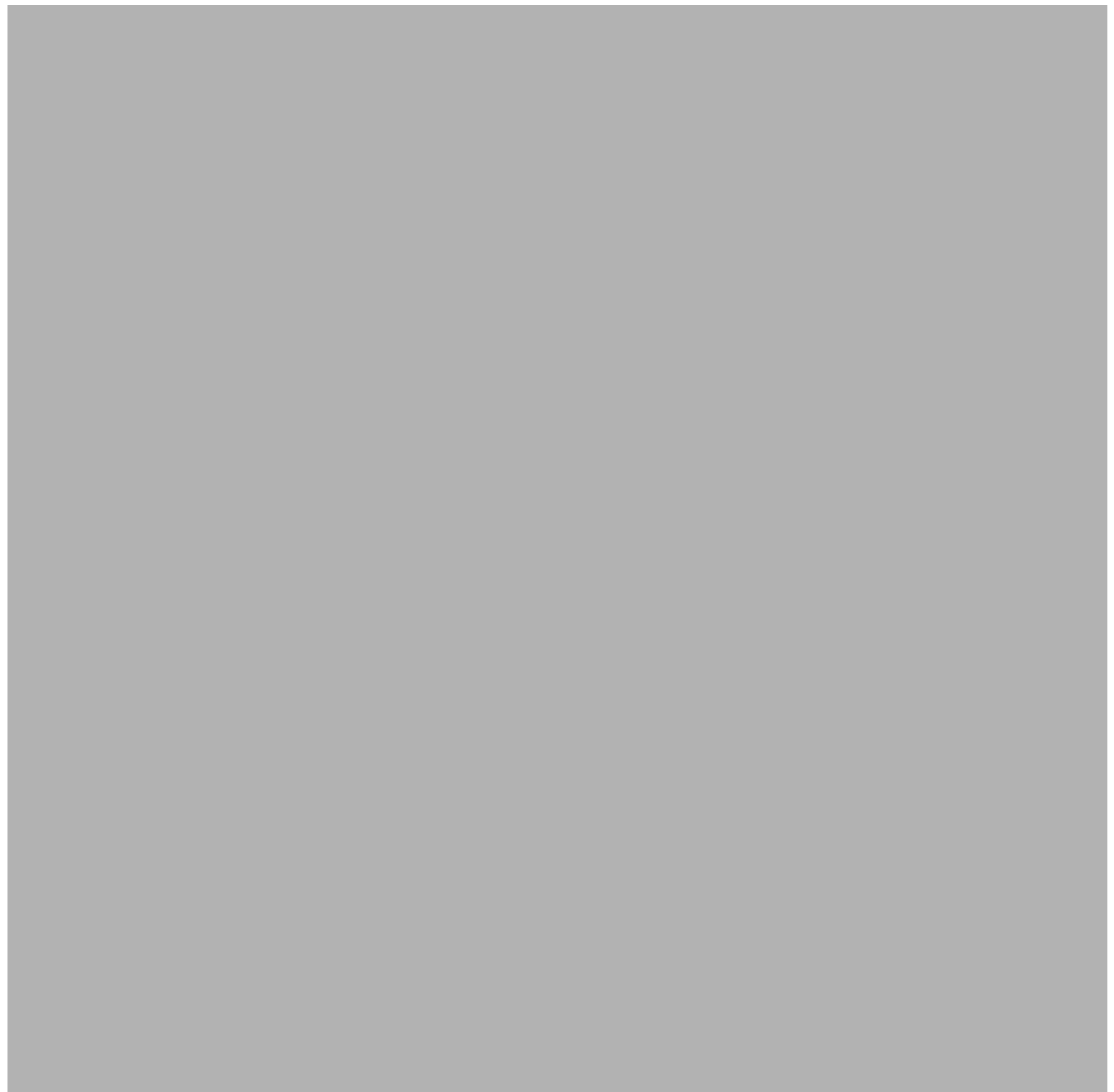


# SIEMENS

SIMOVERT Master Drives  
Einspeise-Einheit  
Bauform B und C  
Common Rectifier  
Size B and C

Betriebsanleitung  
Operating Instructions





Von dieser Betriebsanleitung sind folgende fremdsprachige Ausgaben lieferbar:  
 These Operating Instructions are available in the following languages:

<b>Sprache Language</b>	<b>Französisch French</b>	<b>Spanisch Spanish</b>	<b>Italienisch Italian</b>
Bestell-Nr. Order-No.	6SE7087-7AC85-0AA0	6SE7087-8AC85-0AA0	6SE7087-2AC85-0AA0

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# ENGLISH

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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 authorisation 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**

within the meaning of these operating instructions or the warning information on the product itself, indicates that death and/or substantial property damage will result if proper precautions are not taken.

- **WARNING**

within the meaning of these operating instructions or the warning information on the product itself, indicates that severe personal injury and/or substantial property damage will result if proper precautions are not taken.

- **CAUTION**

within the meaning of these operating instructions or the warning information on the product itself, indicates that slight personal injury or property damage will result if proper precautions are not taken.

- **NOTE**


within the meaning of these operating instructions indicates important information about the product or the respective part of the operating instructions to which attention is drawn.

## 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.

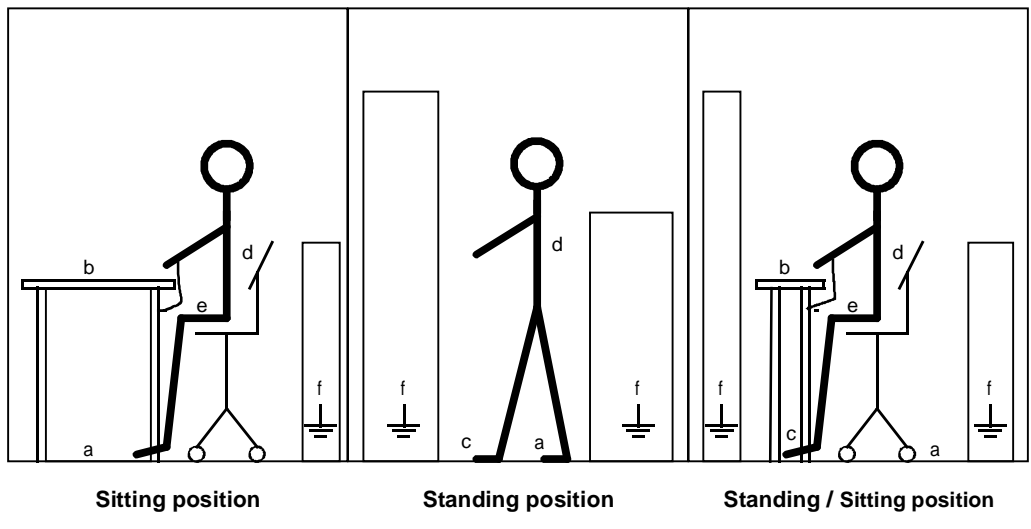
	<p><b>CAUTION</b></p> <p><b>Electrostatically Sensitive Devices (ESDs)</b></p>
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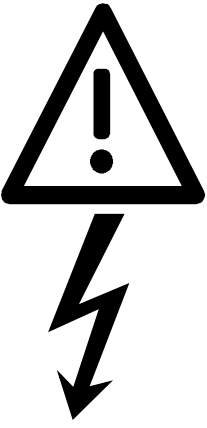
The equipment contains electrostatically sensitive devices. These components may be destroyed very easily by improper handling. Please observe the following notes if you nevertheless have to work with electronic modules:

- ◆ 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 fibre 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. metallised 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 aluminium 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 |



	<b>WARNING</b>
	<p>When operating electrical equipment, certain parts of such equipment are inevitably live.</p> <p>Owing to the dc link capacitors, hazardous voltages are present on the equipment up to 5 min. after deenergisation (power terminal and electronic power supply). This is why it is not permitted to open the housing until after waiting for 5 minutes.</p> <p>Non-observance of warning notices can result in death, severe personal injury or considerable property damage.</p> <p>Such personnel must be thoroughly acquainted with all warnings and maintenance activities.</p> <p>Perfect and safe operation of the equipment requires proper transport, expert storage, installation and assembly and cautious operation and maintenance.</p>





# 1 Description

## 1.1 Applicability

The common rectifier in the SIMOVERT Master Drives series is a power electronics device. From the three-phase mains, it generates a dc network and is used as a dc supply unit for one or several units in the SIMOVERT Master Drives inverter series with a dc link.

A three-phase mains is connected to the input. One or more inverters and a brake chopper can be connected to the DC output. The total of the rated currents of the installed inverters may then exceed the rated current of the common rectifier. It must however be ensured in the course of system planning that at no moment in time is the total of DC load currents greater than the rated DC current of the common rectifier. Feedback to the mains is not possible.

Refer to the technical data in Chapter 14 for details of voltage and current ranges.

## 1.2 Principle of operation

The common rectifier consists of a 6-pulse diode bridge for rectification of the dc network.

Precharging begins as from the point when the mains voltage is applied and is realised by resistors in the dc branch. The precharging resistors are bypassed by relays when the dc link voltage exceeds a given power-on threshold. Within the 15 % mains voltage tolerance, and if the rated ac-side voltage is chosen correctly on selector switch S1 and if the maximum possible capacitive load is observed, precharging takes place within one second. The maximum dc link capacitance of a group drive must not exceed that of a single inverter whose rated current in the dc link corresponds to the rated current of the common rectifier.

Tapping of load current during precharging must be avoided!

Bypassing of the precharging resistors will be interrupted if the dc link voltage should drop below the off threshold as the result of a mains power failure or extreme drops in the mains voltage. This prevents excess currents as the result of charging of the dc link capacitors at too fast a rate when the mains voltage returns.

The common rectifier does not check for an earth fault at the output of a connected converter because the precharging resistors adequately protect its freewheeling diodes against excess current.

Excess temperature of the power section, excess temperature of the precharging resistors, phase failure and the electronic power supply are monitored. Monitoring triggers deactivation and a fault signal in the event of any hazard. The output current is not monitored. Protection against excess currents must be ensured by suitable dimensioning and operation of the connected inverters.

Use of a main contactor or a similarly functioning facility controlled by the fault signalling relay is necessary to ensure safe and reliable operation of the common rectifier.

Fault signals are acknowledged by deactivating the mains voltage or the electronic power supply.

The on and off thresholds for bypassing the precharging resistors are defined by the setting of selector switch S1 on module A23 (see Commissioning).

The power for the electronics is supplied externally via a 24 V DC input.



## 2 Transport, unpacking, assembly

### 2.1 Transport, unpacking

The units are packed at the manufacturing works in conformity with the order. A product packaging plate 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. It 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  $-25\text{ °C}$  ( $-13\text{ °F}$ ) and  $+70\text{ °C}$  ( $158\text{ °F}$ ) are permissible. Temperature fluctuations  $> 20\text{ K}$  per hour are not permissible.

## 2.3 Aids to assembly

The following are required for securing:


- ◆ G rail conforming to EN50035 with screws for securing
- ◆ one M6 bolt
- ◆ dimension drawing (figure 2.2 for size B, figure 2.3 for size C).

	<b>WARNING</b>
	<p>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.</p> <p>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.</p> <p>Non-observance of warning notices can result in death, severe personal injury or considerable property damage.</p> <p>The unit must be protected against the ingress of foreign matter as otherwise proper functioning and safety will not be guaranteed.</p>

### Requirements for the installation site

Local guidelines and standards must be observed in relation to assembly.

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

	<b>WARNING</b>
	<p>Dimension cabinet ventilation according to the dissipated power! (Technical data in Chapter 14)</p>

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 Chapter 2.4.

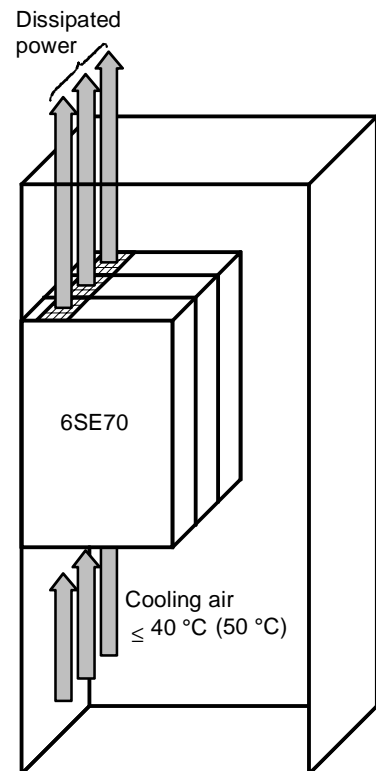


Figure 2.1 Installation in control cabinets

## 2.4 Dimension drawings

- 1) Mounting hole for screw M6.
- 2) Hook (suspension) for mounting on a g-rail according to EN50035
- 3) Space required for cooling the unit.
- 4) Screen connection for two cables.
- 5) Shock-hazard protection
- 6) Connector for power supply DC24V and fault signal

No displacement of the centre of gravity

Weight: approx. 12kg

Dimension: mm

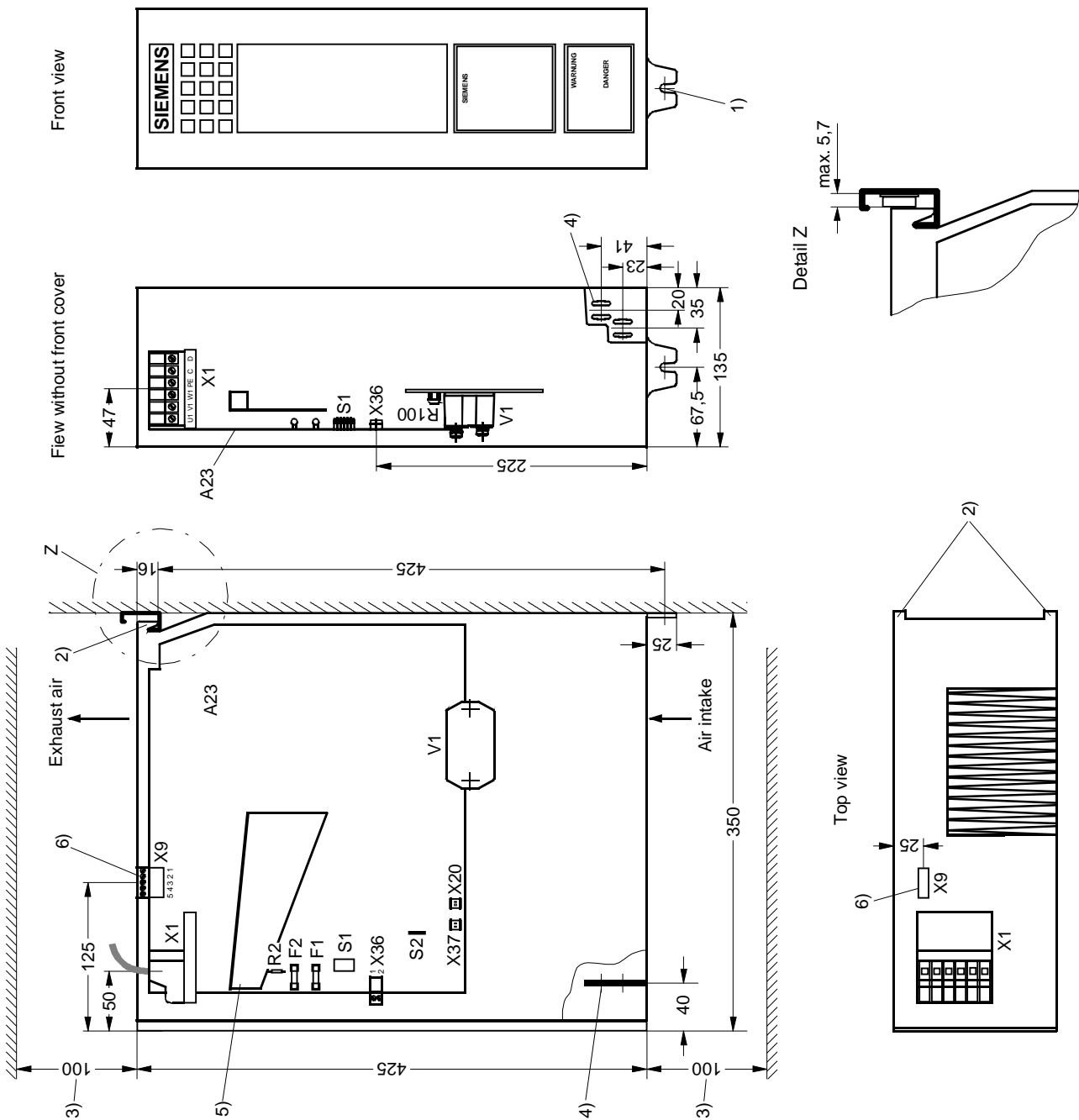


Figure 2.2 Size B

- 1) Mounting hole for screw M6.
- 2) Hook (suspension) for mounting on a g-rail according to EN50035
- 3) Space required for cooling the unit.
- 4) Screen connection for two cables.
- 5) Connector for power supply DC24V and fault signal

No displacement of the centre of gravity  
 Weight: refer to section 14 (technical data)  
 Dimension: mm

Detail Z

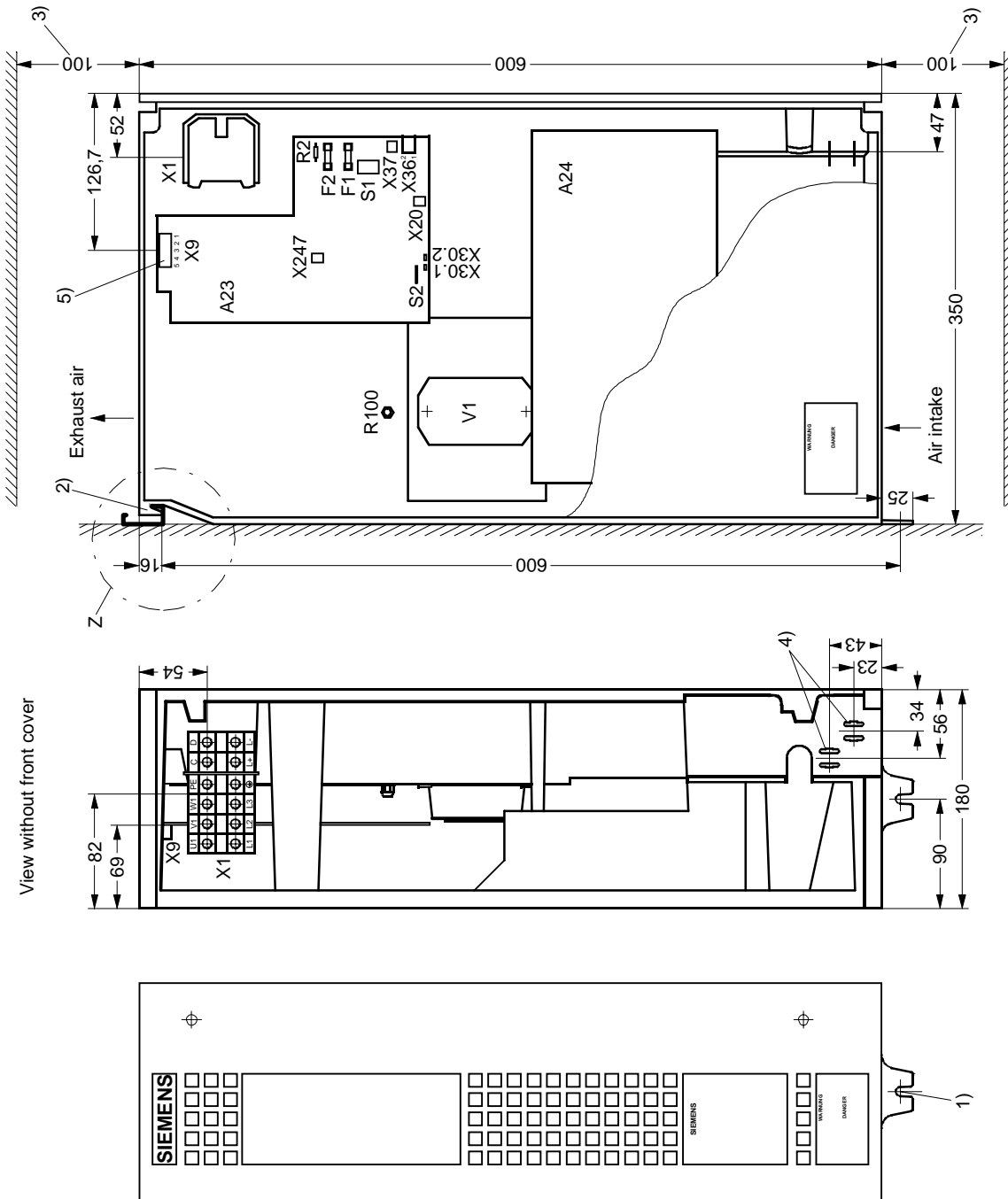
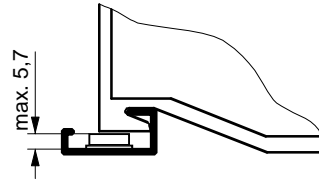
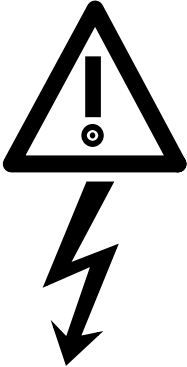


Figure 2.3 Size C


### 3 Connection

	<b>WARNING</b>
	<p>The units are operated with 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.</p>
	<p>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.</p>
	<p>The power terminals and control terminals may carry a voltage even when the motor is at standstill.</p>
	<p>When working on the open unit, pay attention to the fact that live parts are exposed.</p>
	<p>The user is responsible for ensuring that the rectifier unit, converter, motor and other units are installed and connected in accordance with the technical regulations recognised in the country of installation (in Germany: VDE, VBG4) and other regionally valid regulations. In doing so, particular attention must be paid to cable dimensioning, fusing, earthing, deactivation, isolation and overcurrent protection.</p>

NOTES
<p>The choice of components used and the definition of creepage distance and clearances conforms to the specifications for safe isolation of VDE 0160 / prEN 50178.</p> <p>It is the responsibility of the user to take these specifications into account when selecting an external power supply.</p>
<p>An <u>external 24 V power supply</u> is required in order to operate the unit (see Chapters 3.5 and 9.3).</p>



### 3.1 Power connections

	<b>WARNING</b>
	Incorrect connection to the mains will destroy the unit!
	The excitation coils of contactors and relays connected to the same mains network as the unit, or which are located in its proximity, must be wired with surge arresters, e.g. RC networks.
	The unit must not be operated via a current-operated earth-leakage circuit-breaker (DIN VDE 0160).
	A voltage may only be applied to the unit after connecting SIMOVERT Master Drives. Swapping or shorting the dc link terminals will destroy the SIMOVERT Master Drives inverter!

The units are intended for permanent connection to the mains in conformity with DIN VDE 0160 Section 6.5.2.1. PE conductor connection: minimum cross-section 10mm<sup>2</sup>.

The units must be fused on the mains side with semiconductor fuses as detailed in Table 3.2. To avoid retroactive effects on the mains and to limit harmonics, the mains should be connected via a 2 % commutation choke as detailed in Table 3.3. Mains plus commutation activity must be  $\geq 3\% u_k$  (ac load carrying capacity of the dc link capacitors in the inverter). See Table 3.2 for details of order numbers for fuses.

The connection cross-sections given in Table 3.1 were determined for copper cables at 40 °C (104 °F) ambient temperature. Data applies to multiple-wire cables.

The terminals accept the following range of cables:

Type B: 2,5mm<sup>2</sup> to 16mm<sup>2</sup> / AWG 14 to AWG 6

Type C: 10mm<sup>2</sup> to 50mm<sup>2</sup> / AWG 8 to AWG 1/0

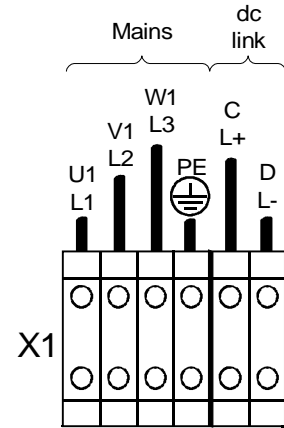


Figure 3.1 Mains connection

Unit order No.	Rated input-		Conductor U1/L1, V1/L2, W1/L3		Conductor C/L+, D/L-		Conductor PE	
	voltage (V)	current (A)	mm <sup>2</sup>	AWG 1)	mm <sup>2</sup>	AWG 1)	mm <sup>2</sup>	AWG 1)
24-1EB85-0AA0	380 to 460	36	16	6	16	6	16	6
28-6EC85-0AA0	380 to 460	74	50	1/0	50	1/0	25	4
24-1FB85-0AA0	500 to 575	36	16	6	16	6	16	6
27-2FC85-0AA0	500 to 575	62	35	2	35	2	16	6
28-8FC85-0AA0	500 to 575	82	50	1/0	50	1/0	25	4

Table 3.1 Mains connection

1) American Wire Gauge

Unit order No.	Mains supply cable fuses					
	Column 1 Siemens gR (SITOR) Preferred type		Column 2 Siemens (SITOR)		Column 3 Bussmann US-standard	
	A	Type	A	Type	A	Type
6SE70						
24-1EB85-0AA0			63	3NE4118	63	170M3610
28-6EC85-0AA0	80	3NE1820-0	125	3NE3222	125	170M3613
24-1FB85-0AA0			63	3NE4118	63	170M3690
27-2FC85-0AA0	80	3NE1820-0	125	3NE3222	100	170M3692
28-8FC85-0AA0	100	3NE1021-0	125	3NE3222	160	170M3693

Table 3.2 Recommended mains fuses

- Column 1: This fuse with gR characteristic protects the semiconductors. At the same time, they also have line protection characteristic which can be used if the appropriate conductor cross-sections are chosen, e.g. in accordance with DIN VDE 0100 Part 430 (to be applied for preference).
- Column 2, 3: Semiconductor protection only, lines are not reliably protected. Discriminative line protection is assured only by correlating the line protection fuses to the installed conductor cross-section in accordance with the applicable regulations - e.g. DIN VDE 0100 Part 430.

Unit order No.	Rated input-		Type	Commutation choke 2 %		Rated current
	voltage	current		Voltage / Frequency		
	(V)	(A)		(V / Hz)	(V / Hz)	
6SE70						
24-1EB85-0AA0	380 to 460	36	4EP3700-2UK	400 / 50	460 / 60	35,5
28-6EC85-0AA0	380 to 460	74	4EP3900-2UK	400 / 50	460 / 60	80
24-1FB85-0AA0	500 to 575	36	4EP3700-1UK	500 / 50		35,5
27-2FC85-0AA0	500 to 575	62	4EP3900-1UK	500 / 50		63
28-8FC85-0AA0	500 to 575	82	4EP4000-1UK	500 / 50		80

Table 3.3 Recommended commutation choke

### 3.2 Power supply / control

#### 3.2.1 Electronic power supply / fault signal

The electronic power supply is not included in the scope of supply of the common rectifier.

Plug-in terminal X9

Terminal X9	Function description	perm. conductor cross-section	
		(mm <sup>2</sup> )	(AWG)
1	DC 24V (tolerance range 20V - 30V) <sup>2)</sup> max. current consumption 2A at +24V max. current consumption without options: size B = 0.5A, size C = 1A	0,2 to 2,5	24 to 14
2	Reference potential	0,2 to 2,5	24 to 14
3	not connected (N.C.)	0,2 to 2,5	24 to 14
4	Fault signal <sup>2)</sup>	0,2 to 2,5	24 to 14
5	Fault signal <sup>2)</sup>	0,2 to 2,5	24 to 14

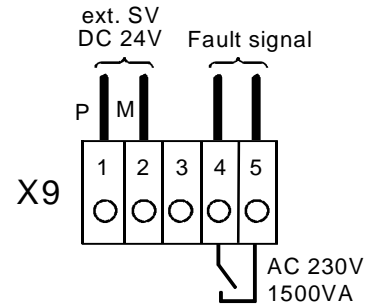


Figure 3.2 DC 24 V power supply and fault signal connection

Table 3.3 Permissible connection cross-sections for the power supply and the fault signal

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

Terminal X9.2 fused with fuse T3,2A/250V träge/time-lag 5x20mm (19198-T3,2A/250V Messrs. Wickmann-Werke GmbH respectively 0034.3998 FSD Messrs. Schurter)

	<b>WARNING</b>
	<p>For safety reasons, we recommend that a master contactor or other device with a similar function is fitted on the mains system side which disconnects the unit from the mains system when the "Fault" contact opens.</p> <p>In cases where a main contactor is fitted, a latching circuit should be provided for this in order to prevent unexpected reclosing after faults.</p>

<b>NOTES</b>
<p>The main contactor's exciter coil must be wired with surge arresters, e.g. an RC network for AC or a diode for DC.</p> <p>The 'Fault' relay contact (terminal X9) must be looped directly or indirectly into the main contactor control. Use of a main contactor is necessary to protect the unit. Connection of a latching relay prevents unexpected activation when the fault is remedied.</p> <p>In the event of phase failure, operation of the main contactor without latching leads to cyclic deactivation and activation of the main contactor because the phase failure signal is suppressed in the event of a mains failure. Mains failure on the unit arises by virtue of the fact that the main contactor drops out in the event of a malfunction.</p>

2) Contacts for switching the main contactor between terminals 4 and 5; switching voltage AC 230V max. AC 3A at cosφ ≥ 0.4; max. switching capacity 1500 VA; at switching voltage DC 30V max. DC 5A

### 3.2.2 Signalling relay X36 ('Warning' signal)

Plug-in terminal X36

Terminals	Function description	perm. conductor cross-section	
		(mm <sup>2</sup> )	(AWG)
X36-1 X36-2	Signalling contacts to switch extra-low voltage between terminals 1 and 2 at a switching voltage of DC 30 V max. DC 5 A, at a switching voltage of AC 60 V max. AC 5 A at $\cos\varphi \geq 0,4$	0,2 to 2,5	24 to 14

Table 3.5 Warning

### 3.2.3 Settings on the module A23:

**R2:** 0Ω resistance as earth - reference potential M connection


On delivery, M is connected to earth. Remove this resistor only to avoid disturbances from earth loops, i.e. if the electronic reference potential is otherwise connected to earth (e.g. via the reference potential connection terminal of the power supply unit. The 0Ω resistor R210 on the A50 module must additionally be removed when using the additional power supply A50 (see Chapter 9.1).

**S1:** Set the rated supply voltage with S1 (Piano DIP switch) (press down the applicable lever). Only one voltage must be selected.

The setting of the system mains voltage on the switch S1 must correspond exactly with the one set on the connected converters, thus guaranteeing a correct bypassing sequence and load current extraction (see Chapter 4, Table 4.1 or 4.2).

**S2:** The status of the bridging relays can be switched through to the "Warning" output (terminal X36) with S2 (DIP-Fix). When S2 is open, the "Warning" relay is opened only in the event of the excess temperature pre-warning.

## 3.3 Control terminal strip of options

	<b>CAUTION</b>
	The unit must be in the deenergised state in order to connect the control lines to X9, X36 and X37.

### ◆ A50 additional power supply PSR for optional modules

Connector X37

Connector X37	Function description
Pin 1	DC 24V connected to terminal X9-1 via a 2A slow-blow fuse
Pin 2	Electronic reference potential connected to terminal X9-2 via a 3.2A slow-blow fuse

Table 3.6 Connection of additional power supply

- ◆ Fan for additional power supply in the case of 36A units (6SE7024-1xB85) (not a customer terminal)

Connector X20

Connector X20	Function description
Pin 1	DC 24V via a controlled voltage limiter
Pin 2	Reference potential

Table 3.7 Fan connection

- ◆ Connecting control lines of optional modules (in preparation)

**NOTE**

When installed, control lines must be shielded and isolated from the power cables, laying them at a minimum distance of 20 cm. The shield must be connected on both sides. On the unit's housing, the shield is connected with shield clamps. Handling of these clamps is shown in Figure 3.3.

When they intersect, control and power cables must be laid at an angle of 90°.

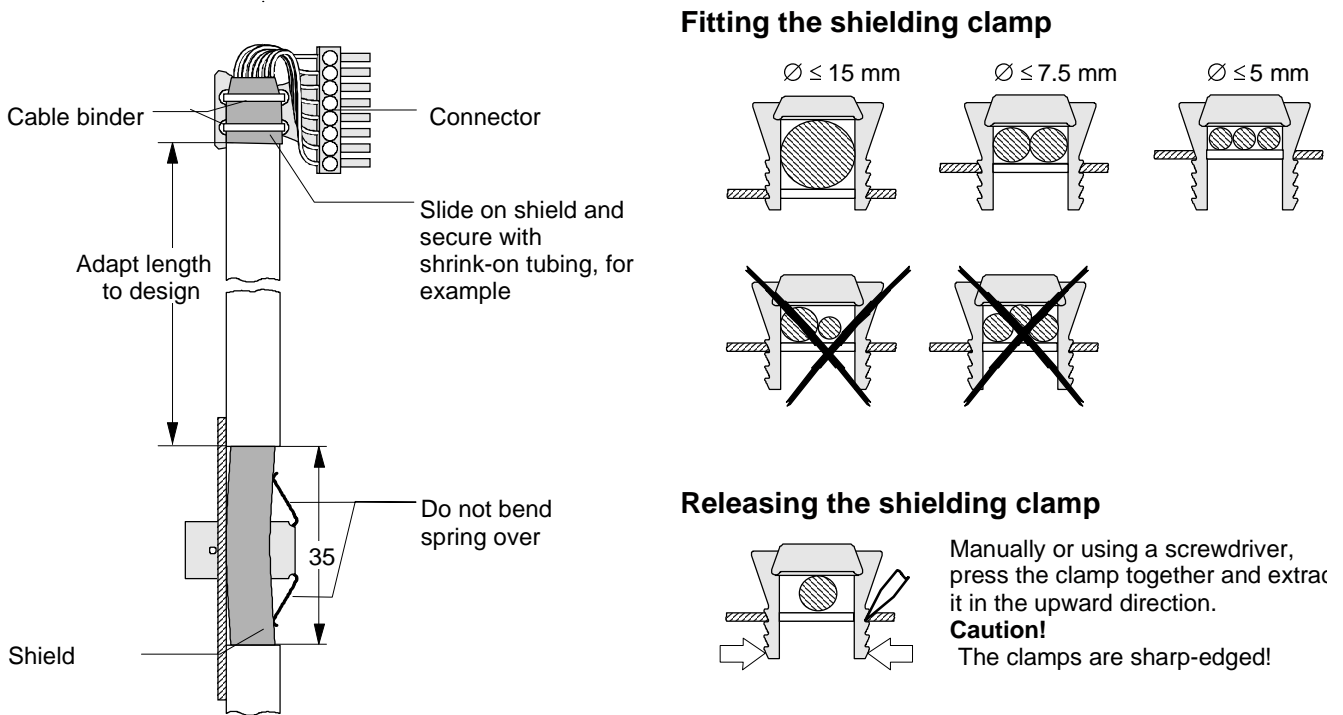


Figure 3.3 Connecting the control lines and handling the shielding clamps

Use must be made of the 'EMC shielding housing' option if so many control lines are needed that two shielding clamps are not enough.

Order numbers:

- ◆ Design B 6SE7090-0XB87-3CA0
- ◆ Design C 6SE7090-0XC87-3CA0

### 3.4 Measures for keeping to RFI suppression regulations

The following points must be observed in order to comply with the radio-frequency interference suppression requirements:

- **Grounding**

Radio frequency interference results from operation of the converters. Such interference voltages should be returned to the source by means of low-resistance connections (cross-section of the ground connection  $\geq$  cross-section of the power supply system connection).

On installation of the power supply unit and of any optional RFI filters use should be made of the best available method of grounding (e.g. mounting plate, earthing wire, earthing bus). Connect all conductive housings together so as to make contact over a large area.

Not only the cross-section (governed also by the safety regulations which should be observed to obviate the effects of a fault) but also the contact surfaces are of vital importance for RFI suppression, since high frequency interference currents do not flow through the entire cross-section but mainly on the outer surface of the conductor.

- **Shielding**

The following measures are required in order to attenuate interference and to meet the RFI suppression requirements

- use of shielded cable between the output of the converter and the motor and
- use of shielded control cables.

The shield must be connected to earth potential at both ends.

- **Filters**

The RFI suppression filters must be connected directly before the power supply unit. The housings must be interconnected by means of an electrically conductive connection.

Type A1 RFI suppression filters are recommended for compliance with the RFI suppression requirements.

### 3.5 Single-line diagrams with suggested circuit arrangements

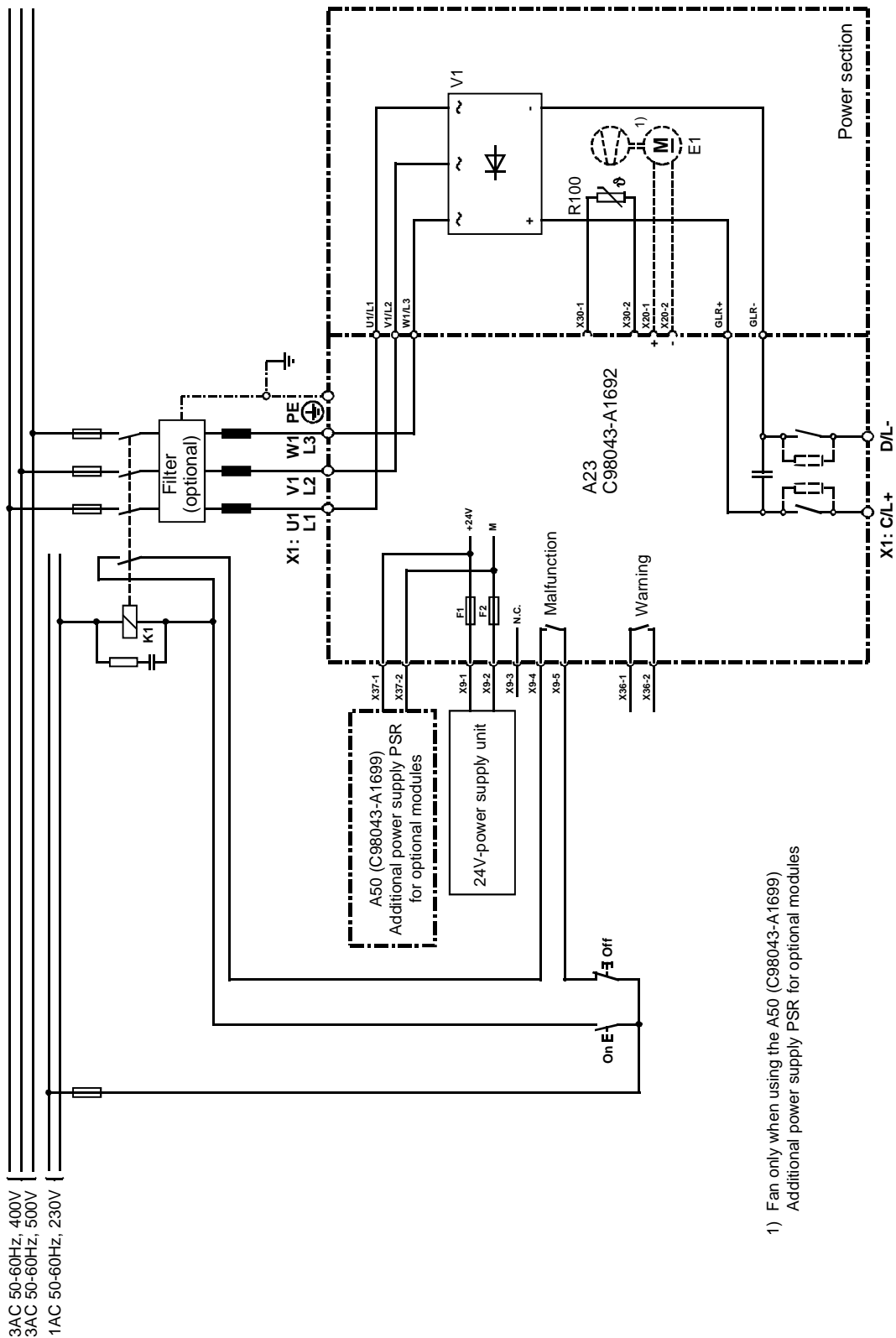


Figure 3.4 Single-line diagram with suggested circuit arrangement, size B

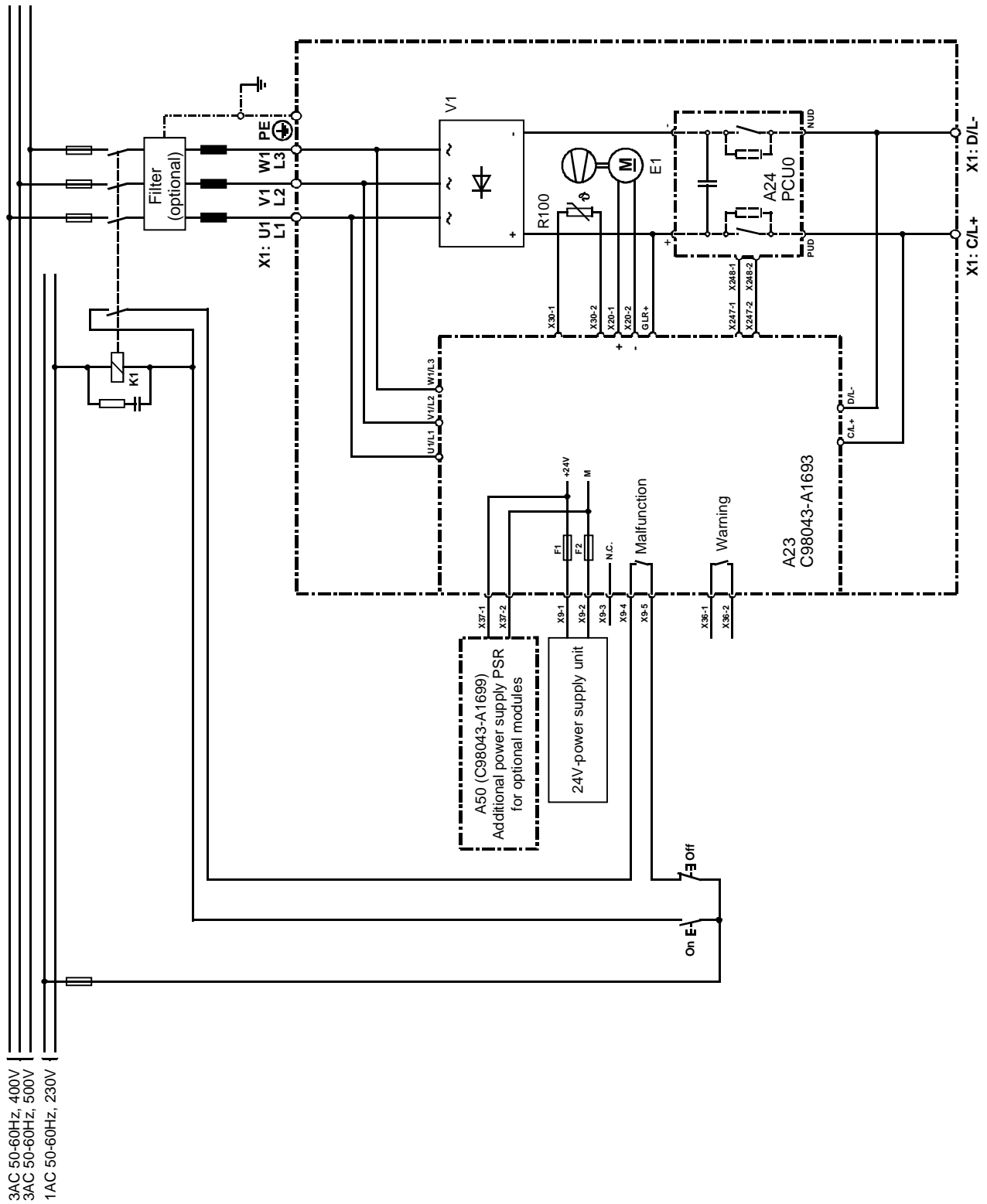


Figure 3.5 Single-line diagram with suggested circuit arrangement, size C



### 3.6 Power sections

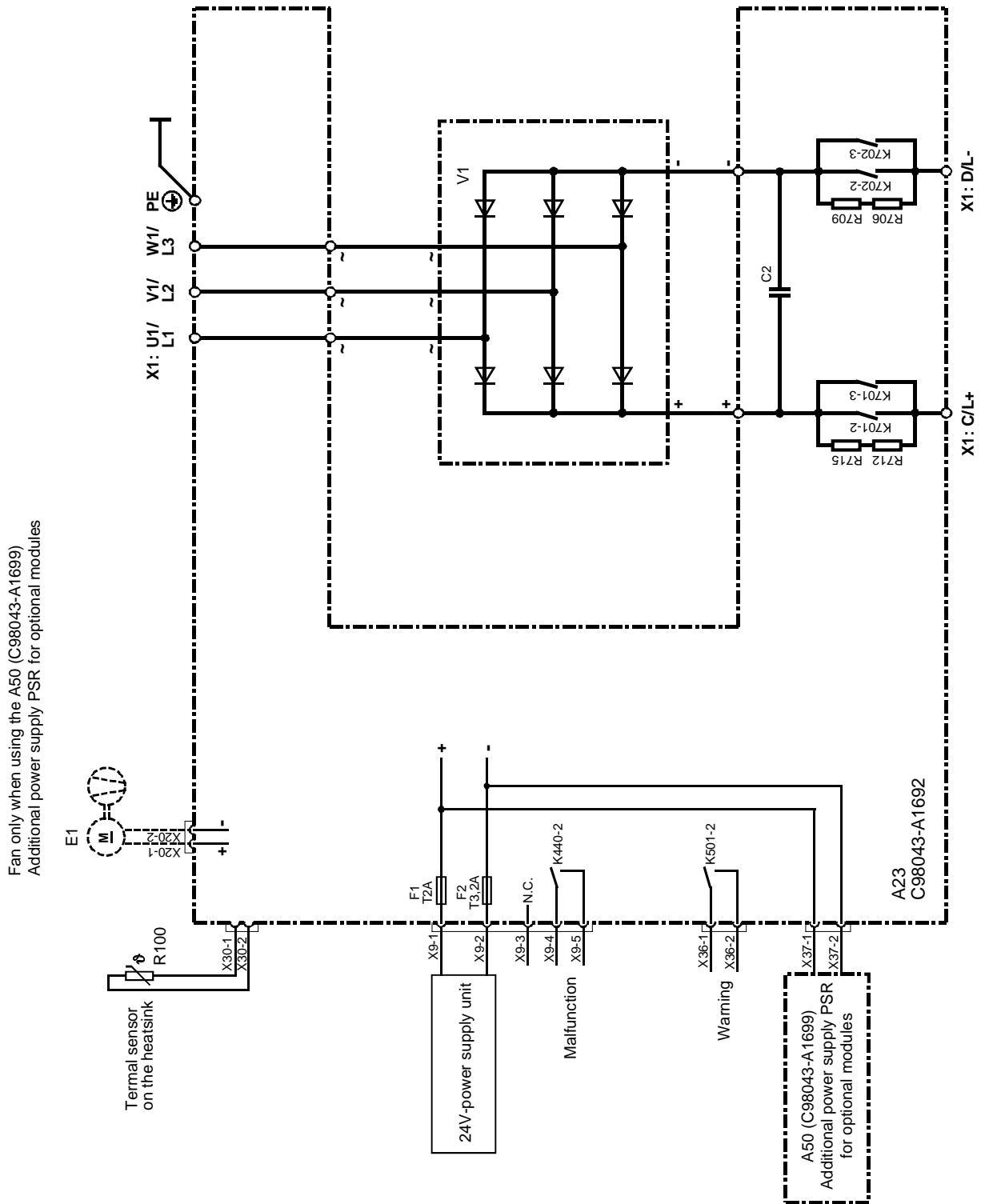


Figure 3.6 Power section, size B

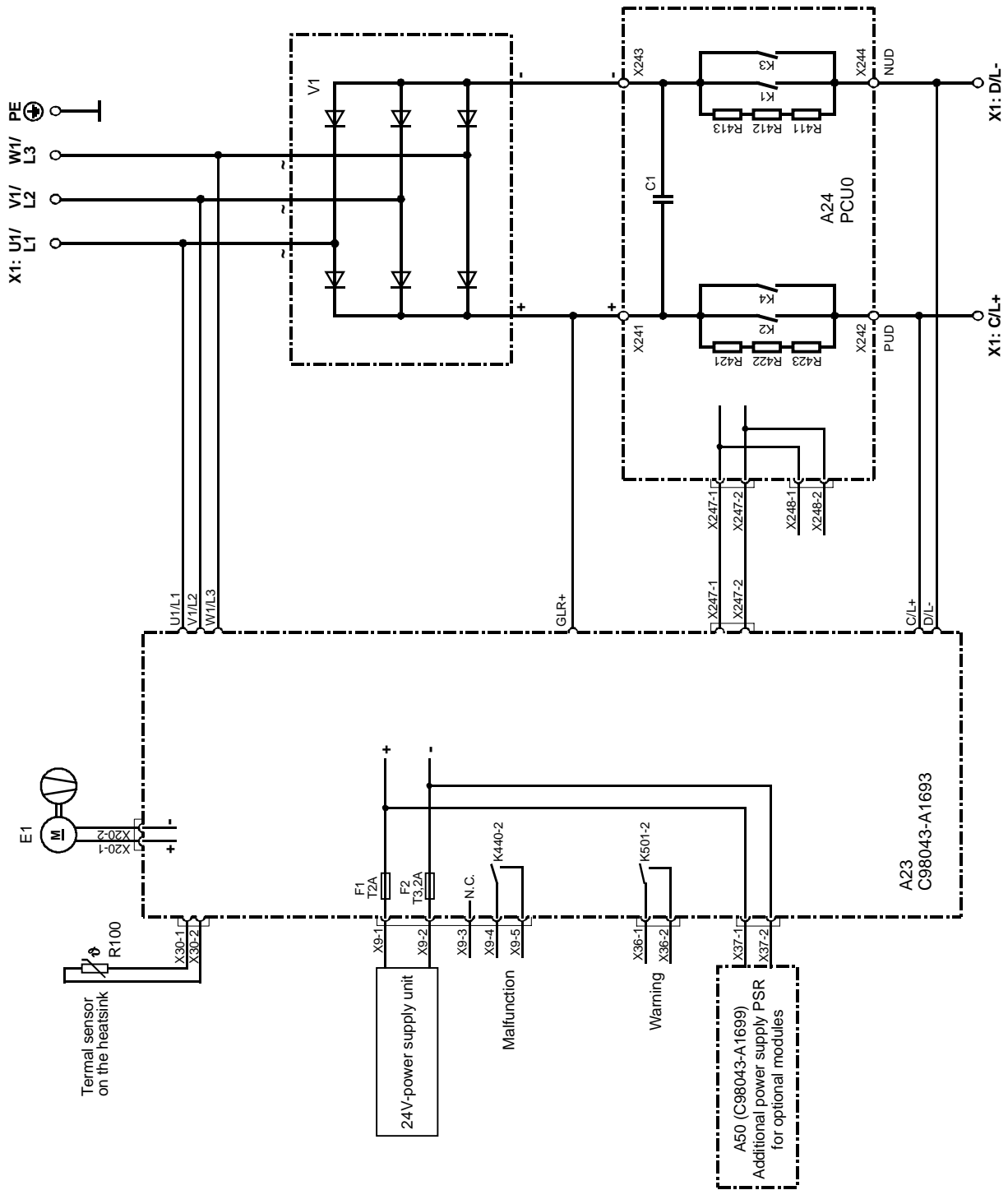
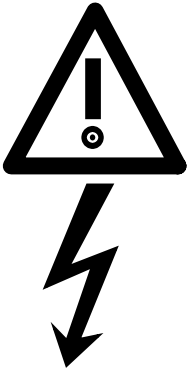


Figure 3.7 Power section, size C



## 4 Start-up

	<b>WARNING</b>
	The units 6SE70 are operated with high voltages.
	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.
	Owing to the dc link capacitors, a hazardous voltage still prevails inside the unit for up to 5 min. after deactivation. This is why it is only permitted to open the unit after a corresponding waiting period.
	When working on the open unit, pay attention to the fact that live parts are exposed.
	Even when the motor is at standstill, the following parts of the unit may be carrying a live voltage: - the mains connection terminals U1/L1, V1/L2 and W1/L3 - the output terminals C/L+ and D/L- - the terminals of the control terminal strip
The user is responsible for ensuring that the rectifier unit, converter, motor and other units are installed and connected in accordance with the technical regulations recognised in the country of installation (in Germany: VDE, VBG4) and other regionally valid regulations. In doing so, particular attention must be paid to cable dimensioning, fusing, earthing, deactivation, isolation and overcurrent protection.	

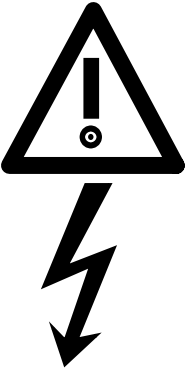
### NOTES

If there are high capacitances (noise suppression capacitors) between the star point of the mains (earth) and the dc link, and the dc link is unloaded, it may charge up by  $\sqrt{2}$  more than is normally the case.

In the event of an earth fault at the converter output, the current through the freewheeling diodes of the converters is adequately limited by the precharging resistors during the precharging process. The connected converters automatically detect earth faults during operation of the inverter.

In the event of phase failure, operation of the main contactor without latching leads to cyclic deactivation and activation of the main contactor because the phase failure signal is suppressed if a mains failure should occur. The mains failure on the unit results from dropping out of the main contactor in the event of a fault.

The fan is only activated if the precharging resistors are shorted.

	<b>WARNING</b>
	<p>The rated ac-side voltage setting on the switch S1 must correspond exactly with the voltage set on the connected converters, thus guaranteeing the correct sequence of bypassing and load current extraction.</p> <p>If the rated ac-side voltage is set too high, the end of precharging is not reached when one of the connected converter is tapping load current adequately. Consequently, the precharging resistors get overheated and the unit switches off with a 'Fault' signal. The bypassing relays also open too early in the event of mains voltage drops and may be damaged by dc arcs.</p> <p>If the rated ac-side voltage is set too low, the precharging resistors are bypassed too early and an overcurrent pulse occurs which may lead to damaging of the rectifier, the relay contacts and the fuses.</p> <p>When using parallel converters, it is imperative to connect the positive and negative poles (C/L+ and D/L-) of the dc link correctly because its freewheeling diodes are not adequately protected against excess currents by the fuses of the common rectifier.</p> <p>Operation without a main contactor or a similarly functioning device that isolates the unit from the mains when the 'Fault' contact opens is not permissible and may lead to damaging of the unit.</p> <p>To prevent unexpected activation after malfunctions, it is necessary to wire a latching circuit for the main contactor.</p> <p>A voltage must be selected with the switch S1 as otherwise the fuse will drop out.</p>

Precharging begins as from the point when the mains voltage is applied and is ended by bridging of the precharging resistors when  $U_d$  exceeds the On threshold.

When  $U_d$  falls below the Off threshold, bridging of the precharging resistors is ended and the unit is again in the precharging state.

Rated ac-side voltages  $U_n \pm 15\%$  (see first column of the following tables)

Rated voltage $U_n$ chained in $V_{rms}$ (A.C.)	Nominal dc link voltage values $U_{nd}$ in V= (set parameter P071 on the SIMOVERT Master Drive)	On threshold of $U_d$ in V=	Off threshold of $U_d$ in V=
<b>460</b>	<b>605</b>	508	419
<b>440</b>	<b>578</b>	486	400
<b>415</b>	<b>545</b>	458	378
<b>400</b>	<b>526</b>	442	364
<b>380</b>	<b>500</b>	420	346
<b>230</b>	<b>302</b>	254	209

Table 4.1 On and off thresholds for units 6SE70xx-xEx8x

Rated voltage $U_n$ chained in $V_{rms}$ (A.C.)	Nominal dc link voltage values $U_{nd}$ in V= (set parameter P071 on the SIMOVERT Master Drive)	On threshold of $U_d$ in V=	Off threshold of $U_d$ in V=
600	789	663	546
575	756	635	523
525	690	580	478
500	657	552	455

Table 4.2 On and off thresholds for units 6SE70xx-xFx8x

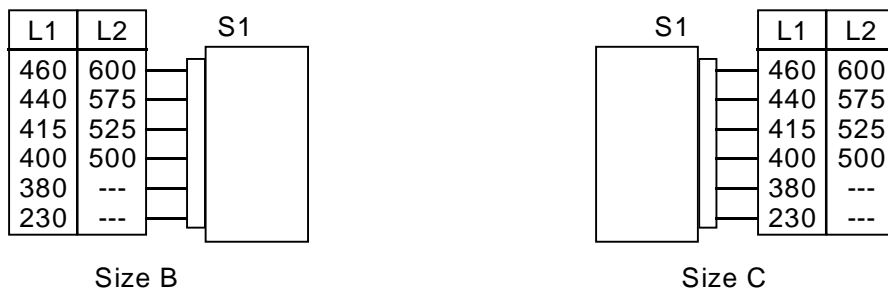


Figure 4.1 Selector switch S1

**The following commissioning steps must be carried out after connecting the unit (as detailed in Chapter 3):**

- ◆ Set the rated mains voltage with S1 (Piano DIP switch) (press the corresponding lever of the switch towards the module). Only one voltage must be selected.  
Works setting:     for 380-460V units = 400V  
                          for 500-575V units = 500V
- ◆ The status of the bridging relays can be switched through to the "Warning" output (terminal X36) with the jumper S2 (DIP-Fix). When S2 is open, the "Warning" relay is opened only in the event of the excess temperature pre-warning.  
Works setting:     S2 open
- ◆ Switch on the mains and electronic power supply.
- ◆ Enable the converter.



# 7 Malfunctions and warnings

## 7.1 Fault signals

The fault relay K440 at terminals X9-4 and X9-5 interrupts. The fault is not stored in the unit.

Possible cause	Remedy
Electronic power supply is less than DC 18 V	Check electronic power supply of 20 to 30 V; check fuses F1 and F2.
No rated ac-side voltage selected on S1	One lever on S1 must be pressed towards the pc board
Several rated ac-side voltages selected on S1	Only one lever on S1 must be pressed towards the pc board.
Phase failure for more than 1 second	Check the mains.
Overloading of the precharging resistors by excessive dc link capacitance or load current tapping during precharging or too frequent precharging in a short time	Correctly set the rated ac-side voltage on S1 and adjust all connected converters properly; check coordination of the build-up of the dc link voltage and load current tapping as well as the sum of the dc link capacitances.
Excess temperature of the power section Switching threshold = 90°C ±5°C	Reduce current extraction; check the air throughput (fan); check the ingoing air temperature.

A fault signal is issued immediately via K440 if one of these faults occurs (the unit must then be isolated from all 3 phases of the mains). The unit does not store or indicate the fault.

It is advisable to wire the main contactor as described in the connection suggestion in Chapter 3.5.

The fault is registered by a fault acknowledgement on the latching circuit of the main contactor or a similarly functioning facility. Precharging begins immediately again after the mains voltage has been applied.

## 7.2 Warning signals

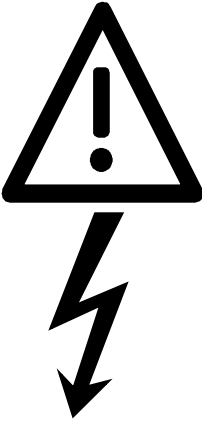
Warning relay K501 at terminals X36-1 and X36-2 interrupts.

Cause	Remedy
Excess temperature of the power section prewarning Switching threshold = 6°C below the fault signal threshold (90°C ±5°C)	Reduce current extraction; check the air throughput; check the ingoing air temperature.
If the DIP-FIX switch S2 is closed, a warning is also issued during precharging.	Open DIP-FIX switch S2.





## 8 Maintenance

	<b>WARNING</b>
	<p>The units SIMOVERT Master Drives are operated with high voltages.</p> <p>All work on the unit must be carried out in agreement with the national electrical regulations (in Germany: VBG 4).</p> <p>Maintenance and repair work must only be carried out by qualified personnel.</p>
	<p>Use must only be made of spare parts approved by the manufacturer.</p> <p>It is imperative to observe the prescribed maintenance intervals and the repair and replacement instructions.</p> <p>Owing to the dc link capacitors, hazardous voltages still prevail in the unit up to 5 min. after deenergisation (power terminal and electronic power supply). This is why it is only permitted to open the unit after a corresponding waiting time.</p> <p>The power and control terminals may still be live even in the even of motor standstill.</p>
	<p>If work on the activated unit is necessary:</p> <ul style="list-style-type: none"> <li>◆ do not touch any live parts.</li> <li>◆ use only proper measuring equipment and protective work clothing.</li> <li>◆ stand or sit on an unearthed and isolated surface that does justice to ESD requirements.</li> </ul> <p>Non-observance of warning notices can result in death, severe personal injury or considerable property damage.</p>

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.

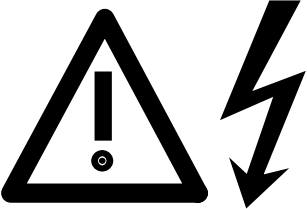
### 8.1 Maintenance recommendations

Dust deposits inside the unit must be removed at least once annually by qualified personnel. If required, cleaning must take place at shorter intervals. The unit must be cleaned with a brush and vacuum cleaner and in inaccessible locations with dust-free dry compressed air at a maximum of 1 bar.

The DC-24V fan is designed for an operating life of 35 000 hours at an ambient temperature of 40 °C. It must be replaced in good time to maintain the availability of the unit.

## 8.2 Replacing components

### 8.2.1 Replacing the fan

	<b>WARNING</b>
	<p>The fan must only be replaced by qualified personnel.</p> <p>Owing to the dc link capacitors, a hazardous voltage prevails for a further 5 min. after deenergisation.</p> <p>Non-observance of warning notices can result in death, severe personal injury or considerable property damage.</p>

#### Sizes B and 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.

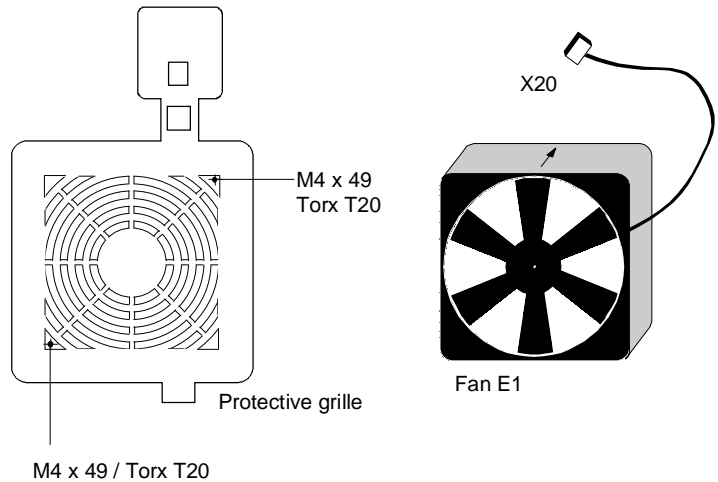
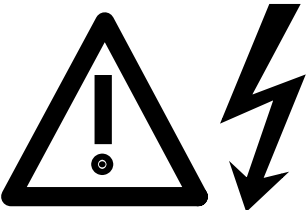



Figure 8.1 Protective grille and fan (24 V) for sizes B and C

### 8.2.2 Replacing modules

	<b>WARNING</b>
	<p>Modules must only be replaced by qualified persons.</p> <p>Modules must not be removed or inserted under a live voltage.</p> <p>Non-observance of warning notices can result in death, severe personal injury or considerable property damage.</p>
	<b>CAUTION</b>
	<p>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.</p>

### 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.

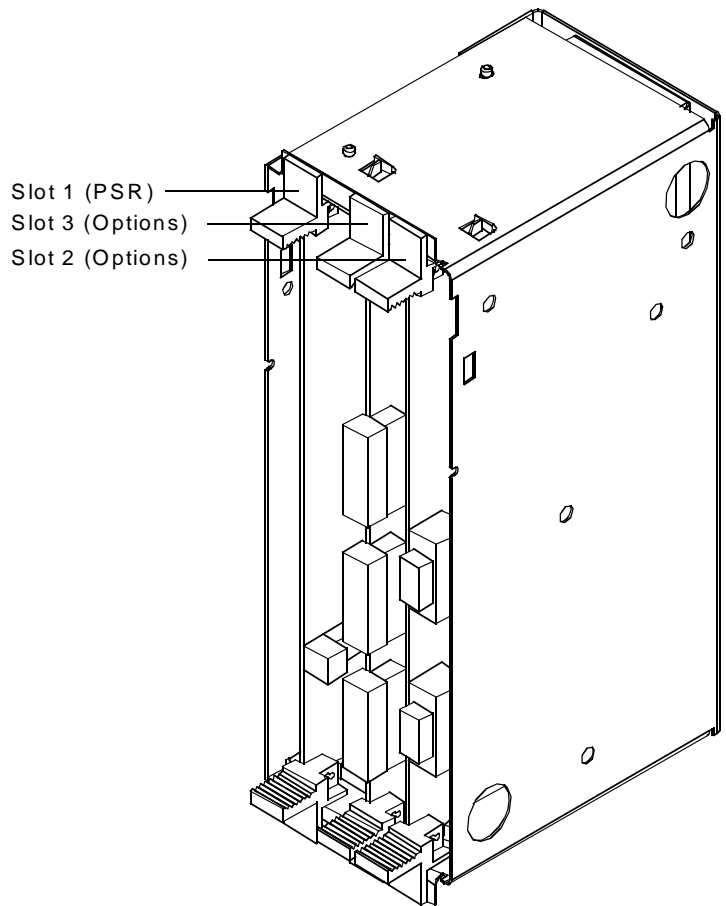


Figure 8.2 Electronics box, equipped with PSR (slot 1) and options (slots 2 and 3)

### 8.2.3 Replacing bridge rectifiers V1

The bridge rectifier is secured with self-tapping screws. When replacing the bridge rectifier, it is imperative to use original-length screws with locking elements to secure it. Also use original-length screws when screwing the bridge rectifier to the connecting cables.




# 9 Options

## 9.1 A50 additional power supply PSR for optional modules Z = K90

Spare part order no.: 6SE7090-0XX85-0KA0

The additional power supply A50 is connected to the module A23 by means of a 2-pole cable and inserted on the left in slot 1. The module is secured on the electronics box by means of the screws of the extraction aid (earth-reference potential connection: see Chapter 3.2.3).

	<b>CAUTION</b>
	The maximum total power that can be extracted is 19 W (taking into account the maximum consumption of the common rectifier and common 2 A fuse for the DC 24 V power supply on the module A23).

### Output voltages and possible currents at the corresponding pins of connector X107

Designation	Voltage	Current	Overload protection	Tolerance
P5	+5 V	0 to 3.5 A	Current limiting	± 2%
P15	+15 V	0 to 0.8 A (0.65A <sup>1)</sup> )	Current limiting	± 3%
N15	-15 V	0 to 0.33 A (0.3A <sup>1)</sup> )	Current limiting	± 3%
P24_AUX	+24 V	0 to 0.2 A	NTC thermistor	Corresponds to the DC 24V power supply

Table 9.1 Output voltages and possible currents of additional power supply

### Input

#### Plug-in terminal X37 on A50 (corresponds to the output plug connector X37 on A23):

Terminal	Function description
1	DC 24V power supply tolerance: 20V - 30V (fused with 2 A slow-blow on module A23)
2	Reference potential (fused with 3.2 A slow-blow on module A23)

Table 9.2 Connection of additional power supply

1) maximum load current on switch-on

## 9.2 Options which can be integrated into the electronics box

One or two option boards, listed in Table 9.3, can be inserted in the electronics box using the LBA option (local bus adapter).

The options are supplied with the option description.

Designation	Description	Order No.	
		Board description	
LBA	Local bus adapter for the electronics box. This is required for installing T300, CB1, TSY, SCB1 and SCB2	Board description	6SE7090-0XX84-4HA0 6SE7080-0CX84-4HA0
T100	Technology board	Board description	6SE7090-0XX87-0BB0 6SE7080-0CX87-0BB0
T300	Technology board for controlling technological processes	Board description	6SE7090-0XX84-0AH0 6SE7080-0CX84-0AH0
SCB1	Serial communications board with fiber-optic cable for serial I/O system and peer-to-peer connection	Board description	6SE7090-0XX84-0BC0 6SE7080-0CX84-0BC0
SCB2	Serial communications board for peer-to-peer connection and USS protocol via RS485	Board description	6SE7090-0XX84-0BD0 6SE7080-0CX84-0BD0
	Use of the serial interface with USS protocol	Application description	6SE7087-6CX87-4KB0
CB1	Communications board with interface for SINEC- L2-DP, (Profibus)	Board description	6SE7090-0XX84-0AK0 6SE7087-0CX84-0AK0
	Use of the PROFIBUS DP interface	Application description	6SE7087-6CX87-0AK0

Table 9.3 Option boards and bus adapter

### Electronics box

Slots in the electronics box		Boards
Left	Slot 1 (PSR)	PSR
Center	Slot 3 (options)	CB1 / SCB1 / SCB2
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / T100 / T300
<b>NOTE</b>		
<p>Only one of each option board type may inserted in the electronics box.</p> <p>TB (technology boards, e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board may not be inserted.</p> <p>If only one option board is used it must always be inserted at slot 2.</p> <p>Option board Order Nos. and their descriptions are found in Section 9 "Options".</p>		

Table 9.4 Slots in the electronics box

### Current input of DC 24V power supply:

The figures are required in addition to the 1A consumed by the basic unit.

(In case of size B, the demand of the basic unit increases from 0,5A to 1A, owing to the fan required).

Boards	Current drain (mA) 24V DC supply
CB1	190
SCB1	50
SCB2	150
T100	550
T300 without tachometer	620

Table 9.5 Current drain of the option boards

## 9.3 Power Supply

A SITOP power supply as described in Catalog KT10 is recommended for the common rectifier (connector X9).

## 9.4 Actual-current sensing module Z = K91

Order-No. for retrofit assembly: 6SE7090-0XC85-1TD0

Unit Size	Jumper	I <sub>rated output</sub>	R <sub>i total</sub>
		[A]	[Ω]
E	J14	605	33,222
	J13	536	37,507
	J12	463	43,432
	J11	420	47,886
	J10	375	53,647
	J9	354	56,849
	J8	270	74,557
	J7	235	85,677
	J6	222	90,720
	J5	173	116,421
	J4	142	141,887
B and C	J3	94	214,464
	J2	86	234,523
	J1	72	280,230
	keine	41	492,381

Table 9.6 Jumpers for actual-current sensing module

The compliance voltage at the rated output current is 10V.

The transformation ratio of the current transformers is 2000 : 1

Source resistance R<sub>i total</sub> as per table.

### NOTE

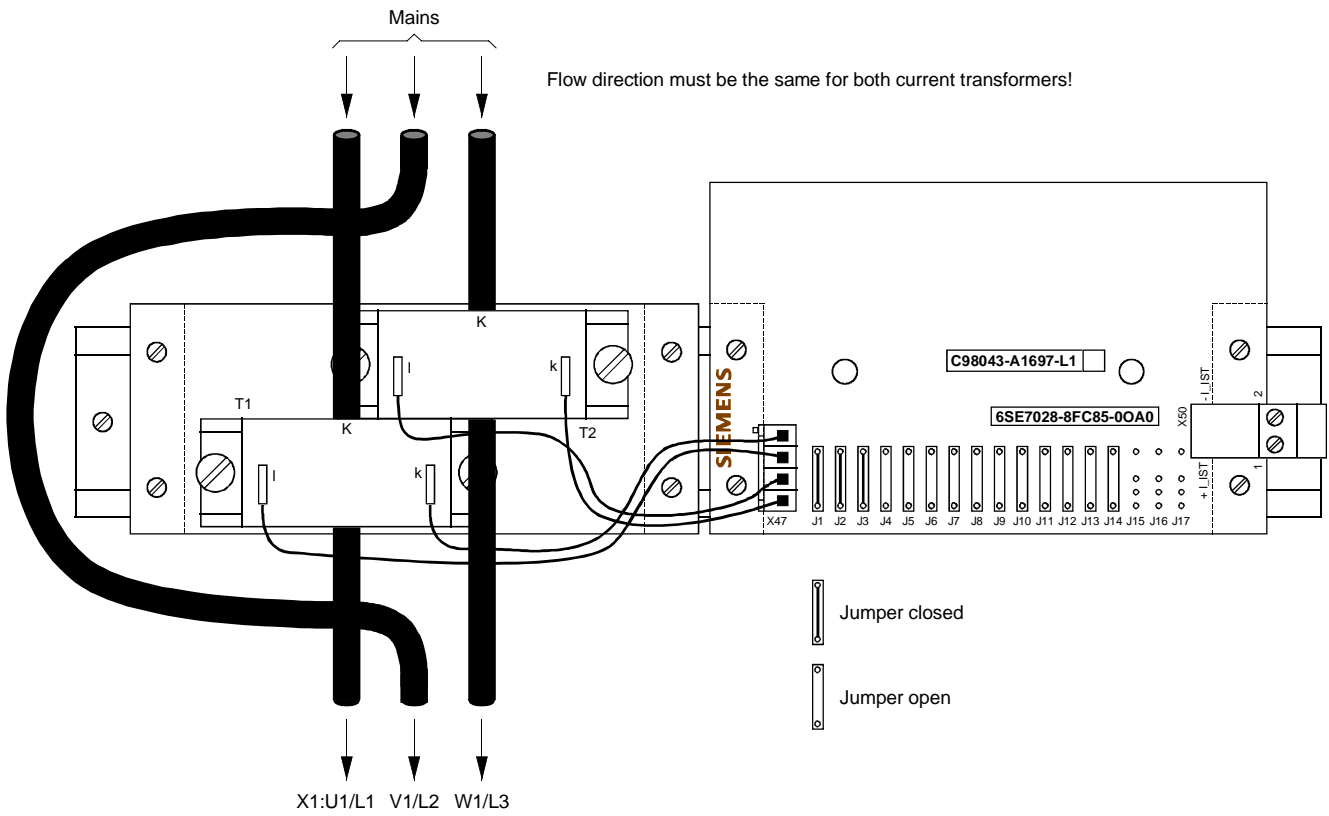
When measuring equipment is connected to the unit, the effective load impedance and thus the voltage will vary in accordance with the internal resistance of the equipment.

For the lowest rated output current of 41A, all the jumpers (J1 to J14) should be open. For the maximum rated output current with units Sizes B and C, 94A, jumpers J1 to J3 should be closed and J4 to J14 open.

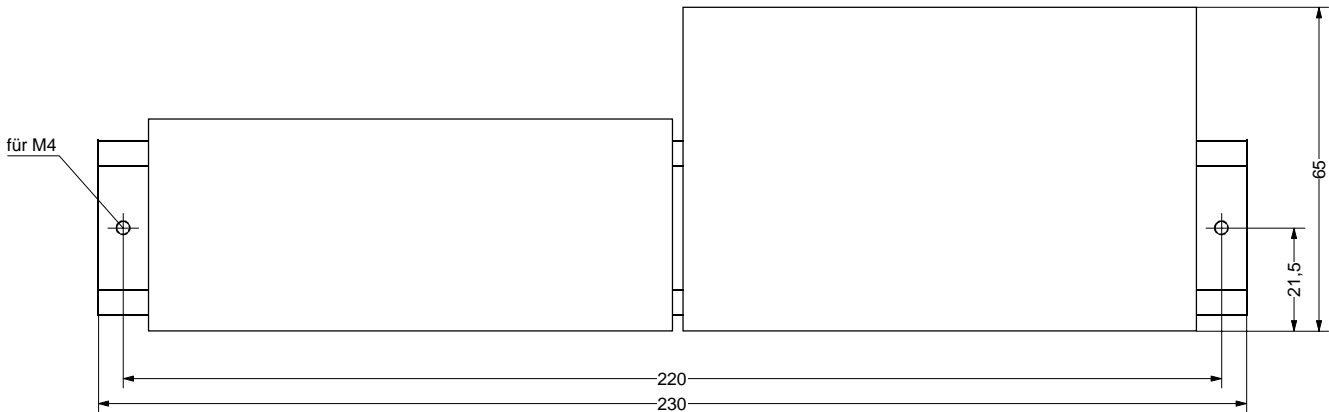
Example: For a unit with a rated output current of 86A, jumper J3 should be open.



The units are dispatched from the factory with the jumpers (J1 to J3) on the board 6SE7028-8FC85-00A0 closed. Before start-up the unit, therefore, the jumpers should be positioned as appropriate to the rated output current (see rating plate) and accordance with Table 9.6.



Dimension drawing:



### 9.5 Mechanical components

Order code for option	Description	Retrofit assembly Order No.
Z = M08	Boards painted on both sides	Factory option only

Table 9.7 Mechanical options

# 10 Spare parts

For common rectifiers, sizes B and C

Equipment identifier	Designation	Order number	Used in
-A23	Resistor precharging pc board	6SE7024-1EB85-0FA0	6SE7024-1EB85-0AA0
		6SE7024-1FB85-0FA0	6SE7024-1FB85-0AA0
-A23	Control pc board	6SE7028-6EC85-0CA0	6SE7028-6EC85-0AA0
		6SE7028-8FC85-0CA0	6SE7027-2FC85-0AA0 6SE7028-8FC85-0AA0
-A24	Precharging pc board PCU0	6SE7024-7FD84-1HH0	6SE7024-1FB85-0AA0 6SE7027-2FC85-0AA0 6SE7028-8FC85-0AA0
-E1	Fan	6SY7000-0AA48	all unit types <sup>1)</sup>
-V1	Bridge rectifier	6SY7010-1AA01	6SE7024-1EB85-0AA0
-V1	Bridge rectifier	6SY7010-1AA02	6SE7024-1FB85-0AA0
-V1	Bridge rectifier	6SY7010-1AA03	6SE7028-6EC85-0AA0
-V1	Bridge rectifier	6SY7010-1AA04	6SE7027-2FC85-0AA0
-V1	Bridge rectifier	6SY7010-1AA05	6SE7028-8FC85-0AA0
-F1	Fuse link	6SY7010-2AA01	all unit types
-F2	Fuse link	6SY7010-2AA02	all unit types
-R100	NTC thermistor	6SY7010-6AA01	all unit types

Table 10.1 Spare parts

1) optional in the case of 36A units (6SE7024-1xB85)



# 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
	PP:	hinge insulating plate handle bus retrofit
	PA6:	insulating films terminal housing

On all essential parts, flame retardants containing halogen and insulating material containing silicone have been substituted by materials that are devoid of noxious substances.

Environmental compatibility was an important criterion in the selection of externally sourced items.

## Environmental aspects during production

Externally sourced items are mainly transported in returnable packaging. The packaging material itself is recyclable, consisting mainly of cardboard.

With the exception of the hot galvanised side plate, surface coatings have been dispensed with.

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 plastic parts are marked in conformity with DIN 54840 and bear 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 inverter connected)	1	DIN VDE 0160 / 04.91
Type of protection		
– Standard	IP20	DIN VDE 0470 Part1 / 11.92 $\triangleq$ EN 60529
Interference immunity		IEC 801-2, IEC 801-4
Mechanical strength		DIN IEC 68-2-6 / 06.90

	Frequency range	Constant Amplitude of	
	Hz	deflection mm	acceleration m/s <sup>2</sup> (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.

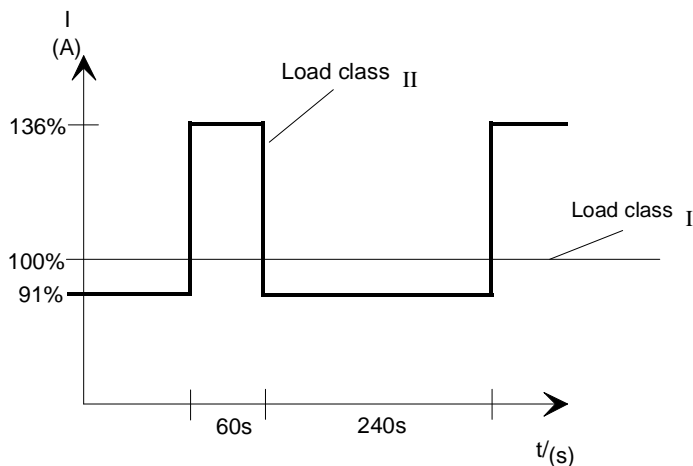


Figure 14.1 Power output according to load class II

Common rectifier	6SE70..-.....0AA0	24-1EB85	28-6EC85		24-1FB85	27-2FC85	28-8FC85
<b>Rated voltage, rated frequency, rated current, rated power</b>							
Rated voltage Input $U_n$ Output $U_{dn}$	V	3 AC 380 to 460V $\pm 15\%$ <sup>1)</sup> DC 510 to 620V $\pm 15\%$			3 AC 500 to 575V $\pm 15\%$ DC 675 to 780V $\pm 15\%$		
Rated frequency $f_n$ Input Output	Hz	46 to 64 D.C.					
Rated current $I_n$ Input (rms value) AC Output (average) DC	A	36 41	74 86		36 41	62 72	82 94
<b>Load class II acc. EN 60146-1-1</b>							
Rated output current average	A	37	78		37	66	86
Base load duration	s	240					
Excess output current average	A	56	117		56	98	128
Excess current duration	s	60					
<b>Losses, cooling, power factor</b>							
Power factor Mains $\cos\phi_{1N}$		1					
Power dissipation – Maximum	kW	0,12	0,26		0,12	0,22	0,28
Cooling air requirement	m <sup>3</sup> /s	0,022 <sup>2)</sup>	0,028		0,022 <sup>2)</sup>	0,028	0,028
<b>Sound pressure level, dimensions, weight</b>							
Sound pressure level of fan	dB(A)	60 <sup>2)</sup>	60		60 <sup>2)</sup>	60	60
Size		B	C		B	C	C
Width	mm	135	180		135	180	180
Height (without securing bracket)	mm	425	600		425	600	600
Depth	mm	350	350		350	350	350
Weight app.	kg	12	18		12	18	18

1) 3AC 208 to 230V Input voltage: see Chapter 4 Commissioning

2) optionally with additional power supply

## 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.

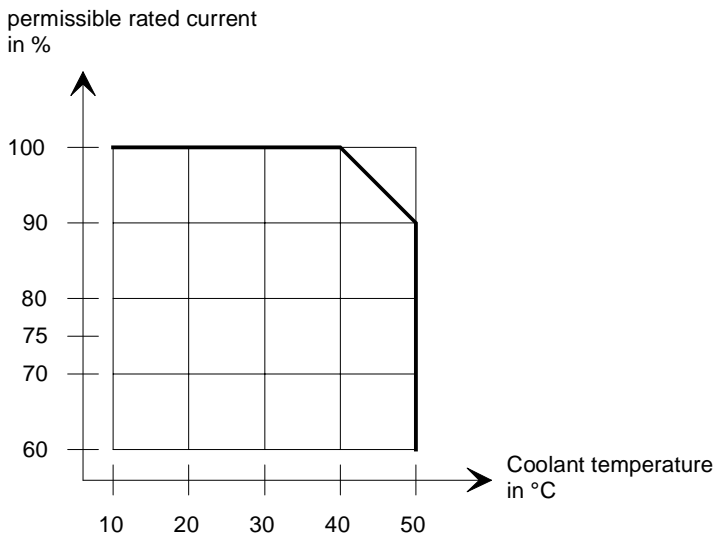


Figure 14.2 Maximum permitted rated current depending on coolant temperature

## 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)

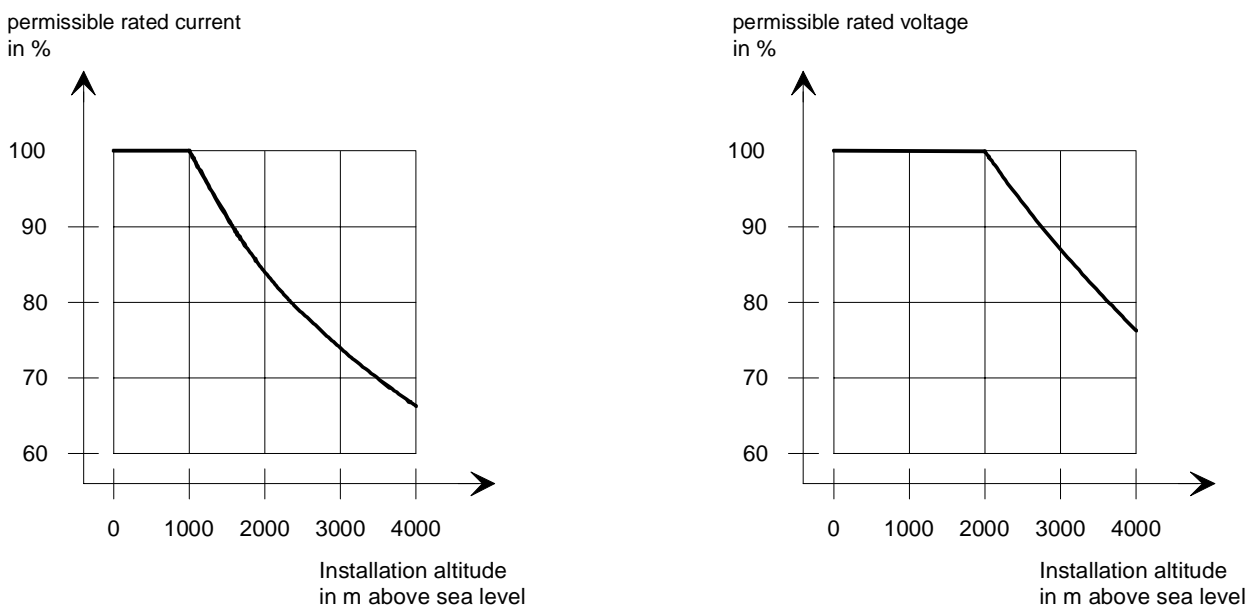


Figure 14.3 Maximum values for rated current and rated voltage depending on installation altitude



## 14.3 Applied standards

DIN VDE 0100	Part 540 A11.91	Erection of power installations with rated voltages up to 1000 V, Selection and erection of electrical equipment, earthing, PE conductor, equipotential bonding conductor
DIN VDE 0106	Part 1 A05.82 Part 100 A03.83	Protection against electric shock: Classification of electrical and electronic equipment (IEC 536) 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	Part 1 A06.93	Safety of machines: electrical equipment of machines, General requirements (EN 60204-1:1992)
DIN VDE 0160	E04.91	Equipping power installations with electronic equipment
DIN VDE 0298	Part 2 A11.79 Part 4 A02.80	Use of cables and insulated cables for power installations: Recommended values for the current carrying capacity of cables with rated voltages $U_0 / U$ to 18/30 kV 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	Part 2 A09.87 Z	Electromagnetic compatibility of instrumentation and control equipment in industrial process engineering: Interference resistance to static electricity discharges; requirements and measurement methods (IEC801-2) Superseded by DIN EN 60801, Part 2 (09.87)
DIN VDE 0875	Part 11 A12.88 Z Part 1 A07.92	RFI suppression of electrical equipment and installations: (EN 55014: 1987) Superseded by DIN VDE 0875, Part 14 and DIN VDE 0075 (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 68	Part 2	Electrical engineering; Fundamental environmental test methods; tests
DIN IEC 721	Part 3 A08.87	Electrical engineering; classification of environmental conditions: classes of influencing quantities
IEC 801	Part 4	Electromagnetic compatibility for industrial - process measurement and control equipment Electrical fast transient / burst requirements
EN 60146-1-1:	1993 Part 1-1	Semiconductor converters; General requirements and line-commutated converters: 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



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in preparation



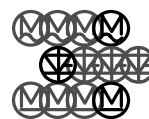
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2 Transportieren, Auspacken, Montieren / Transport, unpacking, assembly	4	02.96
3 Anschließen / Connection	12	02.96
4 Inbetriebnahme / Start-up	4	02.96
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7 Störungen und Warnungen / Malfunctions and warnings	2	02.96
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