SIEMENS

SIMOVERT MASTERDRIVES

Operating Instructions
Part 1

Compact units (Types A - D)
DC-AC

Edition: AD

Order No.: 6SE7087-6BD70

Overview of the MASTER DRIVES Operating Instructions:

Operating Instructions	consists of	
	Part 1	**Part 2**
6SE708_-_AD10	6SE708_-_AD70	6SE708_-_XX10
6SE708_-_AD20	6SE708_-_AD70	6SE708_-_XX20
6SE708_-_AD30	6SE708_-_AD70	6SE708_-_XX30
6SE708_-_BD10	6SE708_-_BD70	6SE708_-_XX10
6SE708_-_BD20	6SE708_-_BD70	6SE708_-_XX20
6SE708_-_BD30	6SE708_-_BD70	6SE708_-_XX30
6SE708_-_AH10	6SE708_-_AH70	6SE708_-_XX10
6SE708_-_AH20	6SE708_-_AH70	6SE708_-_XX20
6SE708_-_AH30	6SE708_-_AH70	6SE708_-_XX30
6SE708_-_BH10	6SE708_-_BH70	6SE708_-_XX10
6SE708_-_BH20	6SE708_-_BH70	6SE708_-_XX20
6SE708_-_BH30	6SE708_-_BH70	6SE708_-_XX30
6SE708_-_BM20	6SE708_-_BM70	6SE708_-_XX20

→ You will receive Parts 1 and 2 of the Operating Instructions when you use this Order No. Parts 1 and 2 can be individually ordered by specifying the particular Order No.

_-_ stands for the language code, e.g. 0-0 for German Editions.

The following foreign language Editions of these Operating Instructions are available:

Language	German	French	Spanish	Italian
Language code	0-0	7-7	7-8	7-2

These Operating Instructions are valid for software release V1.3.

Contents

0 Definitions

- QUALIFIED PERSONAL

  For the purpose of these instructions and product labels, a "Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications:

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

- DANGER

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

- WARNING

  For the purpose of these instructions and product labels, "Warning" indicates death, severe personal injury or property damage can result if proper precautions are not taken.

- CAUTION

  For the purpose of these instructions and product labels, "Caution" indicates that minor personal injury or material damage can result if proper precautions are not taken.

- NOTE

  For the purpose of these instructions, "Note" indicates information about the product or the respective part of the Instruction Manual which is essential to highlight.

NOTE
These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens sales office. The contents of this Instruction Manual shall not become part of or modify any prior or existing agreement, committment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

CAUTION

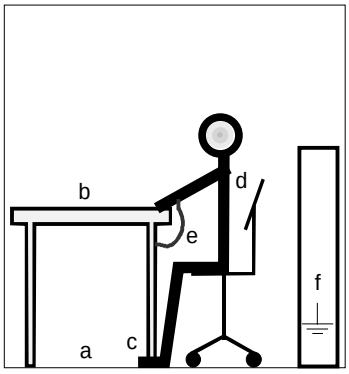
Components which can be destroyed by electrostatic discharge (ESD)

The converters contain components which can be destroyed by electrostatic discharge. These components can be easily destroyed if not carefully handled. If you have to handle electronic boards please observe the following:

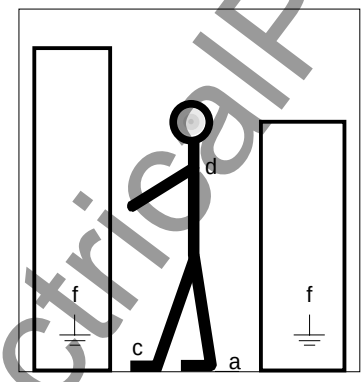
- Electronic boards should only be touched when absolutely necessary.
- The human body must be electrically discharged before touching an electronic board
- Boards must not come into contact with highly insulating materials - e.g. plastic foils, insulated desktops, articles of clothing manufactured from man-made fibers
- Boards must only be placed on conductive surfaces
- When soldering, the soldering iron tip must be grounded
- Boards and components should only be stored and transported in conductive packaging (e.g. metalized plastic boxes, metal containers)
- If the packing material is not conductive, the boards must be wrapped with a conductive packaging material, e.g. conductive foam rubber or household aluminum foil.

The necessary ECB protective measures are clearly shown in the following diagram:

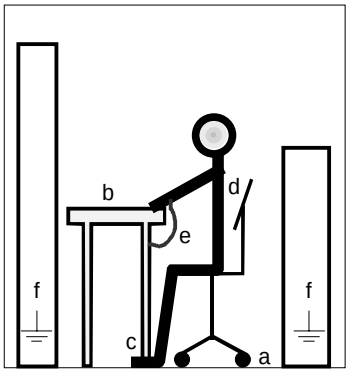
a	=	Conductive floor surface	d	=	ESD overall
b	=	ESD table	e	=	ESD chain
c	=	ESD shoes	f	=	Cubicle ground connection



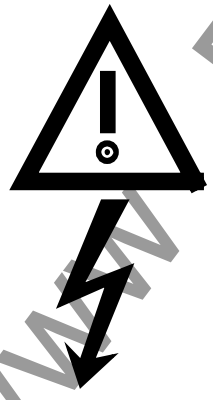
Sitting



Standing



Standing / Siting



WARNING

Hazardous voltages are present in this electrical equipment during operation.

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

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

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

0.1 Safety and operating instructions for drive converters

Safety and operating instructions for drive converters

(in conformity with the low-voltage directive 73/23/EEC)

1. General

In operation, drive converters, depending on their degree of protection, may have live, uninsulated, and possibly also moving or rotating parts, as well as hot surfaces.

In case of inadmissible removal of the required covers, of improper use, wrong installation or maloperation, there is the danger of serious personal injury and damage to property.

For further information, see documentation.

All operations serving transport, installation and commissioning as well as maintenance are to be carried out **by skilled technical personnel** (Observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN/VDE 0110 and national accident prevention rules!).

For the purposes of these basic safety instructions, "skilled technical personnel" means persons who are familiar with the installation, mounting, commissioning and operation of the product and have the qualifications needed for the performance of their functions.

2. Intended use

Drive converters are components designed for inclusion in electrical installations or machinery.

In case of installation in machinery, commissioning of the drive converter (i.e. the starting of normal operation) is prohibited until the machinery has been proved to conform to the provisions of the directive 89/392/EEC (Machinery Safety Directive - MSD). Account is to be taken of EN 60204.

Commissioning (i.e. the starting of normal opertion) is admissible only where conformity with the EMC directive (89/336/EEC) has been established.

The drive converters meet the requirements of the low-voltage directive 73/23/EEC. They are subject to the harmonized standards of the series prEN 50178/DIN VDE 0160 in conjunction with EN 60439-1/ VDE 0660, part 500, and EN 60146/ VDE 0558.

The technical data as well as information concerning the supply conditions shall be taken from the rating plate and from the documentation and shall be strictly observed.

3. Transport, storage

The instructions for transport, storage and proper use shall be complied with.

The climatic conditions shall be in conformity with prEN 50178.

4. Installation

The installation and cooling of the appliances shall be in accordance with the specifications in the pertinent documentation.

The drive converters shall be protected against excessive strains. In particular, no components must be bent or isolating distances altered in the course of transportation or handling. No contact shall be made with electronic components and contacts.

Drive converters contain electrostatic sensitive components which are liable to damage through improper use. Electric components must not be mechanically damaged or destroyed (potential health risks).

5. Electrical connection

When working on live drive converters, the applicable national accident prevention rules (e.g. VBG 4) must be complied with.

The electrical installation shall be carried out in accordance with the relevant requirements (e.g. cross-sectional areas of conductors, fusing, PE connection). For further information, see documentation.

Instructions for the installation in accordance with EMC requirements, like screening, earthing, location of filters and wiring, are contained in the drive converter documentation. They must always be complied with, also for drive converters bearing a CE marking. Observance of the limit values required by EMC law is the responsibility of the manufacturer of the installation or machine.

6. Operation

Installations which include drive converters shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements, e.g. Act respecting technical equipment, accident prevention rules etc. Changes to the drive converters by means of the operating software are admissible.

After disconnection of the drive converter from the voltage supply, live appliance parts and power terminals must not be touched immediately because of possibly energized capacitors. In this respect, the corresponding signs and markings on the drive converter must be respected.

During operation, all covers and doors shall be kept closed.

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

Keep safety instructions in a safe place!

1 Description

SIMOVERT MASTER DRIVES are power electronic units. They are available as

- Compact units with three-phase- or DC current input
  Output range: 2.2 kW to 37 kW
- Chassis units with three-phase- or DC current input
  Output range: 45 kW to 200 kW
- Cabinet units with three-phase- or DC current input
  Output range: 250 kW to 1500 kW

There are three versions depending on the particular application

- Frequency control FC simple applications (e.g. pumps and fans)
- Vector control VC High demands on dynamic performance and accuracy
- Servo Control SC Servodrives

1.1 Applications

Drive converter with DC current input

DC drive converters generate a variable-frequency three-phase system at the motor side from a DC supply. This variable-frequency three-phase system is used to continuously control the speed of three-phase motors.:

SIMOVERT MASTER DRIVES can be used with a common DC link, as well as for single-motor and multi-motor drives.

Technological functions and expansions can be realized via defined interfaces in the open-loop control section.

1.2 Mode of operation

Converters with DC current input are suitable for coupling several converters to a common DC link bus. This permits energy transfer between drives in the motoring and generating modes which in turn means energy savings.

The DC converter must be connected to the DC bus through an E unit (rectifier unit) due to the pre-charging of the DC link capacitors. If an I/R unit (rectifier and regenerative feedback unit) is used instead of the E unit, power is fed back into the supply if the regenerative output for several drives is greater than the motor power required.

The converter is ready for operation after the DC link capacitors have been pre-charged.

The inverter, configured using IGBT modules, generates a three-phase system from the DC link voltage to feed the motor.

SIMOVERT FC

The inverter open-loop control uses a microprocessor with an adjustable V/f characteristic. The pulse frequency is preset to 3 kHz when the unit is shipped.

SIMOVERT FC is suitable for single-motor and multi-motor drives with:

- Induction motors
- Synchronous motors (SM)
- Reluctance motors

Some of the applications are, for example:

- Pump drives
- Fan drives
- Textile machines

The following can be set for the V/f characteristic:

- Max. frequency 300 Hz
- Operation with or without slip compensation
- Operation with or without higher-level speed controller

SIMOVERT VC

The inverter open-loop control uses a microprocessor and field-oriented vector control with an extremely fast closed-loop current control. The drive can be precisely adapted to the demanded load torque as a result of the field-oriented control, which in turn means that the drive has an extremely high dynamic performance.The pulse frequency is preset to 2.5 kHz when the unit is shipped.

SIMOVERT VC is suitable for:

- Induction motors in both single-motor or multi-motor drives.
  For multi-motor drives, the motors within the group must be the same.

Some of the applications are, for example:

- Winder drives
- Rolling mill drives.

When the drive is shipped, closed-loop V/f control is preset. Closed-loop frequency control with field-oriented vector control must be parameterized.

The converter can be set, as a result of the precise motor simulation up to a maximum frequency of 300 Hz, with and without stall protection and with and without tachometer feedback.

SIMOVERT SC

The inverter open-loop control uses a microprocessor with field-oriented vector control, with a very fast secondary closed-loop current control. High drive dynamic performance is achieved as a result of the field oriented vector control. When the unit is shipped, the pulse frequency is preset to 5 kHz.

It can be set in the range from 5 kHz to 7.5 kHz.

SIMOVERT SC is suitable for:

- Single-motor drives with permanent-field 1FT6 motors

Some of the applications are, for example

- Winder drives,
- Foil machines,
- Packaging machines

After power-up, only the motor must be selected and the drive can then be enabled. The drive can be matched to the load moment of inertia and optimized by changing a closed-loop control parameter.

The converter operates with motor identification (MOTID). The maximum stator frequency is 400 Hz.
The following operating modes can be selected:

- Closed-loop speed control
- Closed-loop torque control

The following encoders can be used:

- ERN 1387 encoders
- Encoders which are compatible to ERN 1387
- Resolvers

1.3 Operator control- and open-loop control possibilities

The unit can be controlled via

- the parameterization unit (PMU)
- an optional operator control panel (OP1)
- terminal strip
- a serial interface.

When networked with automation systems, the unit open-loop control is realized via optional interfaces and technology boards.

1.4 Block diagram

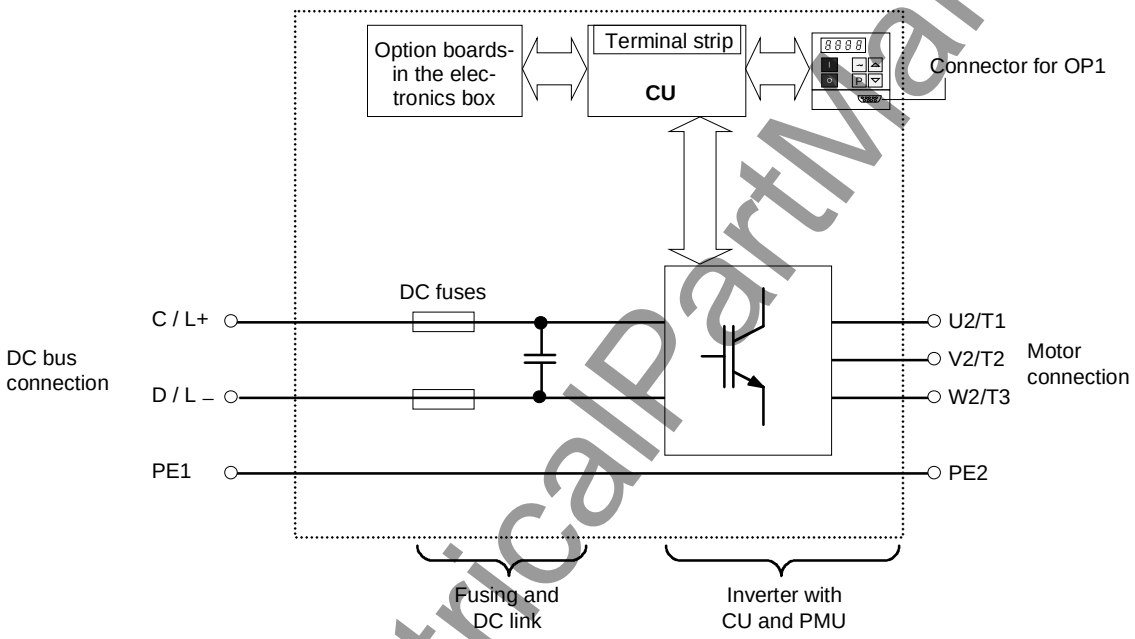


Fig. 1.1 Block diagram

2 Transport, Unpacking, Installation

2.1 Transport and unpacking

The units are packed in the manufacturing plant corresponding to that specified when ordered. A product packing label is located on the outside of the packing.

Please observe the instructions on the packaging for transport, storage and professional handling.

Vibration and jolts must be avoided during transport, e.g. when setting the unit down.

The converter can be installed after it has been unpacked and checked to ensure that everything is complete and that the converter is not damaged.

If the converter is damaged you must inform your shipping company immediately.

The packaging comprises board and corrugated paper. It can be disposed of corresponding to the appropriate local regulations for the disposal of board products.

2.2 Storage

The converters 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.

WARNING

The equipment should not be stored for longer than one year. If it is stored for longer periods of time, the converter DC link capacitors must be formed at start-up.

Capacitor forming is described in Part 2 of the Operating Instructions.

2.3 Mounting

The following are required for mounting:

- G busbar according to EN50035 with screws for mounting
- One M6 screw for types of construction A to C; two M6 screws for type of construction D
- Dimension drawing (Fig. 2.2 for types of construction A, B and C, Fig. 2.3 for type of construction D).

	WARNING
	Safe converter operation requires that the equipment is mounted and commissioned by qualified personnel taking into account the warning information provided in this Instruction Manual. The general and domestic installation and safety regulations for work on electrical power equipment (e.g. VDE) must be observed as well as the professional handling of tools and the use of personnal protective equipment. Death, severe bodily injury or significant material damage could result if these instructions are not followed. The unit must be protected against the ingress of foreign bodies as otherwise the function as well as the operational safety cannot be guaranteed.

Requirements at the point of installation:

The local guidelines and regulations must be observed when mounting and installing the equipment.

The unit is mounted corresponding to the dimension drawings in Section 2.4.

Equipment rooms must be dry and dust-free.Ambient and cooling air must not contain any electrically conductive gases, vapors and dusts which could diminish the functionality. Dust-laden air must be filtered.

	WARNING
	When mounting in cabinets, a clearance of above and below must be provided so that the cooling air flow is not restricted (refer to dimension drawings, Section 2.4). Dimension the cabinet cooling in line with the power loss! (☞ Section „Technical data“)

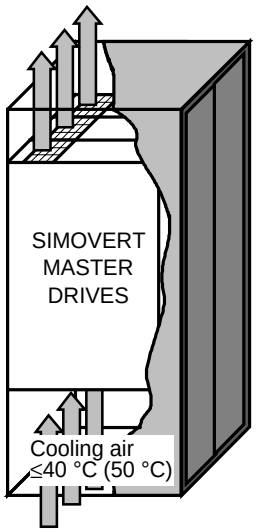


Fig. 2.1 Mounting the converters in cabinets

The converter ambient climate in operating rooms may not exceed the values of code F according to DIN 40040. For temperatures > 40 °C (104 °F) and installation altitudes > 1000 m, de-rating is required (☞ Section „Technical data“).

2.4 Dimension drawings

	a	b	c	d	e
Bauform/Type A	425	48.5	45	90	38.5
Bauform/Type B	425	47	67.5	135	37
Bauform/Type C	600	70	90	180	70

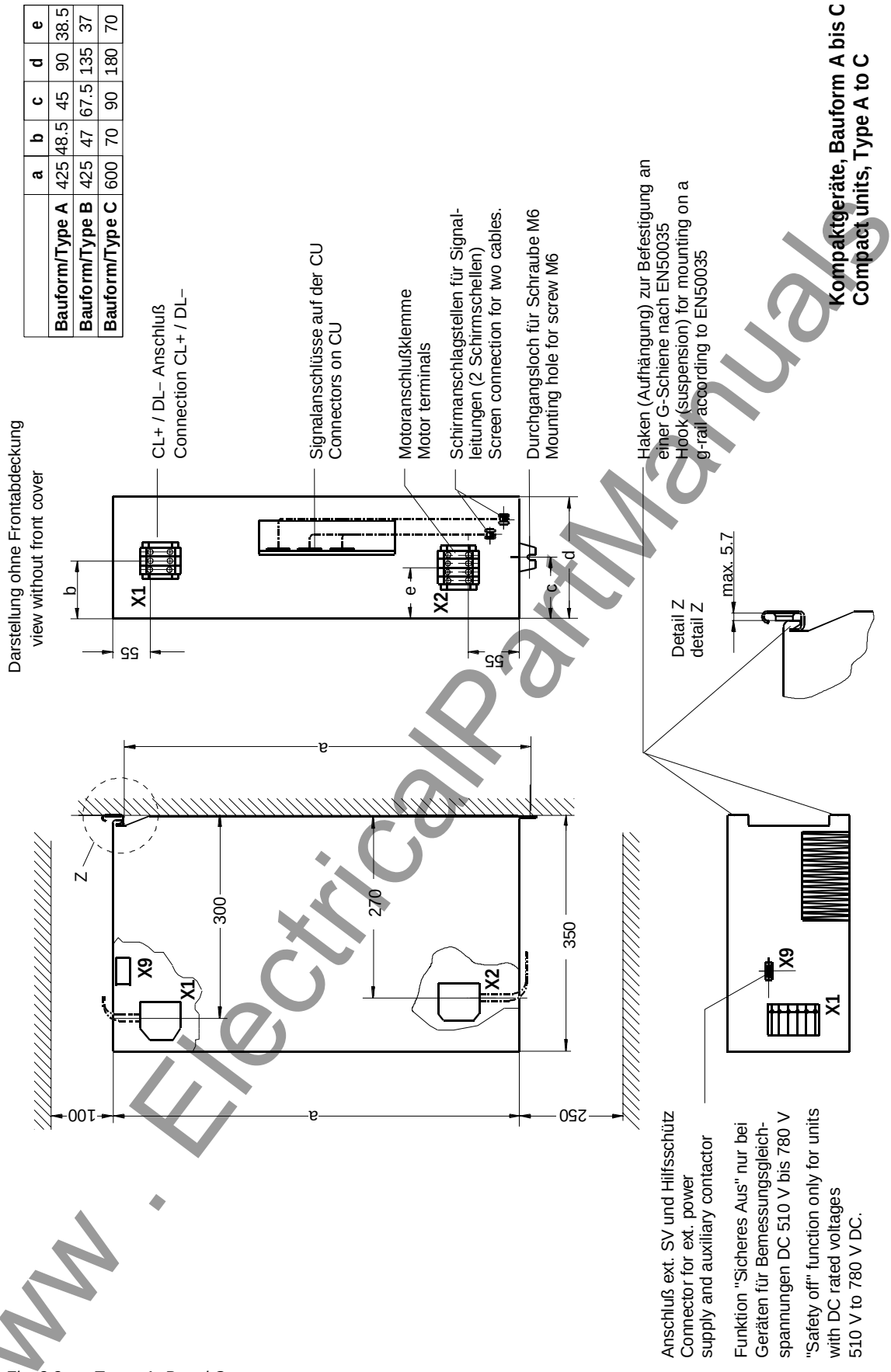


Fig. 2.2 Types A, B and C

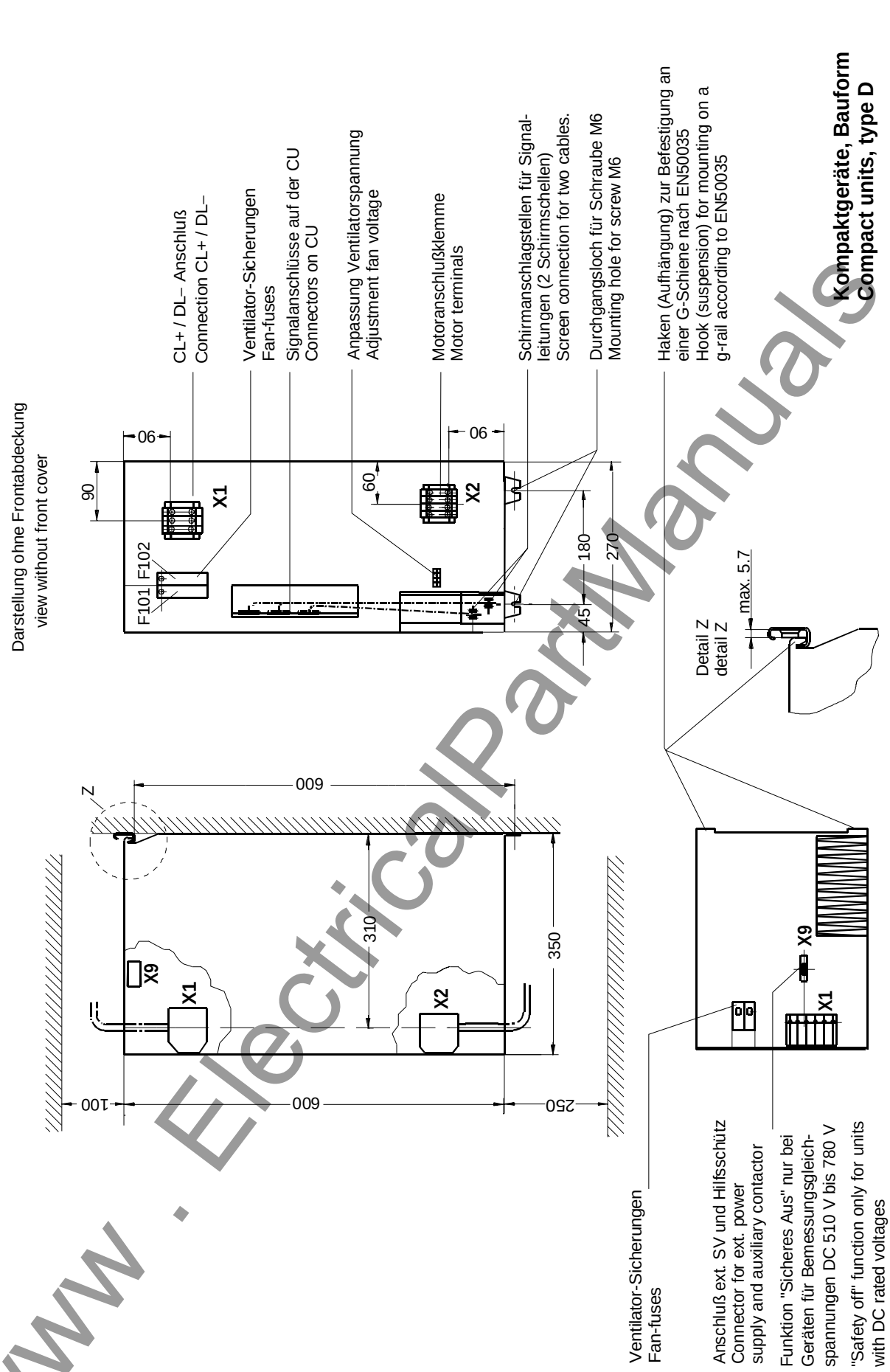
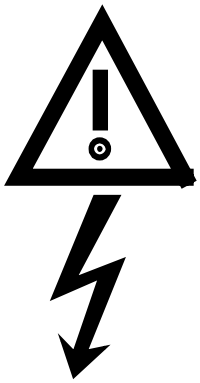


Fig. 2.3 Type D

3 Connecting-up



WARNING
SIMOVERT MASTER DRIVES are operated at high voltages. The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried-out! Only professionally trained, qualified personnel must work on or with the unit. Death, severe bodily injury or significant material damage could occur if these warning instructions are not observed.
Extreme caution should be taken when working-on the unit when it is open, as external power supplies may be connected. The power terminals and control terminals can still be at hazardous potentials even when the motor is stationary. Hazardous voltages are still present in the unit up to 5 minutes after it has been powered-down due to the DC link capacitors. Thus, the appropriate delay time must be observed before opening-up the unit.
Forming the DC link capacitors: The storage time should not exceed one year. The converter DC link capacitors must be formed at start-up if the unit has been stored for a longer period of time. Forming is described in the Instruction Manual, Part 2. When the DC link is supplied from a central unit, it must be ensured that the converter is reliably isolated from the DC link voltage!
The user is responsible, that the motor, converter and any other associated devices or units are installed and connected-up according to all of the recognized regulations in that particular country as well as other regionally valid regulations. Cable dimensioning, fusing, grounding, shutdown, isolation and overcurrent protection should be especially observed.

INFORMATION
♦ Cabling/wiring: Connecting cables should be dimensioned according to the local regulations and according to section „Power connections“. The insulation should be suitable for 75°C.

3.1 Power connections

WARNING

- By interchanging the input terminals, the converter or the rectifier will be destroyed!
- The drive converter or rectifier unit could be destroyed if the input terminals are interchanged!
- The coils of contacts and relays which are connected to the same supply as the converter or are located in the vicinity of the converter, must be provided with overvoltage limiters, e.g. RC elements.

The position of the connecting terminals can be seen in the dimension drawings (☞ Section 2.4).

DC connection:	C/L+	D/L–	
Motor connection:	U2/T1	V2/T2	W2/T3
Protective conductor connection:	PE1 ⏚	PE2 ⏚	

The cross-sections listed in Table 3.2 are defined by the terminal size.

NOTE

For type of construction D, an external 230 V AC auxiliary voltage must be connected at F101 and F102. This auxiliary voltage is required for the unit fan.

NOTE FC and VC

Depending on the motor insulation strength and the length of the motor feeder cable, it may be necessary to install one of the following options between the motor and the converter:

- Output reactor
- dv/dt-filter only for FC and VC, not permissible for SC
- Sinusoidal filter only for FC and VC, not permissible for SC

Information regarding selection and dimensioning is provided in Section „Options“.

Order No.	Supply side					Internal DC fuse			Motor side			
	Rated DC Curr.	Cross-section		Recommended fuse					Rated output		Cross-section	
									Voltage	Curr.		
	(A)	VDE (mm^2)	AWG[1)]	(A)	Type	Type	(V)	(A)	(V)	(A)	VDE (mm^2)	AWG
6SE70					3NE	FWP						
	Rated DC Voltage 280 V to 310 V											
21-1RA_0	12,6	1,5	16	25	8 015	–			0 to 230	10,6	1,5	16
21-3RA_0	15,8	2,5	14	35	8 003	–			0 to 230	13,3	1,5	16
21-8RB_0	21,1	4	10	50	8 017	–			0 to 230	17,7	2,5	14
22-3RB_0	27,3	6	8	80	8 020	–			0 to 230	22,9	4	10
23-2RB_0	38,3	10	6	100	8 021	–			0 to 230	32,2	10	6
24-4RC_0	52,6	16	4	125	8 022	–			0 to 230	44,2	16	4
25-4RD_0	64,3	35	2	160	8 024	–			0 to 230	54,0	25	2
27-0RD_0	82,1	35	2	160	8 024	–			0 to 230	69	25	2
28-1RD_0	96,4	50	0	160	4 124	–			0 to 230	81	35	0
	Rated DC Voltage 510 V to 620 V											
16-1TA_1	7,3	1,5	16	25	8 015	25A14F	700	25	0 to 460	6,1	1,5	16
18-0TA_1	9,5	1,5	16	25	8 015	50A14F	700	50	0 to 460	8,0	1,5	16
21-0TA_1	12,1	1,5	16	25	8 015	50A14F	700	50	0 to 460	10,2	1,5	16
21-3TB_1	15,7	4	10	50	8 017	50A22F	700	50	0 to 460	13,2	2,5	14
21-8TB_1	20,8	4	10	50	8 017	50A22F	700	50	0 to 460	17,5	2,5	14
22-6TC_1	30,4	10	6	80	8 020	100A22F	700	100	0 to 460	25,5	6	8
23-4TC_1	40,5	10	6	80	8 020	100A22F	700	100	0 to 460	34	10	6
23-8TD_1	44,6	16	4	125	8 022	100A22F	700	100	0 to 460	37,5	16	4
24-7TD_1	55,9	25	2	125	8 022	100A22F	700	100	0 to 460	47	16	4
26-0TD_1	70,2	35	0	160	8 024	80A22F	700	2x80	0 to 460	59	25	2
27-2TD_1	85,7	35	0	160	8 024	80A22F	700	2x80	0 to 460	72	25	2
	Rated DC Voltage 675 V to 780 V (only for SC and VC)											
14-5UB_1	5,4	1,5	16	32	4 101	50A22F	700	50	0 to 575	4,5	1,5	16
16-2UB_1	7,4	1,5	16	32	4 101	50A22F	700	50	0 to 575	6,2	1,5	16
17-8UB_1	9,3	2,5	14	32	4 101	50A22F	700	50	0 to 575	7,8	1,5	16
21-1UB_1	13,0	4	10	32	4 101	50A22F	700	50	0 to 575	11	1,5	16
21-5UB_1	18,0	4	10	32	4 101	50A22F	700	50	0 to 575	15,1	1,5	16
22-2UC_1	26,2	6	8	50	4 117	50A22F	700	50	0 to 575	22	4	10
23-0UD_1	34,5	16	4	80	4 120	100A22F	700	100	0 to 575	29	10	6
23-4UD_1	40,5	16	4	80	4 120	100A22F	700	100	0 to 575	34	10	6
24-7UD_1	55,4	25	2	100	4 121	100A22F	700	100	0 to 575	46,5	16	4

INFORMATION AND EXPLANATIONS

The cross-sections are determined for copper cables at 40 °C (104 °F) ambient temperature (in accordance with DIN VDE 0298 Part 4 / 02.88 Group 5).

For rated DC voltages 510 V to 780 V DC, fuses on the incoming supply side are not required as the unit has integrated DC fuses; this assumes that the connecting cables to the DC bus are routed so that they are short-circuit proof and the cable cannot be overloaded by other loads.

1) American Wire Gauge

Table 3.1 Power connections acc. to DIN VDE

Type	Order No.	Possible connection cross-section for power terminals			
		Finely stranded		Multi-stranded/solid	
		(mm^2)	AWG	(mm^2)	AWG
A	6SE702_-_ _ A_ _	1.5 to 10	12 to 6	2.5 to 16	12 to 4
B	6SE702_-_ _ B_ _	1.5 to 10	12 to 6	2.5 to 16	12 to 4
C	6SE702_-_ _ C_ _	4 to 16	10 to 4	10 to 25	6 to 2
D	6SE702_-_ _ D_ _	10 to 35	6 to 2	10 to 50	6 to 0

Table 3.2 Possible connection cross-sections

3.1.1 Protective conductor connection

The protective conductor should be connected-up on both the supply- and motor sides. It should be dimensioned according to the power connections. Due to discharge currents from the noise suppression capacitors, according to VDE 0160, a minimum cross-section of 10 mm^2 is required, or a second protective conductor with the same cross-section must be routed in parallel (for cross-sections < 10 mm^2).

3.2 Auxiliary power supply / main contactor or bypass contactor / „Safety off“

3.2.1 Drive converters for rated DC voltages 280 V to 310 V DC

The auxiliary power supply and the main- or bypass contactor are connected through the 5-pin connector X9.

Connector X9 is supplied together with the connectors for the control terminal strip. Cables with cross-sections from 0.2 mm^2 to 2.5 mm^2 (AWG: 24 to 14) can be connected at X9.

The auxiliary power supply is required if the drive converter is fed through a main- and bypass contactor.

The main- or monitoring contactor is controlled through floating contacts -X9.4 and -X9.5 (software pre-setting).

More detailed information is provided in the Section „options“.

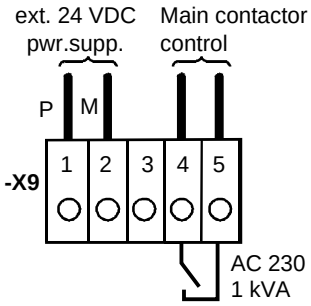


Fig. 3.1 Connecting an external auxiliary 24 V DC power supply and main contactor control

Term.	Function description
1	24 V DC external ≥ 2.1 A (max. 4 A dependent on the options)
2	Reference potential to DC
3	Unassigned
4	Main contactor control
5	Main contactor control

Table 3.3 Connector assignment for -X9

NOTE
The main contactor coil must be provided with overvoltage limiters, e.g. RC element.

3.2.2 Drive converters for rated DC voltages 510 V to 780 V DC

The auxiliary power supply and the main- and bypass contactor as well as the "safety off" function are connected via the nine-pin connector X9.

Connector X9 is supplied together with the connectors for the control terminal strip. Cables with cross-sections from 0.14 mm^2 to 1.5 mm^2 (AWG: 26 to 16) and 1 mm^2 (AWG: 18), finely-stranded with connector sleeves, can be connected at X9.

The auxiliary power supply is required if the drive converter is fed through a main- and bypass contactor.

The main- or monitoring contactor is controlled through floating contacts -X9.7 and -X9.9 (software pre-setting).

The "safety off" function guarantees that a rotating field cannot occur at the motor terminals, i.e. the motor cannot rotate. The "safety off" function is activated by opening the external contact S1 (Fig. 3.2). The drive converter is supplied with terminals X9.5 and X9.6 jumpered.

More detailed information is provided in the Section „options“.

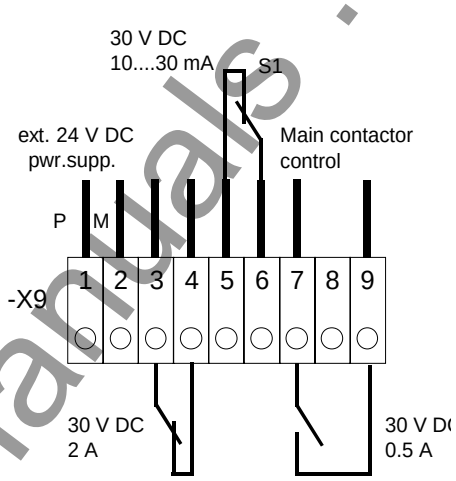


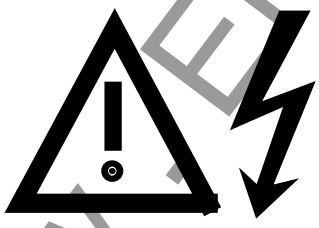
Fig. 3.2 Connecting an external auxiliary 24 V DC power supply, main contactor control and safety off

Term.	Function description
1	24 V DC external ≥ 2.1 A (max. 4 A dependent on the options)
2	Reference potential to DC
3 / 4	Checkback signal for "safety off"
5 / 6	"Safety off" active with switch S1 open
7	Main contactor control
8	Unassigned
9	Main contactor control

Table 3.4 Connector assignment for -X9

NOTE

The main contactor coil must be provided with overvoltage limiters, e.g. RC element.



WARNING

- The power terminals can still be live (under voltage), even if the "safety off" function is active!
- The relay on PEU -X9:7,9 is, for DC-AC units, only suitable for switching voltages up to 30 V!

3.3 Instructions for EMC-correct installation

EMC (**E**lectro**m**agnetic **C**ompatibility) involves the noise emission and noise immunity of electrical equipment.

Optional radio interference suppression filters are available to limit the **noise emission**.

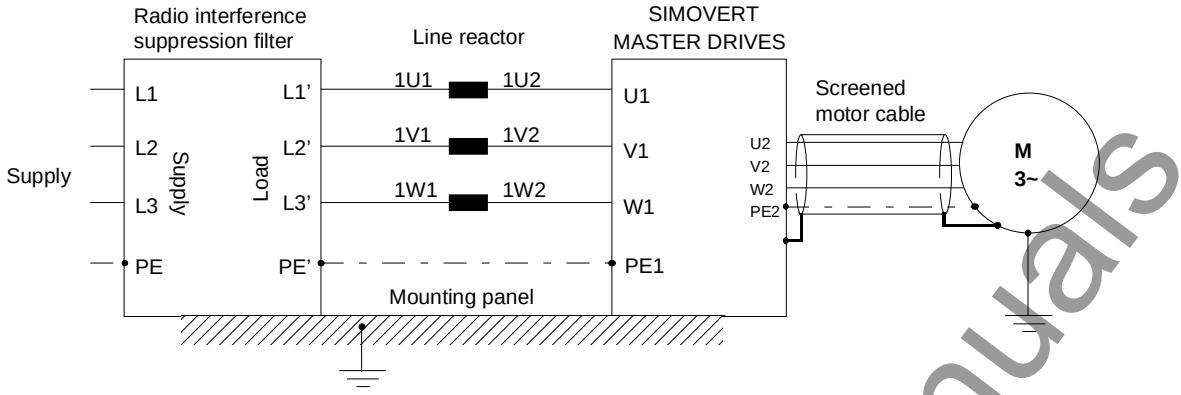


Fig. 3.3 Location of the components

The radio interference suppression filter and drive converter must be connected through a large surface area. The most favorable method is to mount all of the components on a bare metal mounting panel (e.g. galvanized steel). A line reactor must be connected between the radio interference suppression filter and the drive converter.

The cabling should be kept as short as possible. The line feeder cable to the radio interference suppression filter should be routed separately away from other cables.

The motor must be connected using a screened cable, e.g. Siemens PROTOFLEX-EMV-CY (cross-section up to 120 mm^2) or Siemens PROTODUR NYCW (cross-section > 120 mm^2). The screen must be connected to the motor- and drive converter housing through the largest possible surface area to keep inductances as low as possible.

Use screened control cables to increase the **noise immunity**. Connect the screens of the control cables to the mounting positions provided. Screen clamps are provided with every SIMOVERT MASTER DRIVES to connect the screens of the control cables (☞ Fig. 3.4.1). Otherwise, cable ties can be used to connect the screen (☞ Fig. 3.4.2).

- Do not interrupt the screens, e.g. when installing intermediate terminals.
- Control cables and power cables (= line feeder cable, motor cable) must be routed separately away from one another.

You will find more detailed information in the brochure (Installation instructions for EMC correct design of drives“
(Order No.: 6SE7087-6CX87-8CE0).

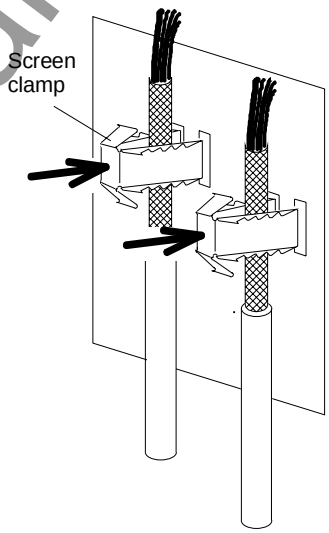


Fig. 3.4.1

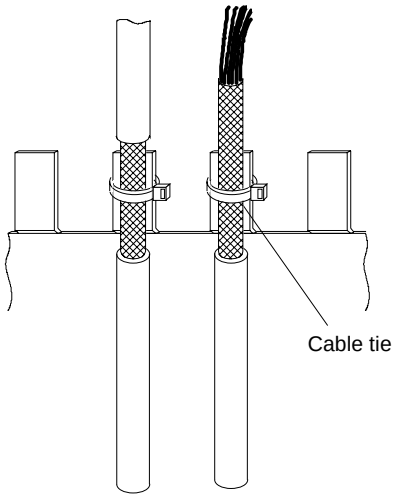


Fig. 3.4.2

Fig. 3.4 Connecting the screens of signal cables for SIMOVERT MASTER DRIVES

4 Operator control

The converter can be controlled via:

- the PMU (Parameterization Unit)
- the control terminal strip on the CU (☞ section “Control terminal strip“ in the Operating Instructions, Part 2)
- the OP1 operator control panel (☞ section “Options“)
- the RS485 and RS232 serial interface on PMU-X300

Operator control using the PMU is described in this section.

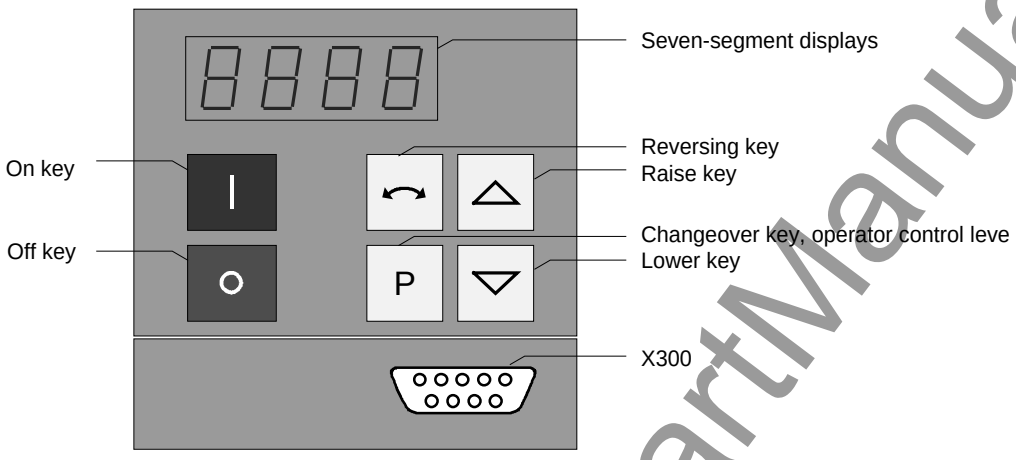


Fig. 4.1 Parameterization unit

4.1 Operator control elements

Operator control elements	Function
I	Converter switch on (standard). For faults: Return to the fault display. Command is effective when the key is released.
O	Converter shutdown depending on the parameterization of OFF 1, OFF 2 or OFF 3 (P554 to P560). Command becomes effective when the key is released.
	Field reversal / reversing for the appropriate parameterization. Command becomes effective when the key is released.
P	Changeover from parameter number to parameter value. In conjunction with other keys, additional functions (see Operating Instructions, Part 2). Command becomes effective when the key is released.
,	Values (raise, lower) change as long as the keys are depressed.
P + resp. P +	Depress P and hold, then depress the second key. The command becomes effective when the key is released (e.g. fast changeover).

Table 4.1 Function of the operator control elements on the PMU

4.2 Displays 8.8.8.8.

		Parameter number		Index	Parameter value
		Pos. Actual value e.g	Neg. actual value e.g	e.g..	e.g.
Visualization parameters	**Basic converter**	r000	r.000	---	009
	Technology board	d000	d.000		
Setting parameters	**Basic converter**	P005	P.005	i000	-2.08
	Technology board	H002	H.002		

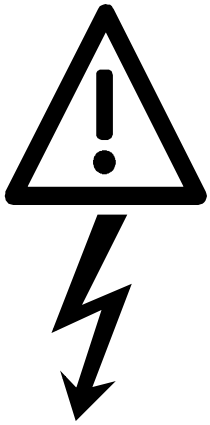
Table 4.2 Displaying visualization- and setting parameters on the PMU

	Actual value	Parameter value not possible	Alarm	Fault
Display	-2.08	----	A022	F006

Table 4.3 Status display on the PMU

NOTE
The parameter description is provided in the Operating Instructions, Part 2.

5 Maintenance



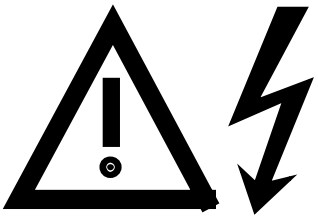
WARNING
SIMOVERT MASTER DRIVES are operated at high voltages. All work carried-out on or with the equipment must conform to all of the relevant national electrical codes (VBG4 in Germany). Maintenance and service work may only be executed by qualified personnel.
Only spare parts authorized by the manufacturer may be used. The specified maintenance intervals and also the instructions for repair and replacement must be adhered to. The drive units have hazardous voltage levels up to 5 min after the converter has been powered-down due to the DC link capacitors so that the unit must only be opened after an appropriate delay time. The power- and control terminals can still be at hazardous voltage levels even though the motor is at a standstill.
If it is absolutely necessary that the drive converter must be worked on when powered-up: ♦ never touch any live components. ♦ only use the appropriate measuring and test equipment and protective clothing. ♦ always stand on an ungrounded, isolated and ESD-compatible pad. If these warnings are not observed this can result in death, severe bodily injury or significant material damage.

Always have your MASTER DRIVE converter Order No. and serial No. available when contacting the service department. These numbers and other important data are located on the drive converter rating plate.

5.1 Maintenance requirements

The fans are designed for a service life of 35000 hours at an ambient temperature of T_U = 40 °C. They must be replaced before their service life expires so that the drive converter availability is guaranteed.

5.2 Replacing components



WARNING

The fan may only replaced by qualified personnel.

The drive converters are still at hazardous voltage levels up to 5 min. after the unit has been powered-down as a result of the DC link capacitors.

If these warnings are not observed, death, severe bodily injury or considerable material damage could occur.

5.2.1 Replacing the fan

Housing sizes A to C

The fan is located under the converter

- Remove the M4 x 49 Torx screws
- Remove the fan towards the bottom and withdraw connector X20
- Install the new fan in the inverse sequence
- Before commissioning the drive check that the fan can run freely and the air flow direction (arrow towards the top). The air must be blown upwards out of the unit.

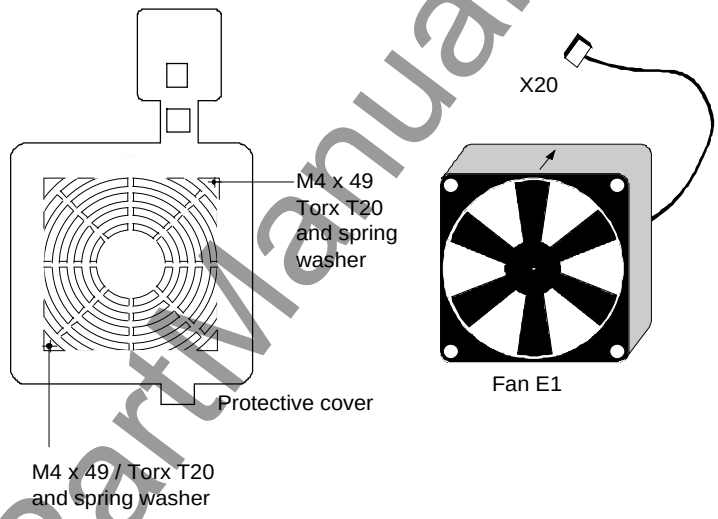


Fig. 5.1 Fan (24 V) and protective cover for housing sizes A to C

Size D

The fan is screwed to a bracket which is located in the lower section of the drive converter.

- Withdraw connector X20
- Remove both M5 x 16 Torx screws on the lower part of the converter
  (They are captive, and connected to the console)
- Withdraw the fan with bracket out of the unit from the bottom
- Release fan screws M4 (observe the cable routing!)
- Install the new fan in the inverse sequence (the fan is already mounted on the bracket).
- Before commissioning the drive, check that the fan can rotate freely.

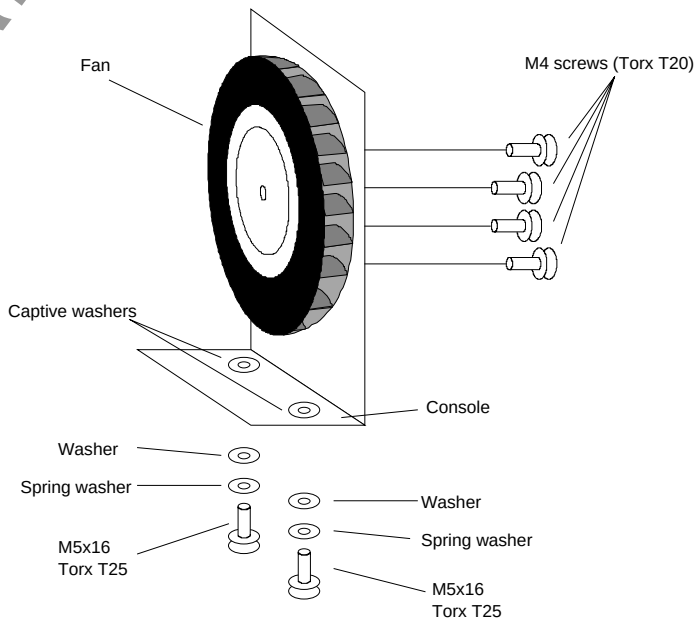


Fig. 5.2 Fan (230 V) with bracket for housing size D

5.2.2 Replacing the fuses (size D)

The fuses are located in the upper section of the converter in a fuse holder. The fuse holder must be opened to remove the fuses.

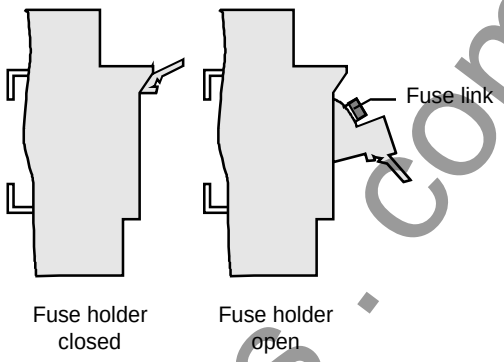
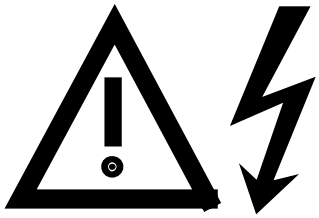


Fig. 5.3 Fuse holder (size D)

5.2.3 Replacing boards



WARNING

The boards may only be replaced by qualified personnel.

It is not permissible that the boards are withdrawn or inserted under voltage.

Death, severe bodily injury or significant materal damage might result if these instructions are not observed.

CAUTION

Boards contain components which could be damaged by electrostatic discharge. The human body must be discharged immediately before an electronics board is touched. This can be simply done by touching a conductive, grounded object immediately beforehand (e.g. bare metal cubicle components).

5.2.3.1 Replacing boards in the electronics box

- Loosen the board retaining screws above and below the handles for inserting/withdrawing the boards
- Carefully remove the board using these handles making sure that the board doesn't catch on anything
- Carefully locate the new board on the guide rails and insert it completely into the electronics box
- Tighten the retaining screws above and below the handles.

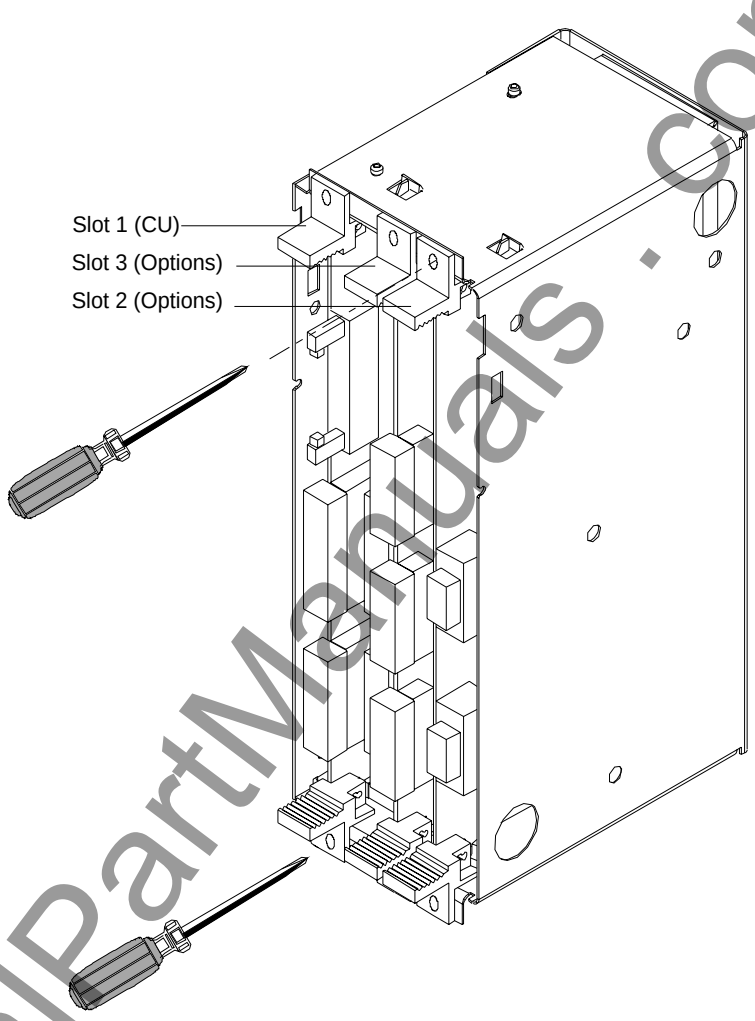


Fig. 5.4 Electronics box equipped with CU (slot 1) and options (slot 2 (right) and 3 (middle))

5.2.3.2 Replacing the PMU (Parameterization Unit)

- Release the snaps on the front cover
- Open-up the front cover
- Withdraw connector X108 on the CU (Control Unit)
- Remove the ribbon cable from the guide hooks
- 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.

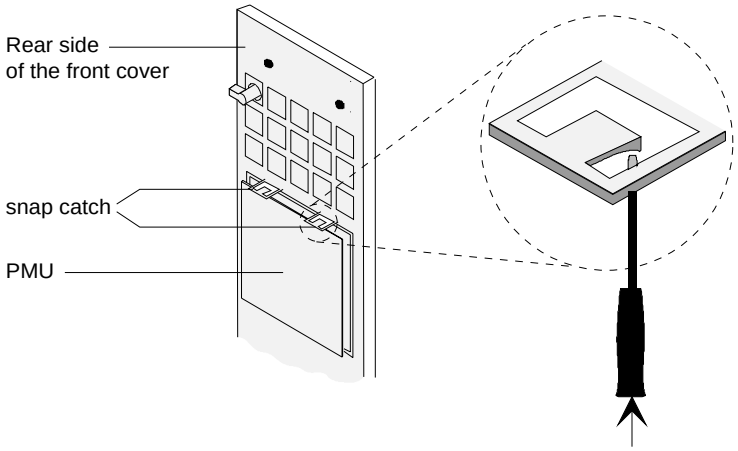


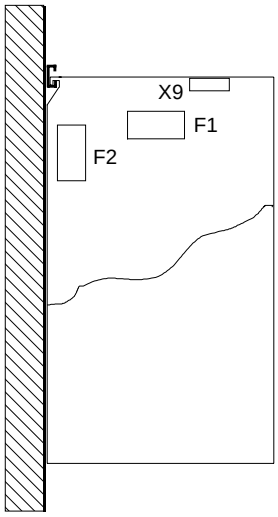
Fig. 5.5 Rear side of the front cover with PMU board

5.2.4 Replacing the DC fuses

Types A and B

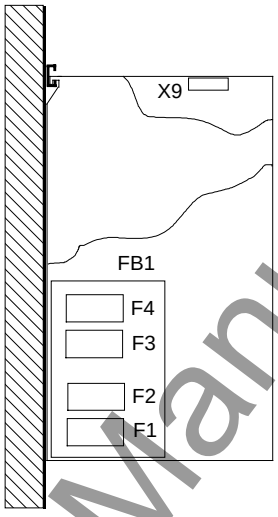
For types A and B, the DC fuses are not accessible. They may only be replaced by service personnel.

Type C



- Remove the side panel
- Replace fuses F1 and F2

Type D



- Remove the side panel
- Replace fuses F1 to F4 on FB1 (fuse board)

6 Options

6.1 Options which can be integrated into the electronics box

One or two option boards, listed in Table 6.1, can be inserted in the electronics box using the LBA option (local bus adapter).

Before installing option boards in the electronics box, the LBA (local Bus Adapter) has to be inserted.

Install the LBA bus expansion:

- Remove the CU (lefthand slot in the electronics box) using the handles after first removing the connecting cable to the PMU and both retaining screws.
- Insert the LBA bus expansion in the electronics box (position, refer to the diagram) so that it snaps into place.
- Re-insert the CU into the lefthand slot, screw the retaining screws on the handles tight, and insert the connecting cable to the PMU.
- Insert the option board in slot 2 (right) or slot 3 (center) of the electronics box, and screw into place. Each option board may only by inserted in the electronics box. If only one option is used, it must always be inserted at slot 2 (right).

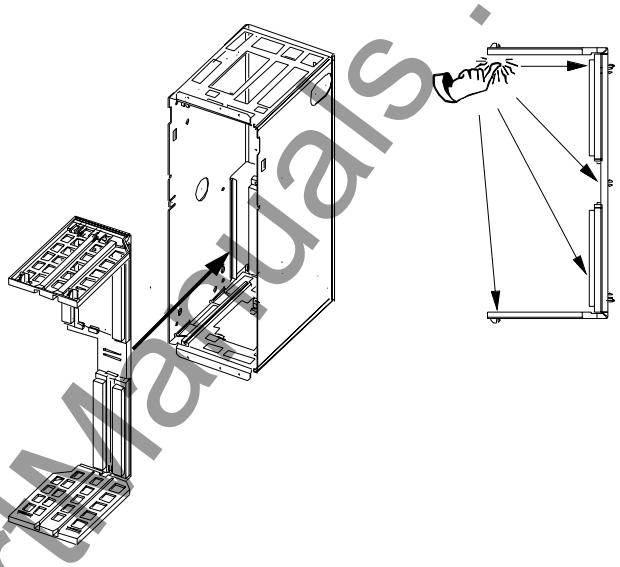


Fig. 6.1 Installing the Local Bus Adapter

Slots in the electronics box		**Boards**
Left	Slot 1 (CU)	CU
Center	Slot 3 (options)	CB1 / SCB1 / SCB2
Right	Slots 2 (options)	CB1 / SCB1 / SCB2 / TSY / TB

NOTES

- Only one of each option board type may inserted in the electronics box.
- TB (technology boards, e.g. T300) must always be inserted at slot 2. When a TB board is used, a TSY board my not be inserted.
- If only one option board is used it must always be inserted at slot 2.

Table 6.1 Possible arrangements of boards in the electronics box

The options are supplied with the option description.

Desig-nation	Description	Order No.	
LBA	Local bus adapter for the electronics box. This is required for installing T300, CB1, TSY, SCB1 and SCB2	Board description	6SE7090-0XX84-4HA0 6SE7087-6CX84-4HA0
T300	Technology board for controlling technological processes	Board description	6SE7090-0XX84-0AH0 6SE7087-6CX84-0AH0
TSY	Synchronizing board	Board description	6SE7090-0XX84-0BA0 6SE7087-6CX84-0BA0
SCB1	Serial communications board with fiber-optic cable for serial I/O system and peer-to-peer connection	Board description	6SE7090-0XX84-0BC0 6SE7087-6CX84-0BC0
SCB2	Serial communications board for peer-to-peer connection and USS protocol via RS485	Board description	6SE7090-0XX84-0BD0 6SE7087-6CX84-0BD0
	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 6SE7087-6CX84-0AK0
	Use of the PROFIBUS DP interface	Application description	6SE7087-6CX87-0AK0

Table 6.2 Option boards and bus adapter

If the converter is supplied through an external main contactor, the option board in the electronics box must be supplied from an external power supply, according to Table 6.3.

These values are required in addition to the current drawn by the basic converter (☞ section “Technical Data“).

Board	**Current drain** (mA)
CB1	190
SCB1	50
SCB2	150
TSY w/out tacho	150
T300 w/out tacho	620
Standard tacho Type: 1XP 8001-1	I_0 95 (190 at 6000 RPM)

Table 6.3 Current drain of the option boards

6.2 Interface boards

The boards, listed in the following table must be externally mounted and wired-up on the external system side.

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 6SE7087-6CX84-0BC0
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 6SE7087-6CX84-0BC0
DTI	Digital tachometer interface	Board description	6SE7090-0XX84-3DB0 6SE7087-6CX84-3DB0
ATI	Analog tachometer interface	Board description	6SE7090-0XX84-3DF0 6SE7087-6CX84-3DF0

Table 6.4 Interface boards

6.3 Power supplies

Designation	Description	Order number Option	Use with
Power supply, 0.3 A	115 V / 230 V AC - 24 V 0.3 A DC	6SX7010-0AC14	e.g.: DTI
Power supply 1 A	115 V / 230 V AC - 24 V 1 A DC	6SX7010-0AC15	e.g.: 1 x SCI
Power supply 5 A	115 V / 230 V AC - 24 V 5 A DC	6EP1333-1SL11	Basic conv

Table 6.5 Recommended power supply

6.4 Isolating amplifiers

Input	Output	Order number Option
Input isolating amplifiers for analog inputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–20 mA to +20 mA	–10 V to +10 V	6SX7010-0AC02
4 mA to +20 mA	0 V to +10 V	6SX7010-0AC16
Output isolating amplifiers for analog outputs		
–10 V to +10 V	–10 V to +10 V	6SX7010-0AC00
–10 V to +10 V	–20 mA to +20 mA	6SX7010-0AC03
0 V to +10 V	4 mA to +20 mA	6SX7010-0AC04

Table 6.6 Overview of isolating amplifiers

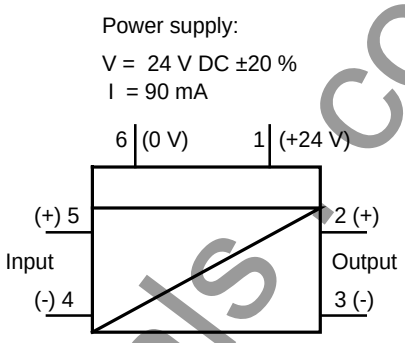


Fig. 6.2 Isolating amplifiers

6.5 Power section

Options	Description/function
Braking unit	For converting the regenerative energy into heat
Braking resistors	Load resistor for the braking unit
Electrical DC link coupling	Switching the DC-AC converter in and out under load
Mechanical DC link coupling	Switching the DC-AC converter in and out in a no-voltage condition
Input rectifier	Input rectifier for one or several DC-AC converters
Input rectifier with line-commutated feedback	Supply rectifier for one or several DC-AC converters for motor or generator operation

Table 6.7 Power section options

6.5.1 Output reactor, dv/dt filter, sinusoidal filter

When longer feeder cables are used between the converter and motor:

- the converter has to cope with additional current peaks due to re-charging the cable capacitances
- the motor insulation is additionally stressed as a result of transient voltage spikes caused by reflection.

NOTE

In order to prevent premature aging of the motor insulation and thus early failures, the following limit values may not be exceeded at the motor terminals:

- the permissible voltage gradient dv/dt and
- the permissible peak voltage between phase conductors $\hat{V}_{LL}$

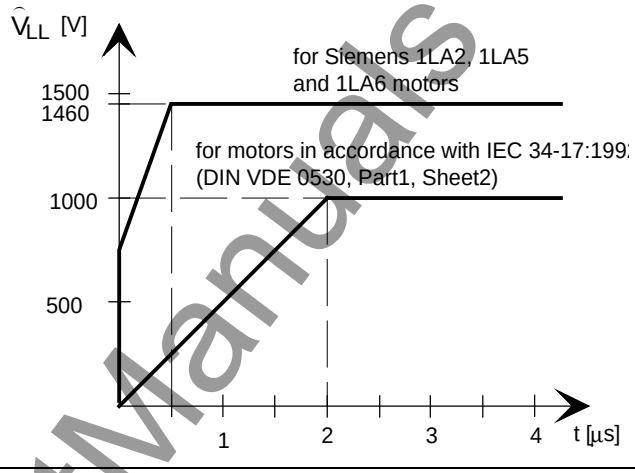


Fig. 6.3 Permissible limit values for the motor insulation

Depending on the application, the voltagerate-of-rise, voltage and current peaks can be reduced using the following options: Output reactor, dv/dt filter, or sinusoidal filter.

Characteristics of the output reactors, dv/dt filters and sinusoidal filter:

	Output reactor	dv/dt filter	Sinusoidal filter
Reduces the current peaks for long cables	yes	yes	yes
Reduces the voltage gradient (rate of rise) dv/dt at the motor terminals	slightly	yes	yes
Limits the amplitude of the transient voltage peaks at the motor terminals to the following typical values ≤ 800 V at 3-ph. AC 400 V to 460 V ≤ 1000 V at 3-ph. AC 500 V to 575 V	no	yes	yes
Generates sinusoidal motor voltages and currents	no	no	yes
Reduces the supplementary losses in the motor	no	no	yes
Reduces motor noise (corresponding to direct online operation)	no	no	yes

Table 6.8

6.5.1.1 Output reactor

The output reactor is especially used to limit additional current spikes caused by the cable capacitances when long cables are used, i.e. it

- reduces the charge current spikes for long cables
- reduces the voltage rate-of-change dv/dt at the motor terminals.

It does **not** reduce the magnitude of the transient voltage spikes at the motor terminals.

In order that the reactor temperature rise remains within the specified limits, the pulse frequency f_p of the drive converter, rated motor frequency $f_{mot\ N}$ and the maximum drive converter output frequency f_{max} must lie within the specified limits:

	V/f = constant		V = constant	
	280 V to 620 V DC	**675 V to 780 V DC**	**280 V to 620 V DC**	**675 V to 780 V DC**
Standard reactor (iron) $f_P \leq$ 3 kHz				
V/f / Vector control	$f_{mot\ N} \leq 87$ Hz	$f_{mot\ N} \leq 200$ Hz	$f_{max} \leq 200$ Hz	$f_{max} \leq 300$ Hz
V/f textile	$f_{mot\ N} = f_{max} \leq 120$ Hz	not possible	not possible	not possible
Ferrite reactor $f_P \leq$ 6 kHz				
V/f / Vector control	$f_{mot\ N} \leq 150$ Hz	$f_{mot\ N} \leq 150$ Hz	$f_{max} \leq 300$ Hz	$f_{max} \leq 300$ Hz
V/f textile	$f_{mot\ N} = f_{max} \leq 600$ Hz	not possible	not possible	not possible

Table 6.9 Output reactor design

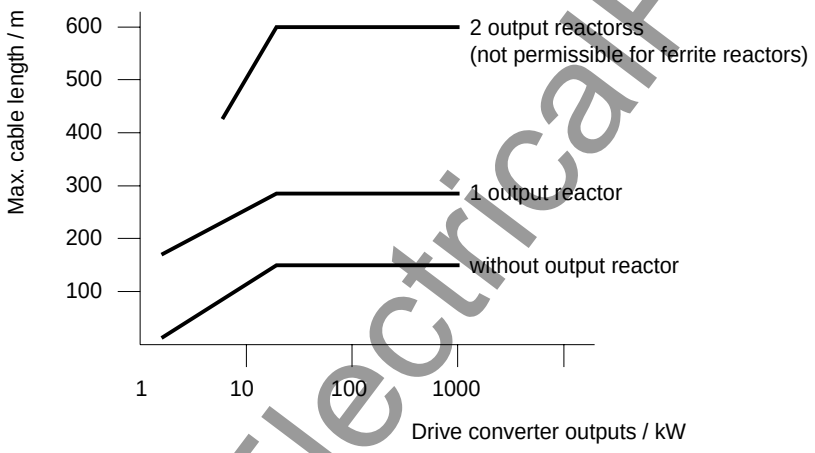


Fig. 6.4 Permissible cable lengths with and without output reactors

NOTE
The specified lengths are valid for unshielded cables; for shielded cables, these values must be reduced to 2/3. If several motors are connected to a drive converter, the sum of the cables lengths of all the motor feeder cables must be less than the permissible cable length.

6.5.1.2 dv/dt filter

The dv/dt filter protects the motor insulation by limiting the voltage gradient and the transient peak voltage at the motor winding to uncritical values in accordance with IEC 34-17:1992 (DIN VDE 0530, Part 1, Sheet 2):

- Voltage gradient (rate of rise) $dv/dt \leq 500\ V/\mu s$
- Transient peak voltage $\hat{U}_{typ.} \leq 800\ V$ for $400\ V \leq U_N$ (3 ph. AC) $\leq 460\ V$, $540\ V \leq U_N$ (DC) $\leq 620\ V$
  $\hat{U}_{typ.} \leq 1000\ V$ for $500\ V \leq U_N$ (3 ph. AC) $\leq 575\ V$, $675\ V \leq U_N$ (DC) $\leq 780\ V$

For long feeder cables, the dv/dt filter simultaneously reduces the current spikes, which additionally load the drive converter due to the re-charging of the cable capacitances.

The dv/dt filter can be used for the following control versions

- FC (Frequency Control) and
- VC (Vector Control)

The dv/dt filter is suitable for use with

- grounded supply networks (TN- and TT supply networks)
- ungrounded supplies (IT supplies)
  (exceptions: 6SE70_ _ - _ _ B _ _ -1FD0 and 6SE70 _ _ - _ _ C _ _ -1FD0 with version release A)

NOTE
The dv/dt filter is designed for a pulse frequency fp = 3 kHz and can be operated at pulse frequencies $f_p \leq 3$ kHz. In this case, when the drive converter is being set (P052 = 5), parameter **P092 should be set to 2**. Thus, parameter P761 (pulse frequency) is automatically limited to values ≤ 3 kHz.

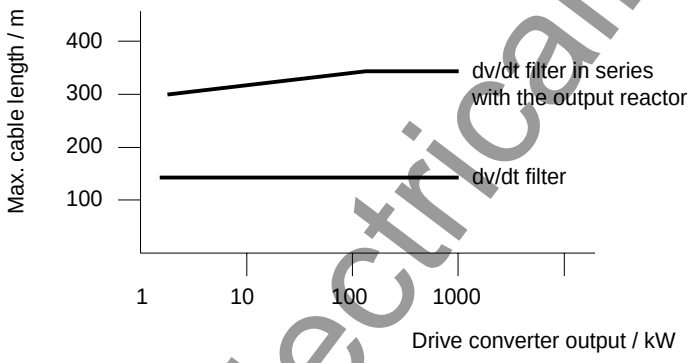


Fig. 6.5 Permissible cable lengths with dv/dt filter

NOTES
The specified cable lengths are valid for unshielded cables; for shielded cables, these values should be reduced to 2/3. If several motors are connected to a drive converter, the sum of the cable lengths of all of the motor feeder cables must be less than the permissible cable length.

6.5.1.3 Sinusoidal filter

Using the sinusoidal filter, square-wave voltage pulses at the converter output are almost sinusoidal, i.e.

- generates an almost sinusoidal motor voltage, and an absolute sinusoidal motor current,
- reduces the voltage gradient at the motor terminals to values dv/dt << 500 V/µs,
- prevents transient voltage spikes at the motor terminals
- reduces the supplementary motor losses
- reduces motor noise.

Simultaneously, the sinusoidal filter, for long motor feeder cables, reduces the current peaks, which additionally stress the drive converter as a result of the periodic re-charging of the cable capacitances.

The sinusoidal filter can be used with the following control versions.

- FC (Frequency Control) and
- VC (Vector Control)

The sinusoidal filter is suitable for use with

- grounded supplies (TN- and TT supply networks)
- ungrounded supply networks (IT supply networks)

NOTE

Operation with the sinusoidal filter requires a defined drive converter setting. For this purpose, when setting the drive converter (P052 = 5), parameter **P092 should be set to 1**.

Thus, **all** of the relevant parameters for operation with the sinusoidal filter are correctly set and limited:

P092 = 1 causes:	**Input voltage, drive converter/inverter**	
	DC 510 V - 620 V	**DC 675 V - 780 V**
Pulse frequency	P761 = 6 kHz	P761 = 3 kHz
Maximum frequency, RDF Maximum frequency, LDF	P452 ≤ + 400 Hz P453 ≥ – 400 Hz	P452 ≤ + 200 Hz P453 ≥ – 200 Hz
Pulse system enable	corresponding to P769 = 3 (no edge modulation systems)	
Firing angle limit	r180 < approx. 83 %	r180 < approx. 87 %

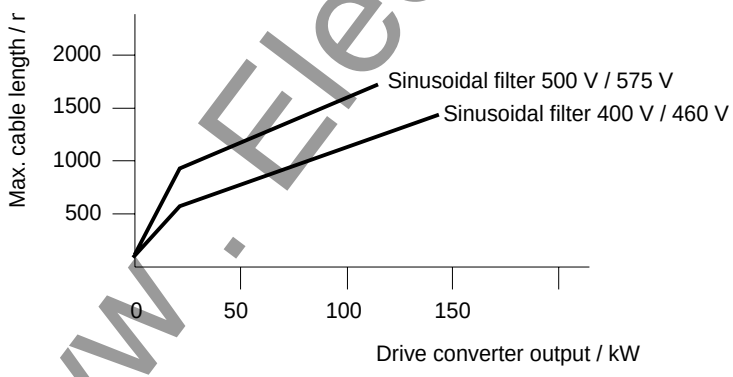


Fig. 6.6 Permissible cable lengths with sinusoidal filter

NOTE
The specified lengths are valid for unshielded cables; for shielded cables, the values must be reduced to 2/3. If several motors are connected to a drive converter, the sum of the cable lengths of all of the motor feeder cables must be less than the permissible cable lengths. When fully utilizing the permissible cable lengths, a line commutating reactor should be used and, if required, a higher starting current set.

6.5.1.4 Selection criteria for the output reactor, dv/d filter or sinusoidal filter

The following table indicates the selection criteria for the output reactor, dv/dt filter or sinusoidal filters

	Voltage range		
	280 V - 310 V (DC)	**510 V - 675 V (DC)**	**710 V - 780 V (DC)**
Motors, acc. to IEC 34-17:1992 (DIN VDE 0530, Part 1, Sheet 2)	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.	dv/dt filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.
Siemens motors 1LA2, 1LA5, 1LA6.	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.	dv/dt- filter or sinusoidal filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5 and Section „Sinusoidal filter“, Fig. 6.6.

Table 6.10 Selection criteria for the following options: Output reactor, sinusoidal filter and dv/dt filter between the converter and motor

6.6 Bypass- and output contactor

6.6.1 Bypass contactor (electrical DC link coupling)

Using the electrical DC link coupling, it is possible, for a multi-motor group with common DC bus, to connect or disconnect a converter with DC supply input to the DC bus.

This option is used when an inverter section has to be replaced.

For drive converters with rated DC voltage 280 V to 310 V, binary output **-X9:4,5** is provided to control the contactor.

For drive converters with rated DC voltage 510 V to 780 V, binary output **-X9:7,9** is provided to control the contactor. For higher outputs, an additional auxiliary contactor must be provided due to the necessary 230 V AC (contactor coil).

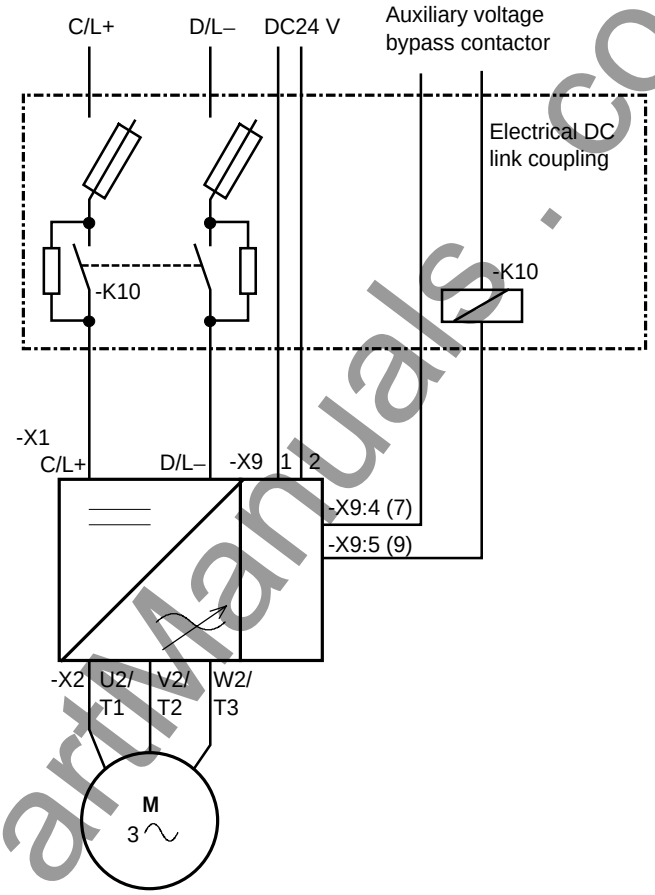


Fig. 6.7 Connecting- up example for the bypass contactor

6.6.1.1 Bypass contactor without I/R unit

Parameterization for operation with bypass contactor:

Parameter-			Terminal
No.	**Name**	**Value**	
P612, i001	ST.MC energized	0000	X9:4,5 (7,9) *)
P629, i001	ST.BC energized	1001	X9:4,5 (7,9) *)

Table 6.11 Parameterization for the bypass contactor (electrical DC link coupling)

*) Terminal assignment for drive converters for rated DC voltages 510 V to 780 V DC in brackets.

6.6.1.2 Bypass contactor with I/R unit

NOTE
If individual inverters have to be isolated when the DC busbar is supplied through an input/regenerative feedback unit, the the appropriate parameter sets of the infeed/regenerative feedback unit must be simultaneously switched-over using the binary input. An optimization run for each required constellation must be executed to determine the appropriate parameters. A maximum of four parameter sets can be selected.

If the DC busbar is to be fed from an infeed/regenerative feedback unit, the control parameter values must be determined for this infeed/regenerative feedback unit. During commissioning, the following steps are required:

- Re-parameterization for the optimization run:

Parameter-			Terminal	Information
No.	**Name**	**Value**		
P629, i001	ST.BC energized	0000	X9:4,5 (7,9) *)	
P612, i001	ST.BC energized	1001	X9:4,5 (7,9) *)	
P600, i001	ST. ready to switch-on	1001	X9:4,5 (7,9) *)	Bypass contactor closes

Table 6.12 Parameterization for the optimization run

- Execute the optimization run to determine the values for the closed-loop control parameters for the infeed/regenerative feedback unit (☞ Instruction Manual, infeed/regenerative feedback unit).

- Re-parameterize for operation with the bypass contactor:

Parameter-			Terminal	Information
No.	**Name**	**Value**		
P600, i001	ST.ready-to-switch-on	0000	X9:4,5 (7,9) *)	
P629, i001	ST.BC energiz.	1001	X9:4,5 (7,9) *)	
NOTE				
In this case, the converter must be externally supplied with 24 V DC (connector -X9: 1,2)				

Table 6.13 Parameterization for the bypass contactor (electrical DC link coupling)

*) Terminal assignment for drive converters for rated DC voltages 510 V to 780 V DC in brackets.

6.6.1.3 Connecting and disconnecting individual converters to the DC bus

Sequence control	
Switch the converter to the DC bus	**Isolate the converter from the DC bus**
Close the fuse disconnect switch	Output an off command
DC link is pre-charged through the pre-charging resistors	Bypass contactor drops out
Enter an on command	Open the fuse disconnect switch
Bypass contactor is closed	Converter is electrically isolated from the DC bus
	Wait until the DC link capacitors have completely discharged

Table 6.14 Sequence control for connecting/disconnecting individual converters to the bus

6.6.2 Output contactor

It is not necessary that the converter is operated with output contactor.

If the drive converter is operated using an output contactor, for drive converters with rated DC voltage 280 V to 310 V DC binary output -X9:4,5 is provided to control the contactor (pre-assignment).

For drive converters with rated DC voltage 510 V to 780 V DC, binary output -X9:7,9 is provided to control the contactor. Binary output X9:7,9 is only suitable for switching voltages up to 30 V DC.

The checkback signal can be connected to a binary input (e.g. binary input 3).

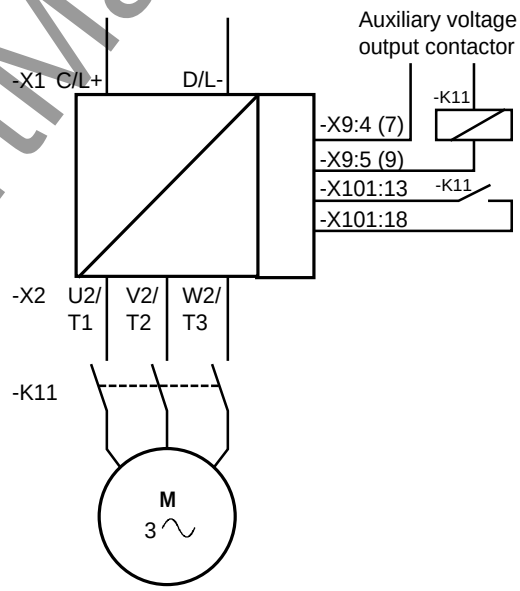


Fig. 6.8 Example for connecting-up a output contactor

Sequence control, on command-operation (effect on the bypass-or output contactor)

NOTES
For the special case, where a customer wishes to connect-up both an electrical DC link coupling as well as an output contactor, then one of the two must be energized through a binary output. For higher ratings, an additional auxiliary contactor must be provided due to the 230 V AC required (contactor coil).

6.7 Operator control

Option	Description
OP1	User-friendly operator control panel with plain text display
SIMOVIS	Floppy disk with program for operator control via PC

Table 6.15 Operator control options

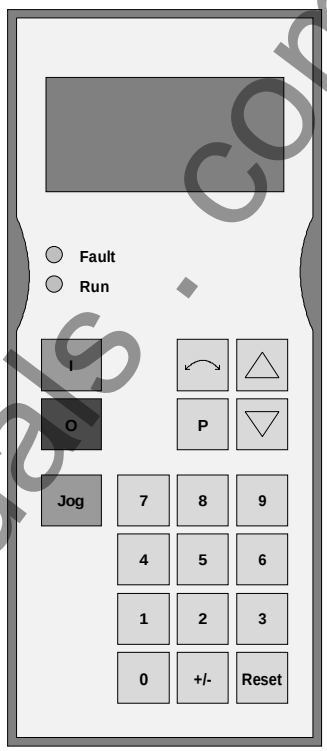


Fig. 6.9 OP1

6.8 Mechanical design

Option	Description
EMC screened housing	For screened cables

Table 6.16 Mechanical options

7 Spare Parts

Component code	Designation	Order number	Used in
-A10	CU1 (FC)	6SE7090-0XX84-0AA0	6SE70_ _-_ _ _10
-A10	CU2 (VC)	6SE7090-0XX84-0AF0	6SE70_ _-_ _ _20
-A10	CU3 (SC)	6SE7090-0XX84-0AG0	6SE70_ _-_ _ _30
-A30	PMU	6SE7090-0XX84-2FA0	6SE70_ _-_ _A_0 6SE70_ _-_ _B_0
-A30	PMU	6SE7090-0XX84-2FB0	6SE70_ _-_ _C_0 6SE70_ _-_ _D_0
-E1	24 V DC fan	6SY7000-0AA50	6SE70_ _-_ _A_0
-E1	24 V DC fan	6SY7000-0AA48	6SE70_ _-_ _B_0 6SE70_ _-_ _C_0
-E1	230 V AC fan	6SY7000-0AA80	6SE70_ _-_ _D_0
-F101, -F102	2 A, fuse, 600 V	6SY7000-0AA24	6SE70_ _-_ _D_0
-F1, -F2	50 A, fuse 700 V	6SY7000-0AC74	6SE7022-2UC_1
-F1, -F2, -F3, -F4	80 A, fuse 700 V	6SY7000-0AC73	6SE7026-0TD_1 6SE7027-2TD_1
-F1, -F2	100 A, fuse 700 V	6SY7000-0AC72	6SE7022-6TC_1 6SE7023-4TC_1
-F1, -F3	100 A, fuse 700 V	6SY7000-0AC72	6SE7023-8TD_1 6SE7024-7TD_1 6SE702_-_UD_1

Table 7.1 Spare parts

8 Environmental friendliness

Environmental aspects during the development

The number of components has been significantly reduced over earlier converter series by the use of highly integrated components and the modular design of the complete series. Thus, the energy requirement during production has been reduced.

Special significance was placed on the reduction of the volume, weight and variety of metal and plastic components.

Plastic parts used:

PC: Front cover

ABS: Fan mesh
PMU support board
Logo

PP: Hinges
Insulating board
Handle
Bus retrofit

PA6: Insulating foils
Terminal housing
Support

Halogen-containing flame retardants were, for all essential components, replaced by environmentally-friendly flame retardants.

Environmental compatibility was an important criterium when selecting the supplied components.

Environmental aspects during production

Purchased components are generally supplied in recyclable packaging materials (board).

Surface finishes and coatings were eliminated with the exception of the galvanized sheet steel side panels.

ASIC devices and SMD devices were used on the boards.

The product is emission-free.

Environmental aspects for disposal

The unit can be broken-down into recyclable mechanical components as a result of the easily releasable screw- and snap connections.

The plastic components and moulded housing are to DIN 54840 and have a recycling symbol.

Units can be disposed of through certified disposal companies. Addresses are available from your local Siemens partner.

9 Technical Data

The drive converters correspond to the listed conditions as well as the specified domestic and international standards.

Switching at the input	No./min	2
Cooling medium 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 Moisture condensation not permissible
Pollution level	2	DIN VDE 0110 Pert 1
Overvoltage category	III	DIN VDE 0110 Part 2
Overvoltage property class	1	E DIN VDE 0160
Degree of protection		DIN VDE 0470 Section 1 ≙ EN 60529
– standard	IP20	

NOTE

Degree of protection IP20 is only guaranteed if the size of the opening for the control- and outgoing cables is reduced in accordance with DIN VDE 0470 Part 1 (☞ Fig. 9.1).

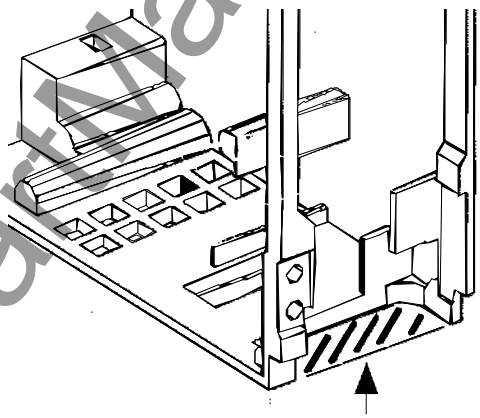


Fig. 9.1

Protection class	I	DIN VDE 0106 Section 1
Radio interference level		DIN VDE 0875 Section 11 ≙ EN 55011
– standard	without	
– option	B1	EN55011
Noise immunity		EN50082-2
Mechanical strength		
– Vibrations/oscillations		DIN IEC 68-2-6 / 06.90

	Frequency range Hz	Constant amplitude of the Deflection mm	Acceleration m/s^2 (g)
– for stead-state operation, severity level 12	10 to 58	0.075	
	above 58 to 500		9.8 (1)
– for transport, severity level 22	5 to 9	3.5	
	above 9 to 500		10 (1)

– Shock shock stressing	DIN IEC 68-2-27 / 08.89 30 g, 16 ms half-sinusoidal shock
– Falling over falling over on a surface and on a corner	DIN IEC 68-2-31 / 04.84

Inverter types							
FC	**6SE70...**	**21-1RA10**	**21-3RA10**	**21-8RB10**	**22-3RB10**	**23-2RB10**	**24-4RC10**
VC	**6SE70...**	**21-1RA20**	**21-3RA20**	**21-8RB20**	**22-3RB20**	**23-2RB20**	**24-4RC20**
SC	**6SE70...**	**21-1RA30**	**21-3RA30**	**21-8RB30**	**22-3RB30**	**23-2RB30**	**24-4RC30**
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	DC 280 ... 310 ±15 % 3 AC 0 ... Rated voltage / 1.35; **SC**: × 0.86 at f_p = 5 kHz					
Rated frequency f_n Input Output:	Hz	—— FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	12.6 10.6	15.8 13.3	21.1 17.7	27.3 22.9	38.3 32.2	52.6 44.2
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	3.8...4.2	4.8...5.3	6.4...7.1	8.3...9.1	11.6...12.8	15.8...17.6
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	9.6	12.1	16.1	20.8	29.3	40.2
Base load time	s	240					
Overcurrent	A	14.5	18.2	24.2	31.3	44.0	60.3
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	9.6	12.1	16.1	20.8	29.3	40.2
Base load time	s	270					
Overcurrent	A	17.0	21.3	28.3	36.6	51.5	70.7
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter cosφU		<0.92 ind.	<0.92 ind.	<0.92 ind.	<0.92 ind.	<0.92 ind.	<0.92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.97 0.97	 0.98 0.97	 0.97 0.97	 0.98 0.97	 0.98 0.98	 0.98 0.98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.09 0.11	 0.11 0.13	 0.13 0.15	 0.17 0.18	 0.22 0.24	 0.29 0.31
Required cooling air flow	m^3/s	0.009	0.009	0.022	0.022	0.022	0.028
Pressure drop Δp	Pa	10	10	32	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		A	A	B	B	B	C
Width Height Depth	mm	90 425 350	90 425 350	135 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	8.5	8.5	12.5	12.5	12.5	21

Inverter types							
FC	**6SE70...**	**25-4RD10**	**27-0RD10**	**28-1RD10**			
VC	**6SE70...**	**25-4RD20**	**27-0RD20**	**28-1RD20**			
SC	**6SE70...**	**25-4RD30**	**27-0RD30**	**28-1RD30**			
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	DC 280 ... 310 ±15 % 3 AC 0 ... Rated voltage / 1.35; **SC**: × 0.86 at f_p = 5 kHz					
Rated frequency f_n Input Output:	Hz	——— FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	64.3 54.0	82.1 69.0	96.4 81.0			
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	19.5...21.5	24.9...27.5	29.2...32.3			
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V	AC 230 ±15% (0.4 A)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	49.1	62.8	73.7			
Base load time	s	240					
Overcurrent	A	73.7	94.2	110.6			
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	49.1	62.8	73.7			
Base load time	s	270					
Overcurrent	A	86.4	110.4	129.6			
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		<0.92 ind.	<0.92 ind.	<0.92 ind.			
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.98 0.98	 0.98 0.98	 0.98 0.98			
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.44 0.49	 0.54 0.61	 0.60 0.67			
Required cooling air flow	m^3/s	0.054	0.054	0.054			
Pressure drop Δp	Pa	230	230	230			
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	65	65	65			
Type		D	D	D			
Width Height Depth	mm	270 600 350	270 600 350	270 600 350			
Weight	kg	32	32	32			

Inverter types							
FC	**6SE70...**	**16-1TA11**	**18-0TA11**	**21-0TA11**	**21-3TB11**	**21-8TB11**	**22-6TC11**
VC	**6SE70...**	**16-1TA21**	**18-0TA21**	**21-0TA21**	**21-3TB21**	**21-8TB21**	**22-6TC21**
SC	**6SE70...**	**16-1TA31**	**18-0TA31**	**21-0TA31**	**21-3TB31**	**21-8TB31**	**22-6TC31**
Rated voltage, rated frequency, rated current							
Rated voltage in V_n Input Output	V	 DC 510 ... 620 ±15 % 3 AC 0 ... Rated voltage / 1.35; **SC**: × 0.86 at f_p = 5 kHz					
Rated frequency f_n Input Output:	Hz	 ––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 7.3 6.1	 9.5 8.0	 12.1 10.2	 15.7 13.2	 20.8 17.5	 30.4 25.5
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	4...4.9	5.3...6.4	6.7...8.1	8.7...10.5	11.5...13.9	16.8...20.3
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	5.6	7.3	9.3	12.0	15.9	23.2
Base load time	s	240					
Overcurrent	A	8.3	10.9	13.9	18.0	23.9	34.8
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	5.6	7.3	9.3	12.0	15.9	23.2
Base load time	s	270					
Overcurrent	A	9.8	12.8	16.3	21.1	28.0	40.8
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter cosφU		 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	 <0.92 ind.
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.97 0.97	 0.98 0.98	 0.98 0.98	 0.98 0.98	 0.98 0.98	 0.98 0.98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.09 0.10	 0.10 0.11	 0.12 0.13	 0.13 0.15	 0.16 0.19	 0.27 0.31
Required cooling air flow	m^3/s	0.009	0.009	0.009	0.022	0.022	0.028
Pressure drop Δp	Pa	10	10	10	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		A	A	A	B	B	C
Width Height Depth	mm	90 425 350	90 425 350	90 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	8.5	8.5	8.5	12.5	12.5	21

Inverter types							
FC	**6SE70...**	**23-4TC11**	**23-8TD11**	**24-7TD11**	**26-0TD11**	**27-2TD11**	
VC	**6SE70...**	**23-4TC21**	**23-8TD21**	**24-7TD21**	**26-0TD21**	**27-2TD21**	
SC	**6SE70...**	**23-4TC31**	**23-8TD31**	**24-7TD31**	**26-0TD31**	**27-2TD31**	
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	DC 510 ... 620 ±15 % 3 AC 0 ... Rated voltage / 1.35; **SC**: × 0.86 at f_p = 5 kHz					
Rated frequency f_n Input Output:	Hz	——— FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	40.5 34.0	44.6 37.5	55.9 47.0	70.2 59	85.7 72.0	
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	22.4...27.1	24.7...29.9	30.9...37.4	38.8...47.7	47.4...57.4	
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V		AC 230 ±15% (0.4 A)				
Loading Class II acc. to EN 60146-1-1							
Rated current	A	30.9	34.1	42.8	53.7	65.5	
Base load time	s	240					
Overcurrent	A	46.4	51.2	64.2	80.5	98.3	
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	30.9	34.1	42.8	53.6	65.5	
Base load time	s	270					
Overcurrent	A	54.4	60.0	75.2	94.4	115.2	
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		<0.92 ind.	<0.92 ind.	<0.92 ind.	<0.92 ind.	<0.92 ind.	
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		0.98 0.98	0.98 0.98	0.98 0.98	0.98 0.98	0.98 0.98	
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	0.37 0.43	0.49 0.55	0.58 0.67	0.70 0.79	0.86 0.97	
Required cooling air flow	m^3/s	0.028	0.054	0.054	0.054	0.054	
Pressure drop Δp	Pa	30	230	230	230	230	
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	65	65	65	65	
Type		C	D	D	D	D	
Width Height Depth	mm	180 600 350	270 600 350	270 600 350	270 600 350	270 600 350	
Weight	kg	21	32	32	32	32	

Inverter types							
FC	**6SE70...**	**14-5UB11**	**16-2UB11**	**17-8UB11**	**21-1UB11**	**21-5UB11**	**22-2UC11**
VC	**6SE70...**	**14-5UB21**	**16-2UB21**	**17-8UB21**	**21-1UB21**	**21-5UB21**	**22-2UC21**
SC	**6SE70...**						
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	 DC 675 ... 780 ±15 % 3 AC 0 ... Rated voltage / 1.35					
Rated frequency f_n Input Output:	Hz	 ––– FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	 5.4 4.5	 7.4 6.2	 9.3 7.8	 13.0 11.0	 18.0 15.1	 26.2 22.0
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	3.9...4.5	5.4...6.2	6.7...7.7	9.5...10.9	13.1...15	19.1...21.9
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	4.1	5.6	7.1	10.0	13.7	20.0
Base load time	s	240					
Overcurrent	A	6.1	8.5	10.6	15.0	20.6	30.0
Overcurrent time	s	60					
Loading Class II acc. to EN 60146-1-1 (additionally for VC and SC)							
Rated current	A	4.1	5.6	7.1	10.0	13.7	20.0
Base load time	s	270					
Overcurrent	A	7.2	9.9	12.5	17.6	24.2	35.2
Overcurrent time	s	30					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	 <0.92 ind.	
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		 0.99 0.98	 0.98 0.97	 0.99 0.98	 0.99 0.98	 0.99 0.98	 0.99 0.98
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	 0.08 0.09	 0.09 0.11	 0.10 0.12	 0.13 0.16	 0.17 0.20	 0.27 0.32
Required cooling air flow	m^3/s	0.022	0.022	0.022	0.022	0.022	0.028
Pressure drop Δp	Pa	32	32	32	32	32	30
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	60	60	60	60	60	60
Type		B	B	B	B	B	C
Width Height Depth	mm	135 425 350	135 425 350	135 425 350	135 425 350	135 425 350	180 600 350
Weight	kg	12.5	12.5	12.5	12.5	12.5	21

Inverter types							
FC	**6SE70...**	**23-0UD11**	**23-4UD11**	**24-7UD11**			
VC	**6SE70...**	**23-0UD21**	**23-4UD21**	**24-7UD21**			
SC	**6SE70...**						
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V_n Input Output	V	DC 675 ... 780 ±15 % 3 AC 0 ... Rated voltage / 1.35					
Rated frequency f_n Input Output:	Hz	——— FC U/f = konst 0 ... 300 U = konst 8 ... 300 VC U/f = konst 0 ... 600 U = konst 8 ... 300 SC 0 ... 400					
Rated current I_n Input Output	A	34.5 29	40.5 34.0	55.4 46.5			
DC link voltage V_{dn}	V	= Rated voltage					
Rated output	kVA	5.4...6.2	29.4...33.9	40.3...46.3			
Auxiliary power supply	V	DC 24 (20-30) (2.0 A without Options; with Options refer to Section 6.1)					
Auxiliary power supply	V	AC 230 ±15% (0.4 A)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	26.4	30.9	42.3			
Base load time	s	240					
Overcurrent	A	39.6	46.4	63.5			
Overcurrent time	s	60					
Losses, cooling, power factor							
Power factor Converter $\cos\varphi_U$		<0.92 ind.	<0.92 ind.	<0.92 ind.			
Efficiency η – Pulse frequency 3 kHz – Pulse frequency 6 kHz		0.98 0.97	0.98 0.97	0.98 0.97			
Power loss – Pulse frequency 3 kHz – Pulse frequency 6 kHz	kW	0.52 0.63	0.59 0.73	0.74 0.91			
Required cooling air flow	m^3/s	0.054	0.054	0.054			
Pressure drop Δp	Pa	230	230	230			
Sound pressure level, dimensions, weights							
Sound pressure level	dB(A)	65	65	65			
Type		D	D	D			
Width Height Depth	mm	270 600 350	270 600 350	270 600 350			
Weight	kg	32	32	32			

9.1 De-rating for an increased cooling medium temperature

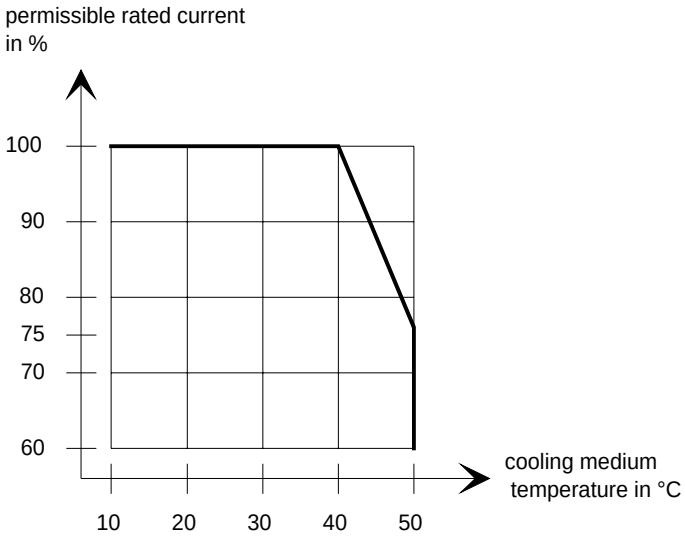


Fig. 9.2 Max. permissible rated current as a function of the cooling medium temperature

9.2 De-rating at installation altitudes > 1000 m above sea level

For installation altitudes > 1000 m above sea level, the rated current must be reduced. For installation altitudes > 2000 m above sea level, the rated voltage must be reduced (see Fig. 9.3). Installation altitudes > 4000 m above sea level are not permissible.

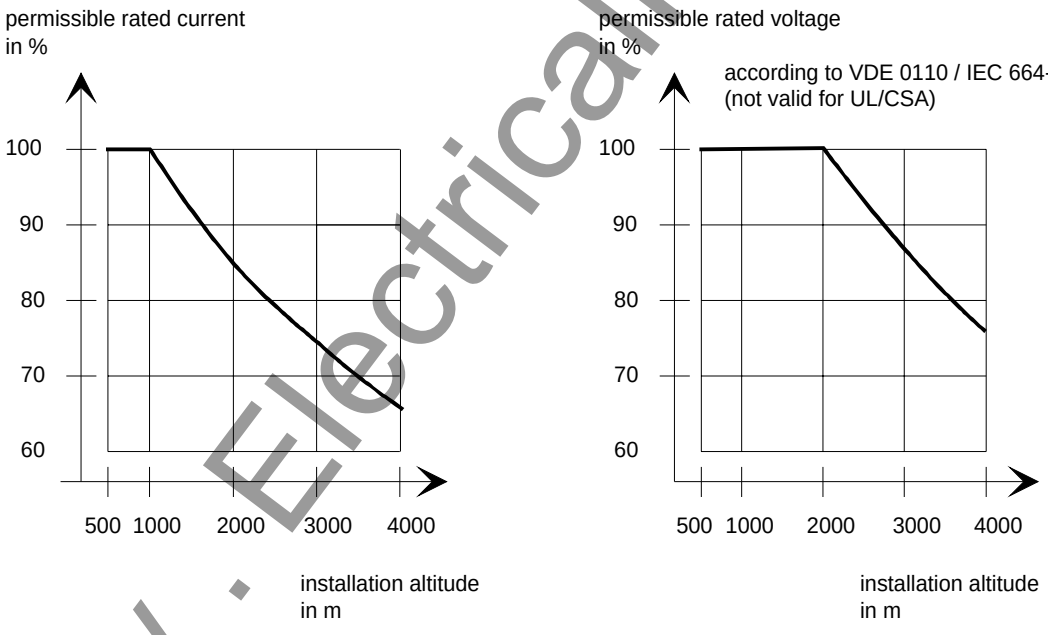


Fig. 9.3 Max. permissible rated current and rated voltage as a function of the installation altitude

9.3 De-rating as a function of the pulse frequency

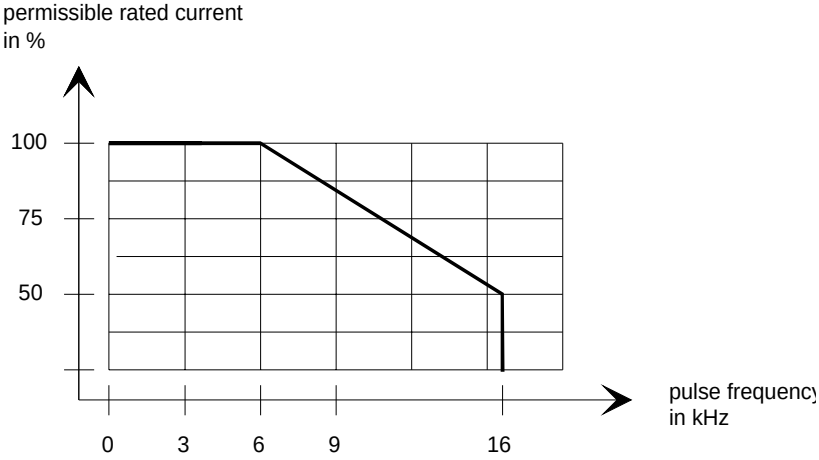


Fig. 9.4 Max. permissible rated current as a function of the pulse frequency

10 Appendix

10.1 Index

10.2 List of abbreviations

A	Alarm
AA	Analog output
AC	Alternating current
AE	Analog input
AFE	Active front end
AS	Sequence control
ASIC	Application specific integrated circuit
ASM	Asynchronous motor
ATI	Analog tacho-Interface
AWG	American wire gauge
BA	Binary output
BC	Bypass contactor
BE	Binary input
BF	Type of construction
CAN	Controller area network
CB	Communication board (option)
CU	Control unit
CUA	Control unit AFE (control unit of AFE)
DC	Direct current
DPR	Dual-port-RAM
DPRAM	Dual-port-RAM
EA	First run-up
EEPROM	Electrically erasable programmable read-only memory
EMC	Electromagnetic compatibility
EMF	Electromotive force
EPROM	Erasable programmable read-only memory
ESD	Electrostatic sensitive devices
F	Fault
FC	Frequency control (control version of SIMOVERT MASTER DRIVES)
FF	Fatal fault
FI	Fault current
FSW	Fixed setpoint
G/R	Basic/reserve
GSST(1/2)	Basic drive converter serial interface (1/2)
H	High (binary signal level)
HLG	Ramp-function generator
HTL	High-voltage transistor logic

HW	Hardware
I/O	Input/output
IGBT	Insulated gate bipolar transistor
IGD	IGBT gate drive
IVI	Inverter interface
KIP	Kinetic buffering
L	Low (binary signal level)
LBA	Local bus adapter (option)
LED	Light emitting diode
LSB	Least significant bit
MC	Main contactor
MDS	Motor data set
MLFB	Machine-readable product designation (machine-readable designation)
MSB	Most significant bit
NN	Sea level
OP(1)	Operation panel (1)
Par	Parameter
PC	Personal computer
PEU	Power electronic unit
PG	Programming unit (programmer)
PKW	Parameter ID value
PMU	Parameterization unit
PROFIBUS	Process field bus
PS	Power supply
PSU	Power supply unit
PWE	Parameter value
PZD	Process data
Q	Source
RC	Combination, resistor ® and capacitor (C)
RDS	Reserve data set
RFG	Ramp-function generator
SC	Servo control (control version of SIMOVERT MASTER DRIVES)
SCB(1/2)	Serial communication board (option)
SCI(1/2)	Serial communication Interface (1/2)
SDS	Setpoint data set
SL	Slave
SM	Synchronous motor
SMD	Surface mounted device

SML	Snubber module low
SMU	Snubber module up
SST1/2	Serial interface 1/2
SW	Software
TB	Technology board (option)
TLG	Telegram
TRC	Trace
TSY	Tacho and synchronization (option)
TTL	Transistor-Transistor-Logic
UCE	Voltage (V) collector->emitter (desaturation signal of the transistors)
UMR	Drive converter
USS	Universal serial interface
VC	Vector control (control version of SIMOVERT MASTER DRIVES)
VDU	Voltage-dividing-unit
VS	Precharging contactor
Vsa	Line supply voltage components in the a axis
Vsb	Line supply voltage components in the b axis
VSB	voltage sensing board (line supply voltage sensing board)
WEA	Automatic restart function
WR	Inverter
X9	Terminal strip on the PEU (types A to D), PSU1 (types E to H) and PSU2 (types J to M)
ZK	DC link

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12 Certificates

SIEMENS Drive and Standard Products Group

Test certificate

Erlangen, 01.07.1995

Equipment	AC drive converter
• Type	SIMOVERT MASTER DRIVES
• Order No.:	6SE70... 1)

The routine testing according to these test instructions

475 100.9000.00 QP for size A - D
476 100.9000.00 QP for size E - H
476 200.9000.00 QP for size J - M

Tests performed:

I. Product check
- checking of presence of all components acc. to parts list

II. Isolation test
- DIN VDE 0160 draft 04.91, par. 7.6.1
- CSA 22.2-14.M91, par. 6.8

III. Functional test acc. to DIN VDE 0558, part1
- power supply
- customer terminals and interfaces
- power conversion section
- protective and monitoring functions

IV. RUN-IN
- Ambient temperature 55 °C cycled
- Duration 24 up to 72 hours
- Scampling 10 % to 100 %

The equipment complied with the test requirements.
Test results are documented within the production data file.

1) For complete type, serial number and technical data please see rating plate.

ASI 1 PE D F

Schlögel

ASI 1
System-Based
Drive Technology

SIEMENS

Drive and Standard Products Group

Confirmation

Erlangen, 01.07.1995

This confirms that

Equipment	AC drive converter
• Type	SIMOVERT MASTER DRIVES
• Order No.:	6SE70...

is manufactured in conformance with DIN VDE 0558 Part 2and DIN VDE 0113 Part 6.2.

This equipment fulfills the shock hazard protection requirements according to DIN VDE 0106 Part 100 when the following safety rules are observed:

- Service work in operation is only permissible at the electronics box
- The converter must be switched into a no-voltage condition and isolated from the supply when replacing any part/component
- All panels must be closed during operation.

Thus, this equipment conforms to the appropriate regulations in Germany according to VBG 4 §2 (2) (VBG is a German regulatory body for safety-related issues).

The local operating regulations (e.g. DIN VDE 0105) must be observed when operating the equipment.

ASI 1 PE D T

Dr. Link

ASI 1
System-Based
Drive Technology

SIEMENS

Factory certificate *

regarding electromagnetic compatability

4SE.475 000 0001.00 WB EEC

Manufacturer:	Siemens Aktiengesellschaft
	Drives and Standard Products Group
	Business Division Variable-speed drives
	Sub-Division Drive systems
Address:	Postfach 3269
	D-91050 Erlangen
Product name:	SIMOVERT
	Type 6SE70 compact drive converters AC-AC and DC-AC

When correctly used, the designated product fulfills all the requirements of Directive 89/336/EEC regarding electromagnetic compatibility.

We confirm the conformance of the above designated product with the Standards:

EN 61800-3 10-1996
EN 61000-4-2 (old IEC 801-2)
EN 61000-4-4 (old IEC 801-4)
EN 61000-4-5 (old IEC 801-5)
IEC 1000-4-3 (old IEC 801-3)
EN 55011 (DIN VDE 0875 Part 11)

Note:

This instructions relating to EMC-correct installation, correct operation, connecting-up conditions and associated instructions in the product documentation supplied must be observed.

Erlangen, 20. 01. 1997

i. V.

H. Mickal
Head of the Drive System Production Unit

This declaration does not guarantee any features.

*) acc. to EN 10204 (DIN 50049)

The following versions have appeared so far:

Version	Internal Item number
AA	475 944.4100.76 AA-76
AB	475 944.4100.76 AB-76
AC	475 944.4100.76 AC-76
AD	475 944.4100.76 AD-76

Version AD consists of the following chapters

Chapters		Changes	Pages	Version date
0	General	Reviewed Edition	8	09.97
1	Description	Reviewed Edition	4	09.97
2	Transport, Unpacking, Installation	Reviewed Edition	4	09.97
3	Connecting-up	Reviewed Edition	6	09.97
4	Operator control	Reviewed Edition	2	09.97
5	Maintenance	Reviewed Edition	5	09.97
6	Options	Reviewed Edition	13	09.97
7	Spare Parts	Reviewed Edition	1	01.2000
8	Environmental friendliness	First Edition	1	08.96
9	Technical Data	Reviewed Edition	9	09.97
10	Appendix	Reviewed Edition	4	09.97
11	Adresses	First Edition	2	08.96
12	Certificates	Reviewed Edition	3	09.97

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Division: Variable-Speed Drive Systems
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Siemens Aktiengesellschaft

Subject to change

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