-8EE85-1AA0 6SE7034-6EE85-1AA0 6SE7036-1EE85-1AA0 6SE7031-5FE85-1AA0 6SE7032-4FE85-1AA0 6SE7032-7FE85-1AA0 6SE7033-5FE85-1AA0 6SE7034-2FE85-1AA0 6SE7035-4FE85-1AA0 6SE7031-4HE85-1AA0 6SE7032-2HE85-1AA0 6SE7032-7HE85-1AA0 6SE7034-2HE85-1AA0 6SE7035-3HE85-1AA0

Equipment identifier	Designation	Order number	Used in
R100	NTC thermistor	6SY7010-6AA02	6SE7038-2EH85-1AA0 6SE7041-0EH85-1AA0 6SE7037-7FH85-1AA0 6SE7041-0FH85-1AA0 6SE7037-7HH85-1AA0 6SE7041-0HH85-1AA0 6SE7041-3EK85-1AA0 6SE7041-3EK85-1AD0 6SE7041-8EK85-1AA0 6SE7041-8EK85-1AD0 6SE7041-3FK85-1AA0 6SE7041-3FK85-1AD0 6SE7041-5FK85-1AA0 6SE7041-5FK85-1AD0 6SE7041-8FK85-1AA0 6SE7041-8FK85-1AD0 6SE7041-3HK85-1AA0 6SE7041-3HK85-1AD0 6SE7041-5HK85-1AA0 6SE7041-5HK85-1AD0 6SE7041-8HK85-1AA0 6SE7041-8HK85-1AD0
E1	Fan	6SY7000-0AA48	6SE7022-1EC85-1AA0 6SE7024-1EC85-1AA0 6SE7028-1EC85-1AA0 6SE7022-7FC85-1AA0 6SE7024-1FC85-1AA0 6SE7027-2FC85-1AA0 6SE7028-8FC85-1AA0
E1	Fan	6SY7010-7AA01	6SE7031-7EE85-1AA0 6SE7032-2EE85-1AA0 6SE7033-1EE85-1AA0 6SE7033-8EE85-1AA0 6SE7034-6EE85-1AA0 6SE7036-1EE85-1AA0 6SE7031-5FE85-1AA0 6SE7032-4FE85-1AA0 6SE7032-7FE85-1AA0 6SE7033-5FE85-1AA0 6SE7034-2FE85-1AA0 6SE7035-4FE85-1AA0 6SE7031-4HE85-1AA0 6SE7032-2HE85-1AA0 6SE7032-7HE85-1AA0 6SE7034-2HE85-1AA0 6SE7035-3HE85-1AA0
E1	Fan	6SY7010-7AA02	6SE7038-2EH85-1AA0 6SE7041-0EH85-1AA0 6SE7037-7FH85-1AA0 6SE7041-0FH85-1AA0 6SE7037-7HH85-1AA0 6SE7041-0HH85-1AA0

Equipment identifier	Designation	Order number	Used in
E1,E2	Fan	6SY7010-7AA02	6SE7041-3EK85-1AA0 6SE7041-3EK85-1AD0 6SE7041-8EK85-1AA0 6SE7041-8EK85-1AD0 6SE7041-3FK85-1AA0 6SE7041-3FK85-1AD0 6SE7041-5FK85-1AA0 6SE7041-5FK85-1AD0 6SE7041-8FK85-1AA0 6SE7041-8FK85-1AD0 6SE7041-3HK85-1AA0 6SE7041-3HK85-1AD0 6SE7041-5HK85-1AA0 6SE7041-5HK85-1AD0 6SE7041-8HK85-1AA0 6SE7041-8HK85-1AD0
T1 to T4	Current transformer	6SY7010-5AA01	6SE7022-1EC85-1AA0 6SE7024-1EC85-1AA0 6SE7028-1EC85-1AA0 6SE7022-7FC85-1AA0 6SE7024-1FC85-1AA0 6SE7027-2FC85-1AA0 6SE7028-8FC85-1AA0
T1 to T4	Current transformer	6SY7010-5AA02	6SE7031-7EE85-1AA0 6SE7032-2EE85-1AA0 6SE7033-1EE85-1AA0 6SE7033-8EE85-1AA0 6SE7034-6EE85-1AA0 6SE7036-1EE85-1AA0 6SE7031-5FE85-1AA0 6SE7032-4FE85-1AA0 6SE7032-7FE85-1AA0 6SE7033-5FE85-1AA0 6SE7034-2FE85-1AA0 6SE7035-4FE85-1AA0 6SE7031-4HE85-1AA0 6SE7032-2HE85-1AA0 6SE7032-7HE85-1AA0 6SE7034-2HE85-1AA0 6SE7035-3HE85-1AA0
T1, T2	Current transformer	6SY7010-5AA03	6SE7038-2EH85-1AA0 6SE7041-0EH85-1AA0 6SE7037-7FH85-1AA0 6SE7041-0FH85-1AA0 6SE7037-7HH85-1AA0 6SE7041-0HH85-1AA0

Equipment identifier	Designation	Order number	Used in
T1, T2	Current transformer	6SY7010-5AA04	6SE7041-3EK85-1AA0 6SE7041-3EK85-1AD0 6SE7041-8EK85-1AA0 6SE7041-8EK85-1AD0 6SE7041-3FK85-1AA0 6SE7041-3FK85-1AD0 6SE7041-5FK85-1AA0 6SE7041-5FK85-1AD0 6SE7041-8FK85-1AA0 6SE7041-8FK85-1AD0 6SE7041-3HK85-1AA0 6SE7041-3HK85-1AD0 6SE7041-5HK85-1AA0 6SE7041-5HK85-1AD0 6SE7041-8HK85-1AA0 6SE7041-8HK85-1AD0

12 Logbook

The logbook must be kept up-to-date by the operating personnel.

All service and maintenance work carried out on the rectifier/regenerating unit should be entered briefly in keywords into the logbook.

Continuous entries are important for maintenance and could be significant when it comes to warranty claims. Similarly, in the event of software upgrading, it is important that a record of the parameter settings is available, because during this procedure all values are reset to their original factory settings.

Location:			Unit Order No.: ..... Serial No.:	
	Date	**Name**	**Department**	**Signature**
Start-up settings				
Start-up settings change				

Par-No.	**Parameter designation**	**Factory setting**	**Start-up setting**	**Start-up setting change**
P050	Language	0		
P051	Access Level	2		
P052	Function select	0		
P053	Parameter Access	6		
P054	Display Light	0		
P070	MLFB(6SE70 ...)	0		
P071	Line Volts	dependent on P070		
P074	Limit LowVoltage	61		
P075	Rtd Amps	dependent on P070		
P076	Config. PCircuit	002		
P077	Factory set.type	0		
P090	Board Position 2	0		
P091	Board Position 3	0		
P140	Rectifier Resist	i001=0.000 i002=0.000 i003=0.000 i004=0.000	i001= i002= i003= i004=	i001= i002= i003= i004=
P141	Rectifier Induct	i001=0.00 i002=0.00 i003=0.00 i004=0.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P142	Inverter Resist.	i001=0.000 i002=0.000 i003=0.000 i004=0.000	i001= i002= i003= i004=	i001= i002= i003= i004=

Par-No.	Parameter designation	Factory setting	Start-up setting	Start-up setting change
P143	Inverter Induct.	i001=0.00 i002=0.00 i003=0.00 i004=0.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P144	DC Bus Capacit.	i001=0.00 i002=0.00 i003=0.00 i004=0.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P160	Motor Curr Limit	i001=150.0 i002=150.0 i003=150.0 i004=150.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P161	Regen Curr Limit	i001=-150.0 i002=-150.0 i003=-150.0 i004=-150.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P310	DC Curr Reg Gain	i001=0.15 i002=0.15 i003=0.15 i004=0.15	i001= i002= i003= i004=	i001= i002= i003= i004=
P311	DC Curr Reg Time	i001=0.015 i002=0.015 i003=0.015 i004=0.015	i001= i002= i003= i004=	i001= i002= i003= i004=
P313	DC Volts Reg Gain	i001=3.00 i002=3.00 i003=3.00 i004=3.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P314	DC Volts RegTime	i001=3.00 i002=3.00 i003=3.00 i004=3.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P316	DC V-Reg +Limit	i001=0.01 i002=0.01 i003=0.01 i004=0.01	i001= i002= i003= i004=	i001= i002= i003= i004=
P317	DC V-Reg -Limit	i001=-1.00 i002=-1.00 i003=-1.00 i004=-1.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P318	DC V(set,red)	i001=80.00 i002=80.00 i003=80.00 i004=80.00	i001= i002= i003= i004=	i001= i002= i003= i004=

Par-No.	Parameter designation	Factory setting	Start-up setting	Start-up setting change
P319	DC V(set,red)Hys	i001=6.00 i002=6.00 i003=6.00 i004=6.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P320	Smooth Load Amps	i001=5 i002=5 i003=5 i004=5	i001= i002= i003= i004=	i001= i002= i003= i004=
P321	Id thres.(Ud red)	i001=30.00 i002=30.00 i003=30.00 i004=30.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P322	Id hyst.(Ud red)	i001=20.00 i002=20.00 i003=20.00 i004=20.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P323	Enab.Ud red (Id)	0		
P329	PreChange Time	i001=500 i002=500 i003=500 i004=500	i001= i002= i003= i004=	i001= i002= i003= i004=
P330	Discharge time	i001=2000 i002=2000 i003=2000 i004=2000	i001= i002= i003= i004=	i001= i002= i003= i004=
P353	Thyristor Test	0		
P354	GroundFault Test	2		
P366	Auto Restart	0		
P408	Caps FormingTime	i001=10.0 i002=10.0 i003=10.0 i004=10.0	i001= i002= i003= i004=	i001= i002= i003= i004=
P409	Contactor Delay	0.0		
P486	Src Current Setp	i001=0 i002=0	i001= i002=	i001= i002=
P517	DC Volts Dev Lim	i001=2.00 i002=2.00 i003=2.00 i004=2.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P518	Deviation Time	i001=0.10 i002=0.10 i003=0.10 i004=0.10	i001= i002= i003= i004=	i001= i002= i003= i004=
P554	Src ON/OFF1	i001=1010 i002=1001	i001= i002=	i001= i002=

Par-No.	Parameter designation	Factory setting	Start-up setting	Start-up setting change
P555	Src1 OFF2	i001=1010 i002=1002	i001= i002=	i001= i002=
P556	Src2 OFF2	i001=1 i002=1	i001= i002=	i001= i002=
P557	Src3 OFF2	i001=1 i002=1	i001= i002=	i001= i002=
P561	Src InvRelease	i001=1 i002=1	i001= i002=	i001= i002=
P565	Src1 Fault Reset	i001=0 i002=1003	i001= i002=	i001= i002=
P566	Src2 Fault Reset	i001=0 i002=0	i001= i002=	i001= i002=
P567	Src3 Fault Reset	i001=2001 i002=2001	i001= i002=	i001= i002=
P568	Src Jog1 ON	i001=0 i002=0	i001= i002=	i001= i002=
P569	Src Jog2 ON	i001=0 i002=0	i001= i002=	i001= i002=
P571	Src Reduce DC V	i001=0 i002=0	i001= i002=	i001= i002=
P572	Src RegenRelease	i001=1 i002=1	i001= i002=	i001= i002=
P573	Src No ExtFault3	i001=1 i002=1	i001= i002=	i001= i002=
P574	Src Motor/Regen	i001=0 i002=0	i001= i002=	i001= i002=
P575	Src No ExtFault1	i001=1 i002=1	i001= i002=	i001= i002=
P578	Src RDataSetBit0	i001=0 i002=0	i001= i002=	i001= i002=
P579	Src RDataSetBit1	i001=0 i002=0	i001= i002=	i001= i002=
P583	Src 12-Pulse Mode	i001=0 i002=0	i001= i002=	i001= i002=
P586	Src No ExtFault2	i001=1 i002=1	i001= i002=	i001= i002=
P587	Src Master/Slave	i001=0 i002=0	i001= i002=	i001= i002=
P588	Src No Ext Warn1	i001=1 i002=1	i001= i002=	i001= i002=
P589	Src No Ext Warn2	i001=1 i002=1	i001= i002=	i001= i002=
P590	Src Base/Reserve	1005		
P591	Src ContactorMsg	1		

Par-No.	Parameter designation	Factory setting	Start-up setting	Start-up setting change
P600	Trg Bit Ready On	i001=0 i002=0	i001= i002=	i001= i002=
P601	Trg Bit Rdy Oper	i001=0 i002=0	i001= i002=	i001= i002=
P602	Trg Bit Operat	i001=0 i002=0	i001= i002=	i001= i002=
P603	Trg Bit Fault	i001=1002 i002=0	i001= i002=	i001= i002=
P604	Trg Bit No OFF2	i001=0 i002=0	i001= i002=	i001= i002=
P606	Trg BitONblocked	i001=0 i002=0	i001= i002=	i001= i002=
P607	Trg Bit Warning	i001=0 i002=0	i001= i002=	i001= i002=
P608	Trg Bit Deviat.	i001=0 i002=0	i001= i002=	i001= i002=
P610	Trg Reren Ready	i001=0 i002=0	i001= i002=	i001= i002=
P611	Trg Low Voltage	i001=0 i002=0	i001= i002=	i001= i002=
P612	Trg Bit Contact	i001=0 i002=0	i001= i002=	i001= i002=
P613	Trg DC V reduced	i001=0 i002=0	i001= i002=	i001= i002=
P614	Trg Motor/Regen	i001=0 i002=0	i001= i002=	i001= i002=
P618	Trg. Cur.Lim. Active	i001=0 i002=0	i001= i002=	i001= i002=
P619	Trg Bit Ext Flt1	i001=0 i002=0	i001= i002=	i001= i002=
P620	Trg Bit Ext Flt2	i001=0 i002=0	i001= i002=	i001= i002=
P621	Trg Bit ExtWarn	i001=0 i002=0	i001= i002=	i001= i002=
P622	Trg Bit i2t Inv	i001=0 i002=0	i001= i002=	i001= i002=
P623	Trg BitFltTmpInv	i001=0 i002=0	i001= i002=	i001= i002=
P624	Trg BitWarTmpInv	i001=0 i002=0	i001= i002=	i001= i002=
P631	Trg Bit Charging	i001=0 i002=0	i001= i002=	i001= i002=
P655	CUR AnaOutActVal	37		
P656	CUR AnaOutGain	10.00		

Par-No.	Parameter designation	Factory setting	Start-up setting	Start-up setting change
P657	CUR AnaOutOffset	0.00		
P658	AO Curr(act)Conf	0		
P660	SCI AnalogInConf	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P661	SCI AnaInSmooth	i001=2 i002=2 i003=2 i004=2 i005=2 i006=2	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P662	SCI AnalogInOffs	i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P664	SCI AnaOutActVal	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P665	SCI-AnaOutGain	i001=10.00 i002=10.00 i003=10.00 i004=10.00 i005=10.00 i006=10.00	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P666	SCI AnaOutOffs	i001=0.00 i002=0.00 i003=0.00 i004=0.00 i005=0.00 i006=0.00	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=

Par-No.	Parameter designation	Factory setting	Start-up setting	Start-up setting change
P680	Scom1 Act Value	i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	i001= i002= i003= i004= i005= i006= i007= i008= i009= i010= i011= i012= i013= i014= i015= i016=	i001= i002= i003= i004= i005= i006= i007= i008= i009= i010= i011= i012= i013= i014= i015= i016=
P681	Scom2 Act Value	i001=599 i002=34 i003=0 i004=0 i005=0	i001= i002= i003= i004= i005=	i001= i002= i003= i004= i005=
P682	SCB Protocol	0		
P683	SCom/SCB BusAddr	i001=0 i002=0	i001= i002=	i001= i002=
P684	SCom/SCB Baud	i001=6 i002=6 i003=13	i001= i002= i003=	i001= i002= i003=
P685	SCom/SCB #PKWDat	i001=127 i002=127	i001= i002=	i001= i002=
P686	SCom/SCB # PrDat	i001=2 i002=2 i003=2	i001= i002= i003=	i001= i002= i003=
P687	SCom/SCB TlgOFF	i001=0 i002=0 i003=1	i001= i002= i003=	i001= i002= i003=
P688	SST2 Protocol	0		
P689	SCB Peer2PeerExt	i001=0 i002=0 i003=0 i004=0 i005=0	i001= i002= i003= i004= i005=	i001= i002= i003= i004= i005=

Par-No.	Parameter designation	Factory setting	Start-up setting	Start-up setting change
P690	SCB Act Values	i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	i001= i002= i003= i004= i005= i006= i007= i008= i009= i010= i011= i012= i013= i014= i015= i016=	i001= i002= i003= i004= i005= i006= i007= i008= i009= i010= i011= i012= i013= i014= i015= i016=
P694	CB/TB Act Values	i001=968 i002=0 i003=0 i004=0 i005=0 i006=0 i007=0 i008=0 i009=0 i010=0 i011=0 i012=0 i013=0 i014=0 i015=0 i016=0	i001= i002= i003= i004= i005= i006= i007= i008= i009= i010= i011= i012= i013= i014= i015= i016=	i001= i002= i003= i004= i005= i006= i007= i008= i009= i010= i011= i012= i013= i014= i015= i016=
P695	CB/TB TlgOFFTime	20		
P696	CB Parameter 1	0		
P697	CB Parameter 2	0		
P698	CB Parameter 3	0		
P699	CB Parameter 4	0		
P700	CB Parameter 5	0		
P701	CB Parameter 6	0		
P702	CB Parameter 7	0		
P703	CB Parameter 8	0		
P704	CB Parameter 9	0		
P705	CB Parameter 10	0		

Par-No.	Parameter designation	Factory setting	Start-up setting	Start-up setting change
P706	CB Parameter 11	i001=0 i002=0 i003=0 i004=0 i005=0	i001= i002= i003= i004= i005=	i001= i002= i003= i004= i005=
r720	Software version	0		
P772	Thyr.vlt.corr (only visible if P051=3, P799=4)	i001=0 i002=0 i003=0 i004=0 i005=0 i006=0	i001= i002= i003= i004= i005= i006=	i001= i002= i003= i004= i005= i006=
P773	Deadband Convert	i001=0.01 i002=0.01 i003=0.01 i004=0.01	i001= i002= i003= i004=	i001= i002= i003= i004=
P774	Deadband Invert	i001=-3.00 i002=-3.00 i003=-3.00 i004=-3.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P775	Min Gating Angle	i001=0 i002=0 i003=0 i004=0	i001= i002= i003= i004=	i001= i002= i003= i004=
P776	Max Gating Angle	i001=150 i002=150 i003=150 i004=150	i001= i002= i003= i004=	i001= i002= i003= i004=
P777	Max Gating Angle Ramp	i001=20.00 i002=20.00 i003=20.00 i004=20.00	i001= i002= i003= i004=	i001= i002= i003= i004=
P785	I^2t Control Word	1		
P793	Line Voltage Delay	0.03		
P799	Spezial Access	0		
P917	Change Reports	0		
P918	CB Bus Address	3		
P927	Parameter Access	6		
P928	Src Base/Reserve	1005		
P952	# of Faults	0		
P970	Factory Settings	1		
P971	EEPROM Storing	0		

No.	Date/time	Name/department	Fault and diagnostic messages	Measures

13 Environmental Compatibility

Environmental aspects during development

The number of parts has been reduced substantially by the use of highly integrated components and by a modular structure of the complete converter series. This reduces energy consumption during production.

Particular attention was paid to reducing volume, mass and type diversity of the metal and plastic parts.

Plastic parts used:

ABS: Front cover
Fan grille, fan cover (Size C)
PMU support

PP: Hinge
Insulating plate
Handle
Bus retrofit

PC: Size E:
Protection against accidental contact
IP20 enclosure
Insulation of customer connections
Plastic part of fan box

PA6: Insulating films
Terminal housing

Flame arresters containing halogen and insulating materials containing silicone have been replaced by pollutant-free materials in all components.

Environmental compatibility was an important criterion in the selection of externally source items.

Environmental aspects during production

Externally sourced items are mainly transported in returnable packaging. The packaging material itself is recyclable, consisting mainly of cardboard and untreated wood.

Except for the hot-dip-galvanized enclosure and tinned rails for size E, H and K, no special surface coatings are used.

SMD components are used on the printed-circuit boards.

Production is emission-free.

Environmental aspects of disposal

The unit can be dismantled into recyclable mechanical components by means of easily removable screw and snap joints.

The PC boards can be disposed of thermally. The number of components containing hazardous substances is only slight.

The recyclable plastic parts are designated in accordance with DIN 54840 and marked with the recycling symbol.

14 Technical Data

In the event of conditions of use other than those listed in this chapter, please contact your local Siemens branch or national subsidiary.

Coolant temperature		0 °C to +40 °C
Storage temperature		– 25 °C to +70 °C
Transport temperature		– 25 °C to +70 °C
Environmental class	3K3	DIN IEC 721-3-3 / 04.90
Soiling	2	DIN VDE 0110 Part 1 / 01.89 moisture not permitted
Overvoltage category (power section)	III	DIN VDE 0110 Part 2 / 01.89
Overvoltage resistance class (with converter connected)	1	DIN VDE 0160 / 04.91
Type of protection		DIN VDE 0470 Part 1 / 11.92 ≙ EN 60529
Size C:		
– Standard	IP20	
Size E:		
– Standard	IP00	
– Option	IP20	
Size H + K:		
– Standard	IP00	
Interference immunity		IEC 801-2, IEC 801-4
Mechanical strength		DIN IEC 68-2-6 / 06.90

	Frequency range	Constant amplitude of	
		deflection	acceleration
	Hz	mm	m/s^2 (g)
– stationary use	10 to 58	0.075	
	more than 58 to 500		9.8 (1)
– during transport		3.5	
			9.8 (1)

The units can also be operated in load class II. The permissible values must be taken from the following tables.

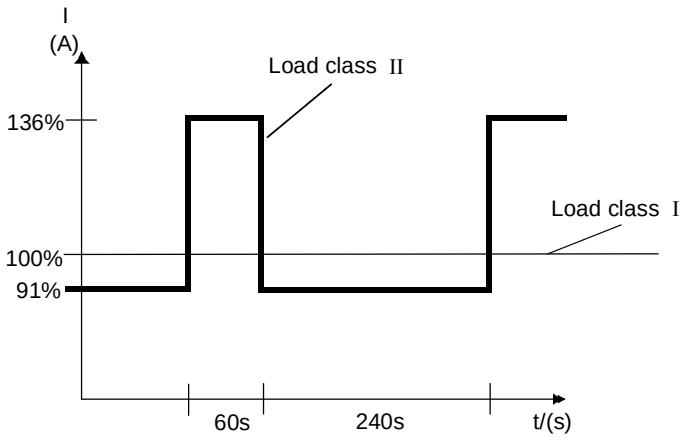


Figure 14.1 Power output according to load class II

R/R unit 6SE70..-.....-1AA0		**22-1EC85**	**24-1EC85**	**28-6EC85**		
Rated voltage, rated frequency, rated current						
Rated voltage Rectifier connection Regenerative connection DC link voltage	V	3AC 200V –10% to 230V +15% or 3AC 380V –15% to 480V +10% using an (auto) transformer 1.2 times the voltage of the rectifier connection DC 270V –10% to 310V +15% or DC 510V –15% to 650V +10%				
Rated frequency f_n Input Output	Hz	46 to 64 (automatic frequency matching) DC				
Rated current (rms value) With autotransformer Regenerating, line side Regenerating, unit side Rectifier operation Without autotransformer Regenerating, unit side Rectifier operation	A	 20 17 18 17 18	 40 33 36 33 36	 82 68 74 68 74		
Load class I to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current (average) DC link connection Rectifier operation	A	21	41	86		
Load class II to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current	A	19	37	78		
Base load duration	s	240				
Excess current	A	29	56	117		
Excess current duration	s	60				
Losses, cooling						
Power dissipation – Maximum	kW	0,14	0,19	0,31		
Cooling air requirement	m^3/s	0,028	0,028	0,028		
Sound pressure level, dimensions, weight						
Sound pressure level	dB(A)	60	60	60		
Size Width Height (without securing bracket) Depth	 mm mm mm	C 180 600 350	C 180 600 350	C 180 600 350		
Weight app.	kg	23	23	23		

R/R unit 6SE70..-.....-1AA0		31-7EE85	32-2EE85	33-1EE85	33-8EE85	34-6EE85	36-1EE85
Rated voltage, rated frequency, rated current							
Rated voltage Rectifier connection Regenerative connection DC link voltage	V	3AC 200V –10% to 230V +15% or 3AC 380V –15% to 480V +10% using an (auto) transformer 1.2 times the voltage of the rectifier connection DC 270V –10% to 310V +15% or DC 510V –15% to 650V +10%					
Rated frequency f_n Input Output	Hz	46 to 64 (automatic frequency matching) DC					
Rated current (rms value) With autotransformer	A						
Regenerating, line side		165	212	297	360	444	581
Regenerating, unit side		137	177	247	300	370	484
Rectifier operation		149	192	269	326	403	526
Without autotransformer							
Regenerating, unit side		137	177	247	300	370	484
Rectifier operation		149	192	269	326	403	526
Load class I to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation							
Rated current (average) DC link connection Rectifier operation	A	173	222	310	375	463	605
Load class II to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation							
Rated current	A	157	202	282	341	421	551
Base load duration	s	240					
Excess current	A	236	303	423	512	632	826
Excess current duration	s	60					
Losses, cooling							
Power dissipation – Maximum	kW	0,69	0,97	1,07	1,16	1,43	1,77
Cooling air requirement	m^3/s	0,2	0,2	0,2	0,2	0,2	0,2
Sound pressure level, dimensions, weight							
Sound pressure level	dB(A)	75	75	75	75	75	75
Size Width Height Depth - Standard - Option	 mm mm mm mm	E 269 1050 340 350	E 269 1050 340 350	E 269 1050 340 350	E 269 1050 340 350	E 269 1050 340 350	E 269 1050 340 350
Weight app.	kg	44	43.5	44	51.5	51.5	63

R/R unit 6SE70..-.....-1AA0		38-2EH85	41-0EH85	41-3EK85	41-8EK85	
Rated voltage, rated frequency, rated current						
Rated voltage Rectifier connection Regenerative connection DC link voltage	V	3AC 380V –15% to 480V +10% using an (auto) transformer 1.2 times the voltage of the rectifier connection DC 510V –15% to 650V +10%				
Rated frequency f_n Input Output	Hz	46 to 64 (automatic frequency matching) DC				
Rated current (rms value) With autotransformer	A					
Regenerating, line side		784	980	1276	1702	
Regenerating, unit side		654	817	1064	1481	
Rectifier operation		710	888	1156	1542	
Without autotransformer						
Regenerating, unit side		654	817	1064	1481	
Rectifier operation		710	888	1156	1542	
Load class I to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current (average) DC link connection Rectifier operation	A	821	1023	1333	1780	
Load class II to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current	A	747	931	1213	1620	
Base load duration	s	240				
Excess current	A	1121	1396	1820	2430	
Excess current duration	s	60				
Losses, cooling						
Power dissipation – Maximum	kW	3.29	3.70	4.84	6.24	
Cooling air requirement	m^3/s	0.55	0.55	1.0	1.0	
Sound pressure level, dimensions, weight						
Sound pressure level 50 Hz 60 Hz	dB(A)	80 83	80 83	82 82	82 82	
Size Width Height Depth	 mm mm mm	H 508 1400 551	H 508 1400 551	K 800 1725 550	K 800 1725 550	
Weight app.	kg	175	175	450	470	

Parallel units (-1AD0) of size K for connecting in parallel have the same technical data as the corresponding "basic units" (-1AA0). Please note the unit correspondence and notes of Section 3.7!

The permissible output current in parallel mode is reduced (due to current division between the power sections) by 10 % as compared to the sum of the rated currents of the separate power sections.

R/R unit 6SE70..-.....-1AA0		22-7FC85	24-1FC85	27-2FC85	28-8FC85	
Rated voltage, rated frequency, rated current						
Rated voltage Rectifier connection Regenerative connection DC link voltage	V	3AC 500V –15% to 600V +10% using an (auto) transformer 1.2 times the voltage of the rectifier connection DC 675V –15% to 810V +10%				
Rated frequency f_n Input Output	Hz	46 to 64 (automatic frequency matching) DC				
Rated current (rms value) With autotransformer	A					
Regenerating, line side		26	40	69	90	
Regenerating, unit side		22	33	57	75	
Rectifier operation		24	36	62	82	
Without autotransformer						
Regenerating, unit side		22	33	57	75	
Rectifier operation		24	36	62	82	
Load class I to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current (average) DC link connection Rectifier operation	A	27	41	72	94	
Load class II to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current	A	25	37	66	86	
Base load duration	s	240				
Excess current	A	37	56	98	128	
Excess current duration	s	60				
Losses, cooling						
Power dissipation – Maximum	kW	0,19	0,21	0,29	0,35	
Cooling air requirement	m^3/s	0,028	0,028	0,028	0,028	
Sound pressure level, dimensions, weight						
Sound pressure level	dB(A)	60	60	60	60	
Size		C	C	C	C	
Width	mm	180	180	180	180	
Height (without securing bracket)	mm	600	600	600	600	
Depth	mm	350	350	350	350	
Weight app.	kg	23	23	23	23	

R/R-unit 6SE70..-.....-1AA0		31-5FE85	32-4FE85	32-7FE85	33-5FE85	34-2FE85	35-4FE85
Rated voltage, rated frequency, rated current							
Rated voltage Rectifier connection Regenerative connection DC link voltage	V	3AC 500V –15% to 600V +10% using an (auto) transformer 1.2 times the voltage of the rectifier connection DC 675V –15% to 810V +10%					
Rated frequency f_n Input Output	Hz	46 to 64 (automatic fredquency matching) DC					
Rated current (rms value) With autotransformer	A						
Regenerating, line side		145	224	257	339	404	514
Regenerating, unit side		121	187	214	282	337	428
Rectifier operation		131	203	233	307	366	465
Without autotransformer							
Regenerating, unit side		121	187	214	282	337	428
Rectifier operation		131	203	233	307	366	465
Load class I to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation							
Rated current (average) DC link connection Rectifier operation	A	151	235	270	354	420	536
Load class II to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation							
Rated current	A	137	214	246	322	382	488
Base load duration	s	240					
Excess current	A	206	321	369	483	573	732
Excess current duration	s	60					
Losses, cooling							
Power dissipation – Maximum	kW	0,76	1,14	1,11	1,36	1,38	2,00
Cooling air requirement	m^3/s	0,2	0,2	0,2	0,2	0,2	0,2
Sound pressure level, dimensions, weight							
Sound pressure level	dB(A)	75	75	75	75	75	75
Size		E	E	E	E	E	E
Width	mm	269	269	269	269	269	269
Height	mm	1050	1050	1050	1050	1050	1050
Depth							
- Standard	mm	340	340	340	340	340	340
- Option	mm	350	350	350	350	350	350
Weight app.	kg	43.5	44.5	44.5	53.5	53.5	68

R/R unit 6SE70..-.....-1AA0		37-7FH85	41-0FH85	41-3FK85	41-5FK85	41-8FK85
Rated voltage, rated frequency, rated current						
Rated voltage Rectifier connection Regenerative connection DC link voltage	V	3AC 500V –15% to 600V +10% using an (auto) transformer 1.2 times the voltage of the rectifier connection DC 675V –15% to 810V +10%				
Rated frequency f_n Input Output	Hz	46 to 64 (automatic frequency matching) DC				
Rated current (rms value) With autotransformer	A					
Regenerating, line side		741	980	1235	1401	1803
Regenerating, unit side		617	817	1029	1168	1502
Rectifier operation		671	888	1119	1269	1633
Without autotransformer						
Regenerating, unit side		617	817	1029	1168	1502
Rectifier operation		671	888	1119	1269	1633
Load class I to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current (average) DC link connection Rectifier operation	A	774	1023	1285	1464	1880
Load class II to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current	A	704	931	1169	1332	1711
Base load duration	s	240				
Excess current	A	1057	1396	1754	1998	2566
Excess current duration	s	60				
Losses, cooling						
Power dissipation – Maximum	kW	3.30	4.03	5.40	5.87	7.65
Cooling air requirement	m^3/s	0.55	0.55	1.0	1.0	1.0
Sound pressure level, dimensions, weight						
Sound pressure level 50 Hz	dB(A)	80	80	82	82	82
60 Hz		83	83	82	82	82
Size		H	H	K	K	K
Width	mm	508	508	800	800	800
Height	mm	1400	1400	1725	1725	1725
Depth	mm	551	551	550	550	550
Weight app.	kg	175	175	450	450	470

Parallel units (-1AD0) of size K for connecting in parallel have the same technical data as the corresponding "basic units" (-1AA0). Please note the unit correspondence and notes of Section 3.7!

The permissible output current in parallel mode is reduced (due to current division between the power sections) by 10 % as compared to the sum of the rated currents of the separate power sections.

R/R unit 6SE70..-.....-1AA0		31-4HE85	32-2HE85	32-7HE85	34-2HE85	35-3HE85
Rated voltage, rated frequency, rated current						
Rated voltage Rectifier connection Regenerative connection DC link voltage	V	3AC 660V to 690V ±15% using an (auto) transformer 1.2 times the voltage of the rectifier connection DC 890V to 930V ±15%				
Rated frequency f_n Input Output	Hz	46 to 64 (automatic Frequency matching) DC				
Rated current (rms value) With autotransformer	A					
Regenerating, line side		136	213	258	404	514
Regenerating, unit side		113	177	215	337	428
Rectifier operation		123	193	234	366	465
Without autotransformer						
Regenerating, unit side		113	177	215	337	428
Rectifier operation		123	193	234	366	465
Load class I to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current (average) Zwischenkreisanschluß beim Einspeisen	A	140	222	270	420	536
Load class II to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current	A	127	202	246	382	488
Base load duration	s	240				
Excess current	A	191	303	369	573	732
Excess current duration	s	60				
Losses, cooling						
Power dissipation – Maximum	kW	0,82	1,26	1,15	1,68	1,81
Cooling air requirement	m^3/s	0,2	0,2	0,2	0,2	0,2
Sound pressure level, dimensions, weight						
Sound pressure level	dB(A)	75	75	75	75	75
Size		E	E	E	E	E
Width	mm	269	269	269	269	269
Height	mm	1050	1050	1050	1050	1050
Depth						
- Standard	mm	340	340	340	340	340
- Option		350	350	350	350	350
Weight app.	kg	44.5	53.5	53.5	63	68

R/R unit 6SE70..-.....-1AA0		37-7HH85	41-0HH85	41-3HK85	41-5HK85	41-8HK85
Rated voltage, rated frequency, rated current						
Rated voltage Rectifier connection Regenerative connection DC link voltage	V	3AC 660V to 690V ±15% using an (auto) transformer 1.2 times the voltage of the rectifier connection DC 890V to 930V ±15%				
Rated frequency f_n Input Output	Hz	46 to 64 (automatic frequency matching) DC				
Rated current (rms value) With autotransformer	A					
Regenerating, line side		741	980	1235	1401	1803
Regenerating, unit side		617	817	1029	1168	1502
Rectifier operation		671	888	1119	1269	1633
Without autotransformer						
Regenerating, unit side		617	817	1029	1168	1502
Rectifier operation		671	888	1119	1269	1633
Load class I to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current (average) DC link connection Rectifier operation	A	774	1023	1285	1464	1880
Load class II to EN 60146-1-1 of the DC link current (average value) in rectifier operation; currents reduced to 92% in regenerative operation						
Rated current	A	704	931	1169	1332	1711
Base load duration	s	240				
Excess current	A	1057	1396	1754	1998	2566
Excess current duration	s	60				
Losses, cooling						
Power dissipation – Maximum	kW	3.70	4.15	5.54	5.97	7.62
Cooling air requirement	m^3/s	0.55	0.55	1.0	1.0	1.0
Sound pressure level, dimensions, weight						
Sound pressure level 50 Hz	dB(A)	80	80	82	82	82
60 Hz		83	83	82	82	82
Size		H	H	K	K	K
Width	mm	508	508	800	800	800
Height	mm	1400	1400	1725	1725	1725
Depth	mm	551	551	550	550	550
Weight app.	kg	175	175	450	450	470

Parallel units (-1AD0) of size K for connecting in parallel have the same technical data as the corresponding "basic units" (-1AA0). Please note the unit correspondence and notes of Section 3.7!

The permissible output current in parallel mode is reduced (due to current division between the power sections) by 10 % as compared to the sum of the rated currents of the separate power sections.

14.1 Power reduction at increased coolant temperature

The rated current must be reduced according to Figure 14.2 for cooling medium temperatures exceeding 40°C. Cooling medium temperatures > 50°C are not permissible.

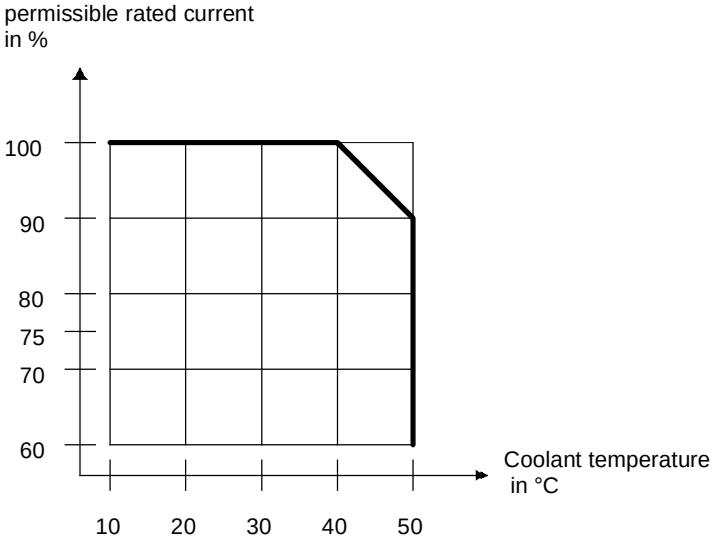


Figure 14.2 Maximum permitted rated current depending on coolant temperature

14.2 Power reduction at altitudes > 1000m above MSL

The rated current must be reduced as shown in Figure 14.3 in the event of installation altitudes > 1000 m above mean sea level. Installation altitudes > 2000 m above MSL (please enquire)

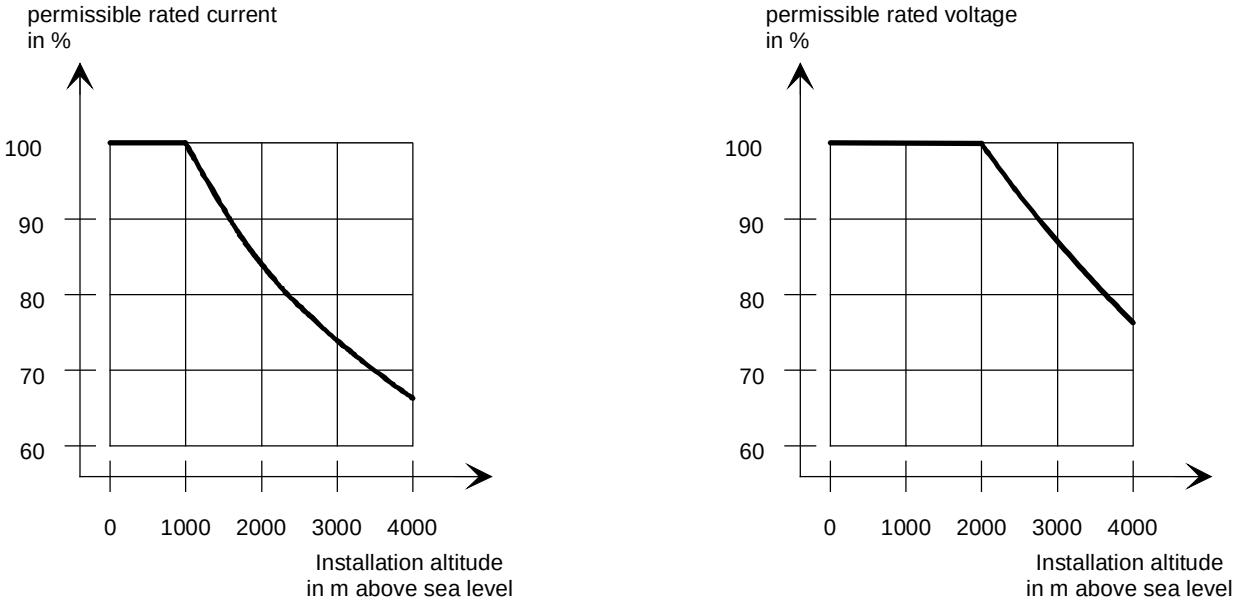


Figure 14.3 Maximum values for rated current and rated voltage depending on installation altitude

14.3 Applied standards

DIN VDE 0100		Erection of power installations with rated voltages up to 1000 V,
	Part 540 A11.91	Selection and erection of electrical equipment, earthing, PE conductor, equipotential bonding conductor
DIN VDE 0106		Protection against electric shock:
	Part 1 A05.82	Classification of electrical and electronic equipment (IEC 536)
	Part 100 A03.83	Arrangement of actuation elements in the proximity of shock-hazard parts
DIN VDE 0110	Part 1 and 2 A01.89	Isolation coordination for electrical equipment in low-voltage installations
DIN VDE 0113		Safety of machines: electrical equipment of machines,
	Part 1 A06.93	General requirements (EN 60204-1:1992)
DIN VDE 0160	E04.91	Equipping power installations with electronic equipment
DIN VDE 0298		Use of cables and insulated cables for power installations:
	Part 2 A11.79	Recommended values for the current carrying capacity of cables with rated voltages U_0 / U to 18/30 kV
	Part 4 A02.80	Recommended values for the current carrying capacity of cables
DIN VDE 0470	Part 1 A12.92	Types of protection, shock, foreign body and water protection for electrical equipment (EN 60529: 1991)
DIN VDE 0558	Part1 A07.87	Semiconductor converters: general regulations and special regulations for line-commutated converters
DIN VDE 0843		Electromagnetic compatibility of instrumentation and control equipment in industrial process engineering:
	Part 2 A09.87 Z	Interference resistance to static electricity discharges; requirements and measurement methods (IEC801-2) Ersetzt durch DIN EN 60801, Teil 2 (09.87)
DIN VDE 0875		RFI suppression of electrical equipment and installations:
	Part 11 A12.88 Z	(EN 55014: 1987) Ersetzt durch DIN VDE 0875, Teil 14 und DIN VDE 0075
	Part 1 A07.92	(EN 55011: 1991)
DIN 41494	Part 5 A9.80	Equipment practice for electronic facilities; subracks and modules
DIN 41651	Part 1 A9.89	Connectors for printed circuits for connecting ribbon cables with round conductors; indirect insertion, grid dimension 2.54 mm
DIN IEC 60068	Part 2	Elektrotechnik; Grundlegende Umweltprüfverfahren; Prüfungen
DIN IEC 60721		Electrical engineering; classification of environmental conditions:
	Part 3 A08.87	classes of influencing quantities
IEC 60801		Electromagnetic compatibility for industrial - process measurement and control equipment
	Part 4	Electrical fast transient / burst requirements
EN 60146-1-1:	1993	Semiconductor converters; General requirements and line-commutated converters:
	Part 1-1	Definition of basic requirements (IEC146-1-1991)

Sources

DIN standards and foreign standards:	Beuth-Verlag GmbH Burggrafenstraße 6 10787 Berlin
DIN VDE regulations:	VDE-Auslieferungsstelle Merianstraße 29 63069 Offenbach

DriveMonitor (see Section 9.6)

The DriveMonitor software tool is provided for commissioning, parameterizing and diagnosing the common rectifier via a PC.

DriveMonitor is supplied on the same CD-ROM (order number: 6SX7010-0FA10) as the operating instructions for the 6SE70 converter used in conjunction with the rectifier unit.

The following versions have appeared so far:

Version	Internal Part number
A	C98130-A1234-A1-01-7647
B	C98130-A1234-A1-02-7647
C	C98130-A1234-A1-03-7647
E	C98130-A1234-A1-05-7647
F	C98130-A1234-A1-06-7647
G	C98130-A1234-A1-07-7647
H	C98130-A1234-A1-08-7647
i	C98130-A1234-A1-09-7647 A5E00811825

Version **i** consists of the following chapters

Chapter		Pages	Date of Edition
0	General	12	09.02
1	Description	2	05.00
2	Transport, unpacking, assembly	8	05.00
3	Connection	60	09.02
4	Start-Up	76	09.02
5	Parameter List	42	09.02
6	Operator control	4	09.02
7	Fault and Alarm Messages	10	09.02
8	Maintenance	14	09.02
9	Options	10	09.02
10	Spare parts	10	09.02
11	Blank	0	—
12	Logbook	10	05.00
13	Environmental compatibility	2	09.02
14	Technical data	12	09.02

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