

SIEMENS

SIMOVERT MASTER DRIVES

Operating Instructions
Part 1

Chassis units (Type K)
AC-AC

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.

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We have checked the contents of this document to ensure that they coincide with the described hardware and software. However, differences cannot be completely excluded, so that we do not accept any guarantee for complete conformance. However, the information in this document is regularly checked and necessary corrections will be included in subsequent editions. We are grateful for any recommendations for improvement.

SIMOVERT® Registered Trade Mark

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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, commitment 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

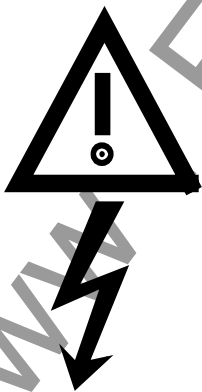
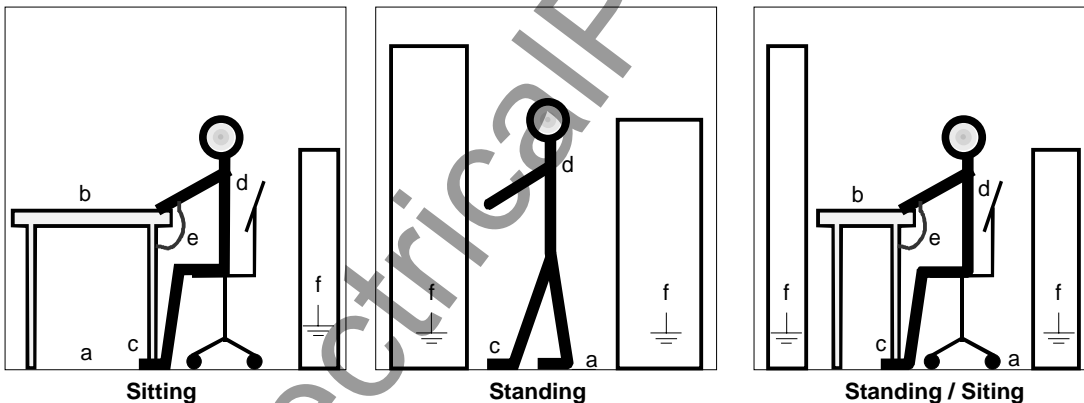
Components which can be destroyed by electrostatic discharge (ESD)

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 |



WARNING

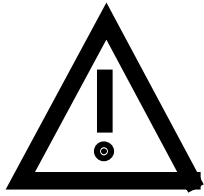
Hazardous voltages are present in this electrical equipment during operation.

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 operation) 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!

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1 Description

SIMOVER 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: AC-AC: 45 kW to 400 kW
 DC-AC: 45 kW to 1500 kW
- ◆ Cabinet units with three-phase- or DC current input
Output range: 45 kW to 6.4 MW

The following control classes are available depending on the application conditions

- ◆ Vector control VC High demands on dynamic performance and accuracy
- ◆ Servo Control SC Servodrives

1.1 Applications

Drive converter with three-phase current input

The drive converter generates a variable-frequency three-phase system at the motor side from a fixed-frequency three-phase supply (50/60 Hz). This variable-frequency three-phase system is used to continuously control the speed of three-phase motors.

In the basic design, SIMOVER MASTER DRIVES can be used for two-quadrant operation. Four-quadrant operation is possible using the braking unit option. SIMOVER MASTER DRIVES are suitable 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

The three-phase AC voltage, fed to the SIMOVER MASTER DRIVES through the input terminals, is rectified in a B6 bridge rectifier and fed to the DC link through series resistors. The DC link is charged through two resistors, so that complete ground-fault proof operation is provided on the load side.

The converter is then ready for operation.

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

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.

SIMOVERT SC is suitable for:

- ◆ Single-motor drives with induction 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

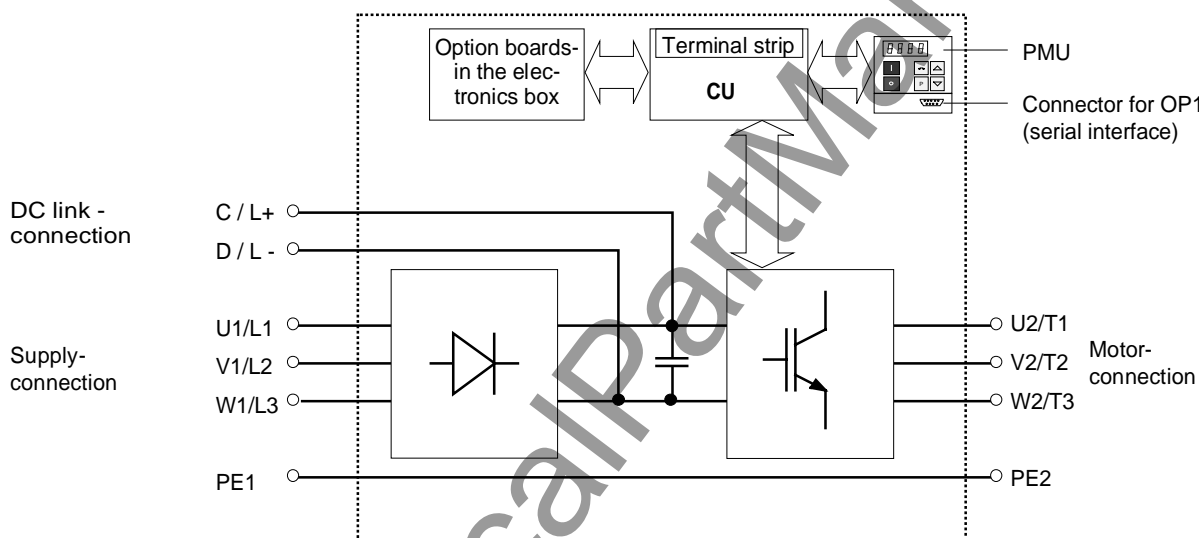


Fig. 1.1 Block diagram

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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.

For transportation with a fork-lift truck the converter is mounted on a wooden pallet.

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.

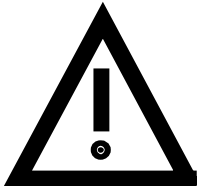
If the converter is damaged you must inform your shipping company immediately.

The packaging consists of a wooden floor section and a PE foil to protect the equipment from humidity. It can be disposed of in accordance with local regulations.

Chassis units are supplied, as standard, with degree of protection IP00.

2.2 Storage


The converters must be stored in clean dry rooms. Temperatures between -25 °C (-13 °F) and $+70\text{ °C}$ (158 °F) are permissible. Temperature fluctuations $> 20\text{ K}$ 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:

- ♦ M8 bolt(s)
- ♦ Dimension drawing: **Fehler! Verweisquelle konnte nicht gefunden werden.** for type of construction K

	WARNING
	<p>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.</p> <p>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 personal protective equipment.</p> <p>Death, severe bodily injury or significant material damage could result if these instructions are not followed.</p> <p>Chassis units do not provide any protection against direct contact. It is the users responsibility to ensure and provide the correct protection against contact according to the relevant accident prevention regulations VBG4, by appropriately designing the enclosure or enclosures around the chassis unit.</p>

Remove shipping brace (marked).


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 drawing in Section 2.4.

Equipment rooms must be dry and dust-free, moisture condensation is not permissible.

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
	<p>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).</p> <p>Dimension the cabinet cooling in line with the power loss and cooling air flow! (↗ Section „Technical data“)</p>

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“).

Information for mounting a chassis unit in a cabinet:

Three different fan assemblies are used for the chassis units, frame sizes (BF) J, K and M (= 2 × K). The following table shows the assignment of the fan modules to the individual units:

	Unit Order No.	6SE70 _ _ - _ T(U,W)J20 6SE70 _ _ - _ E(F,H)K20	6SE70 _ _ - _ T(U,W)K[M]20	6SE7041-1TK20, 6SE7038-6UK20, 6SE7038-6WK20, 6SE7041- _ U(W)M20
2	Fan	1 × RH28M	2 × RH28M	RH35B
3	Air flow (m ³ /s)	0.46	0.6	0.8
4	Cut-out in the cabinet doors (m ²)	0.26	0.26	0.26
5	Cut-out consists of holes, each with X mm ² surface area	280	280	280
6	Cut-out in the roof section (m ²)	0.26	0.26	0.26
7	Cut-out in the roof section consists of holes, each with X mm ² surface area	190	190	190

Table 2.1

Door/roof section cut-outs

The airflow through the openings (cut-outs) in the cabinet doors generates a vacuum. The vacuum depends on the airflow and the hydraulic cross-section of the openings.

In the roof section or under the roof section panel, the airflow causes a slight pressure. As a result of the pressure difference-, pressure at the top, vacuum in the lower part of the cabinet-, air flows through the unit, the so-called closed-loop air circuit. This closed-loop air circuit is defined by the airflow and the cross-section of the openings in the door and roof section.

This air closed loop must be prevented using partitions. In this case, the cabinets adjacent to the inverter cabinets must also be taken into account. The required **partition measures** are illustrated in Fig. 2.1. These partitions must extend to the cabinet frames. They must be designed so that the discharged air isn't pressed into the cabinet frame pieces, but is guided around them.

The required **cross-sections of the openings** are specified in Table 2.1.

The specified cross-section of the openings consists of several holes. In order that the pressure loss at these isn't too excessive, the minimum hole cross-sections are specified in lines 5 and 7 of the table. The opening- and hole cross-sections guarantee a function, even for higher degrees of protection. For example, by using wire meshes in the openings for IP42 or using dirt filters, type FIBROID ELASTOV-10 from the DELBAG-Luftfilter GmbH company. If finer dirt filters are used, the filter surface, and therefore the opening cross-section must be adapted (increased). **The replacement intervals must be maintained when using dirt filters!**

Mounting components in the roof section

If components are mounted in the roof section (DC bus, 24 V DC supply), these should, if possible, be located in the center so that the air, discharged from the fans, can reach the openings in the roof section.

Implementing the 24V DC-auxiliary power supply

In order that the units function perfectly (regarding electromagnetic disturbance), each chassis must have its own 24V DC-auxiliary power supply with isolating transformer. For frame size M, the 24V DC power supply for the master and slave can be arranged as common supply in the master, if the 24 V cable to the slave is routed in the screen duct provided.

Opening cross-section in the roof section at the top.
(Also possible at the front and/or side)

From all 4 sides from direct partition between the fan assembly and cabinet frame

Cabinet frame

Lefthand, righthand and rear partition to the adjacent cabinet

Opening cross-sections in the doors (with possible dirt filters located behind them)

Fig. 2.1

Einbaugeräte AC-AC
Bauform K

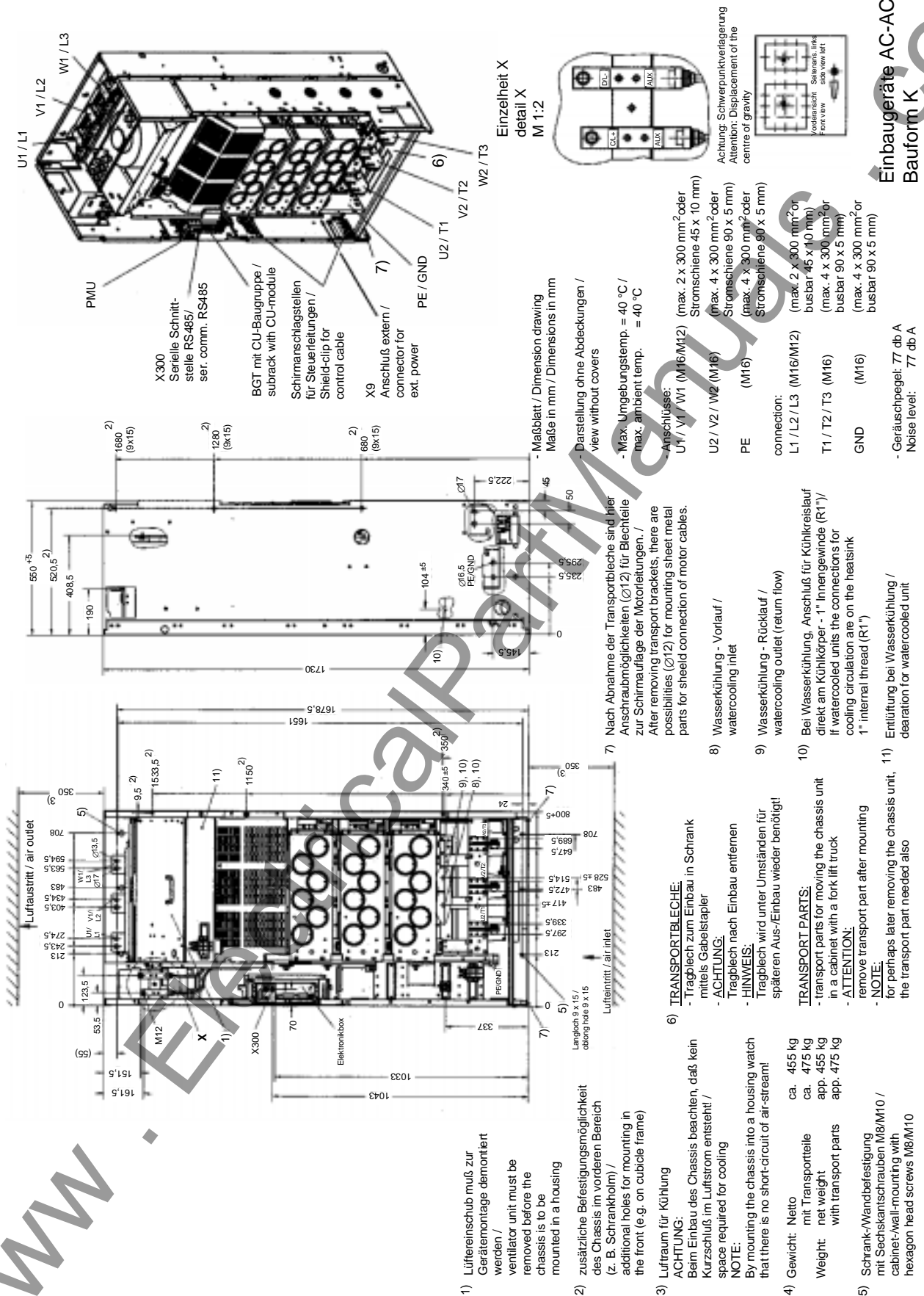
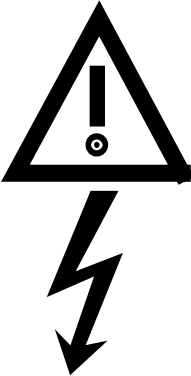


Fig. 2.2 Type of construction K

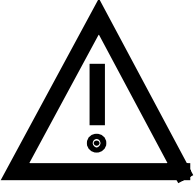
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3 Connecting-up

	WARNING
	<p>SIMOVERT MASTER DRIVES are operated at high voltages.</p> <p>The equipment must be in a no-voltage condition (disconnected from the supply) before any work is carried-out!</p> <p>Only professionally trained, qualified personnel must work on or with the unit.</p> <p>Death, severe bodily injury or significant material damage could occur if these warning instructions are not observed.</p>
	<p>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.</p> <p>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.</p>
	<p>Forming the DC link capacitors:</p> <p>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.</p> <p>Forming is described in the Instruction Manual, Part 2.</p>
	<p>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.</p>
	<p>If a protective device trips in a current arm, then a fault current could have been interrupted. In order to reduce the danger of fire or electric shock, the live parts and over components of the converter should be checked and damaged components replaced.</p>

INFORMATION	
◆ Protection:	Fuses must be incorporated in the equipment supply connection. For a list of the recommended fuses, refer to Table 3.1.
◆ Supply rating:	The converter is suitable for connecting to supplies with a short-circuit rating (supply) $\leq 100 \times$ rated output (converter).
◆ The converter should be connected via a line reactor according to Table 3.1.	
◆ 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
	<ul style="list-style-type: none"> ◆ The unit will be destroyed if the input- and output terminals are interchanged! ◆ The converter will be destroyed if the DC link terminals are interchanged or short-circuited! ◆ 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. ◆ It is not permissible that the converter is connected-up through an e.l.c.b. (ground fault circuit interrupter) (DIN VDE 0160).

The converters should be fused on the line side with fuses according to Table 0.1. In order to reduce noise and to limit the harmonics fed back into the supply a 2% commutating reactor should be used to connect the converter to the supply. Refer to Table 3.1 for the Order Nos. for the fuses and the line commutating reactors.

To maintain the radio interference suppression regulations, refer to the Instruction Manual, Part 2, Section „Measures to maintain the radio interference suppression regulations“.

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

Line connection: U1/L1 V1/L2 W1/L3
 Motor connection: U2/T1 V2/T2 W2/T3
 Protective conductor connection: PE1 ⊕ PE2 ⊕

Connections must be established using cable lugs with bolts according to Table 3.1.

NOTE
A transformer is mounted for the 230 V fan. The terminals on the primary must be changed-over corresponding to the line supply voltage. If this is not done, fuses F3, F4 or F101, F102 could rupture.

NOTE
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:
<ul style="list-style-type: none"> ◆ Output reactor ◆ dv/dt-filter only for VC, not permissible for SC
Information regarding selection and dimensioning is provided in Section „Options“.

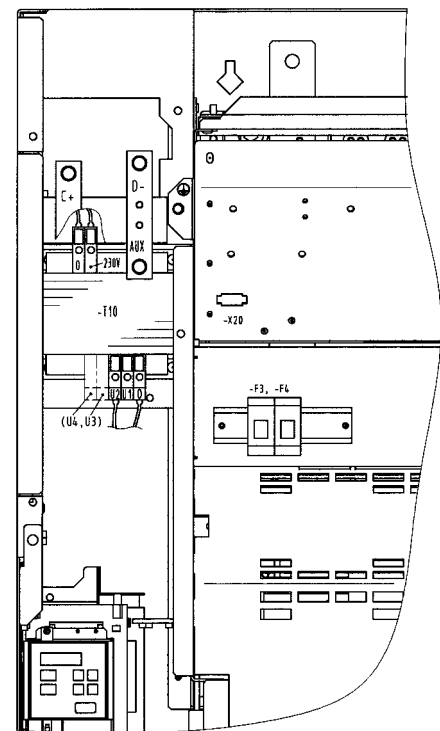


Fig. 3.1 Fan transformer (-T10), fan transformer fuses (-F3, -F4)

Order No.	Rated input cuerr. (A)	supply side										Motor connection Cross-section VDE (mm²) AWG	
		Cross-section		Recommended fuse							Line reactor		
		VDE (mm²)	AWG ¹⁾	gR (SITOR)		gL NH		North-America					
				(A)	Type	(A)	Type	Type	(V)	(A)			
6SE70					3NE1		3NA3				4E		
Rated input-voltage 380 V to 460 V													
35-1EK20	510	2×300	2×800	560	435-0	630	372				U3051-5UA00	2×300	2×800
36-0EK20	590	4×300	4×800	630	436-0	710					U3051-6UA00	4×300	4×800
Rated input-voltage 500 V to 575 V													
33-0FK20	297	2×300	2×800	315	230-0	400	260 ²⁾	AJT, LPJ	600	400	U2751-3UA00	2×300	2×800
33-5FK20	354	2×300	2×800	400	330-0	500	260 ²⁾	AJT, LPJ	600	500	U2751-4UA00	2×300	2×800
34-5FK20	452	2×300	2×800	500	334-0	630	3NE 1436-0	AJT, LPJ	600	600	U3051-2UA00	2×300	2×800
Rated input-voltage 660 V to 690 V													
33-0HK20	297	2×300	2×800	315	230-0	400	260-6				U3051-3UA00	2×300	2×800
33-5HK20	354	2×300	2×800	400	330-0	500	365-6				U3051-4UA00	2×300	2×800
34-5HK20	452	2×300	2×800	500	334-0	630	3NE 1436-0				U3651-5UA00	2×300	2×800
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) and the recommended cable protection according to DIN VDE 0100 Part 430.													
The cables and semiconductors are protected using fuses with gR characteristics. Only the cables, but not the semiconductors, are protected using gL fuses.													
1) American Wire Gauge													
2) The specified fuses are valid for converters with a 3-ph AC 500 V input voltage. For converters with higher input voltage, fuses up to 660 V must be used. The Order Nos. of these fuses are obtained by attaching the suffix "-6" to the appropriate 500 V fuse Order No.													
e.g.: 3NA3803 Δ 500 V 3NA3803-6 Δ 660 V													

Table 3.1 Power connections acc. to DIN VDE

Type of construction	Order No.	Possible connection cross-section		Bolted joint
		(mm ²) lt. VDE	AWG	
K	6SE703...E(F,H)K_0	2 × 300	2 × 800	M12 / M16

Table 3.2 Possible connection cross-sections and bolted joints, on the line side

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.

3.1.2 DC link connection

The "braking unit" (6SE7087-6CX87-2DA0) and "dv/dt filter" (6SE7087-6CX87-1FD0) options can be connected at the DC link terminals C/L+ and D/L– (Fig. 5.5). They are not suitable for connecting other inverter units (e.g. DC drive converters).

This connection is not suitable for connecting a rectifier or rectifier/regenerative feedback unit.

Using option M65, it is possible to shift the DC link terminals C/L+ and D/L– towards the bottom.

3.2 Auxiliary power supply/main contactor

The auxiliary power supply and the main contactor are connected through the 5-pin connector X9. Connector X9 is supplied together with the connectors for the control terminal strip. Cables from 0.2 mm² to 2.5 mm² (AWG: 24 to 14) can be connected to X9.

The auxiliary power supply is used, if the drive converter is fed through a main contactor and the control functions have to be maintained, even when the main contactor is opened.

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

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

Term.	Function description
1	24 V DC external $\geq 1,8$ A (max. 6,5 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

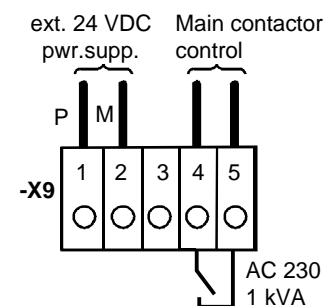


Fig. 3.2 Connecting an external auxiliary 24 V DC power supply and main contactor control

NOTES

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

3.3 Instructions for EMC-correct installation

EMC (**E**lectromagnetic **C**ompatibility) involves the noise emission and noise immunity of electrical equipment. Optional radio interference suppression filters are available to limit the **noise emission**.

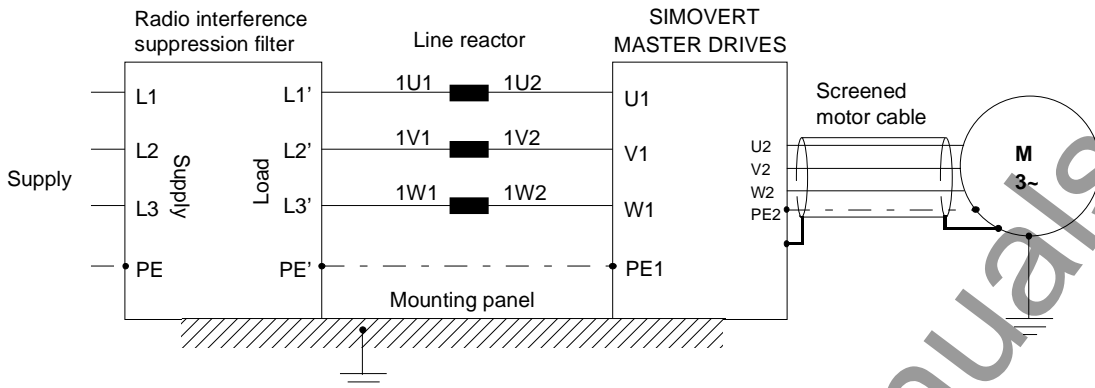


Fig. 3.3 Location of the components

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 mm²) or Siemens PROTOFLEX-EMV-CY (cross-section > 120 mm²). 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 (see Fig. 3.4.1). Otherwise, cable ties can be used to connect the screen (see 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).

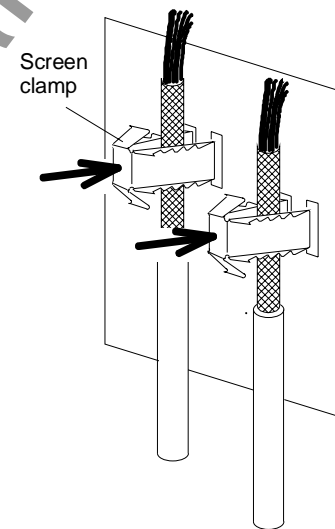


Fig. 3.4.1

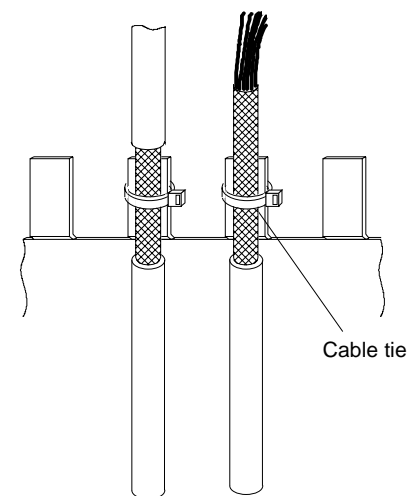


Fig. 3.4.2

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

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4 Operator control

The converter can be controlled via:

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

Operator control using the PMU is described in this section.

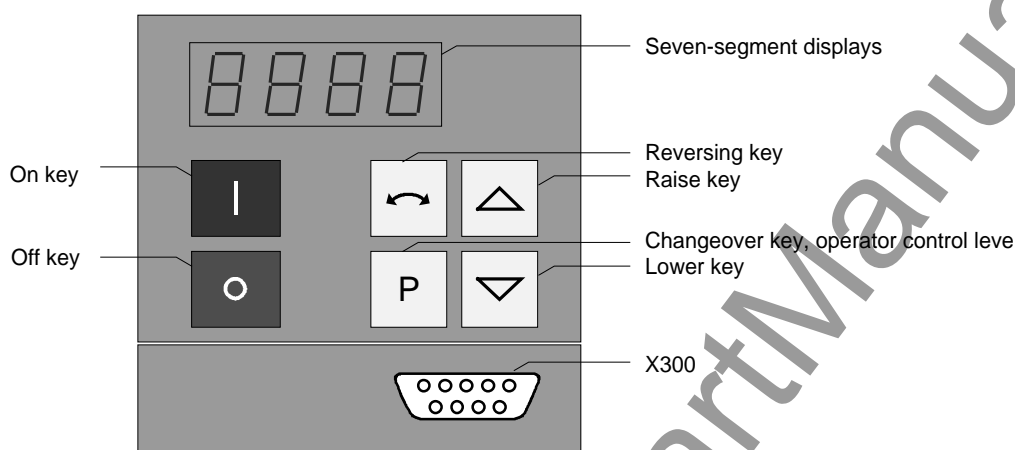


Fig. 4.1 Parameterization unit

4.1 Operator control elements


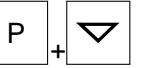
Operator control elements	Function
	Converter switch on (standard). For faults: Return to the fault display. Command is effective when the key is released.
	Converter shutdown depending on the parameterization of OFF 1, OFF 2 or OFF 3 (P554 to P560). Command becomes effective when the key is released.
	Field reversal / reversing for the appropriate parameterization. Command becomes effective when the key is released.
	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.
 resp. 	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











		Parameter number		Index e.g..	Parameter value e.g.
		Pos. Actual value e.g	Neg. actual value e.g		
Visualization parameters	Basic converter			---	
	Technology board				
Setting parameters	Basic converter			, 000	
	Technology board				

Table 4.2 Displaying visualization- and setting parameters on the PMU

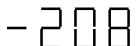



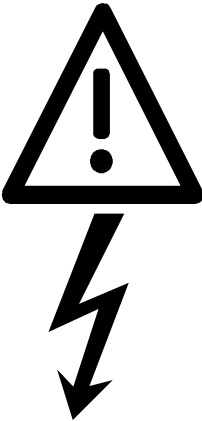
	Actual value	Parameter value not possible	Alarm	Fault
Display				

Table 4.3 Status display on the PMU

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

5 Maintenance

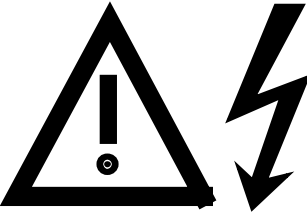
	WARNING	
	<p>SIMOVERT MASTER DRIVES are operated at high voltages.</p> <p>All work carried-out on or with the equipment must conform to all of the relevant national electrical codes (VGB4 in Germany).</p> <p>Maintenance and service work may only be executed by qualified personnel.</p>	
	<p>Only spare parts authorized by the manufacturer may be used.</p> <p>The specified maintenance intervals and also the instructions for repair and replacement must be adhered to.</p> <p>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.</p> <p>The power- and control terminals can still be at hazardous voltage levels even though the motor is at a standstill.</p>	
	<p>If it is absolutely necessary that the drive converter must be worked on when powered-up:</p> <ul style="list-style-type: none"> ◆ 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. <p>If these warnings are not observed this can result in death, severe bodily injury or significant material damage.</p>	

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 $T_U = 40\text{ °C}$. They must be replaced before their service life expires so that the drive converter availability is guaranteed.

5.2 Replacing components

	WARNING
	<p>The fan may only be replaced by qualified personnel.</p> <p>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.</p> <p>If these warnings are not observed, death, severe bodily injury or considerable material damage could occur.</p>

5.2.1 Replacing the fan assembly

The fan assembly consists of:

- ♦ the fan housing
- ♦ a fan
- ♦ the starting capacitors

The fan assembly is mounted at the top in the chassis unit.

- Remove connector X20 (see Fig. 3.1)
- Release both mounting bolts (M8) of the fan assembly
- Withdraw the fan assembly towards the front, and if required, tilt it gently downwards and place carefully on a flat surface
- Release the cable ties and fan connections
- Remove the fan mounting panel from the fan assembly and remove the fan from the mounting panel
- Install the new fan assembly in the inverse sequence
- Before commissioning the drive check that the fan can run freely and check the airflow direction. The air must be blown upwards out of the unit.

Viewed from the top, the direction of rotation is clockwise.

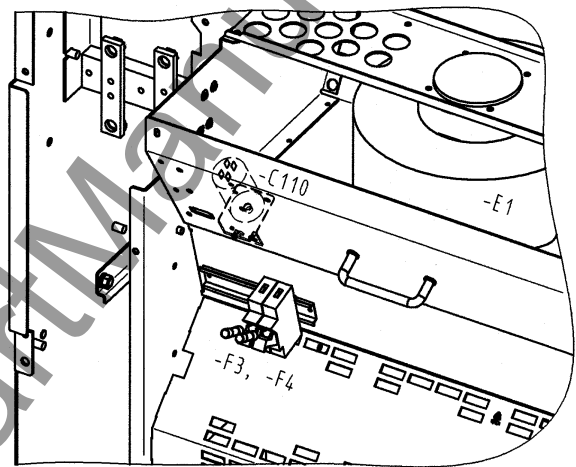


Fig. 5.1 Fan assembly -E1, fan transformer primary fuses, starting capacitor -C110

5.2.2 Replacing the fuses (-F101, -F102)

The fuses are installed in a fuse holder. The fuse holder is mounted on a DIN mounting rail at the bottom left in the chassis unit. The fuse holder must be opened to replace fuses.

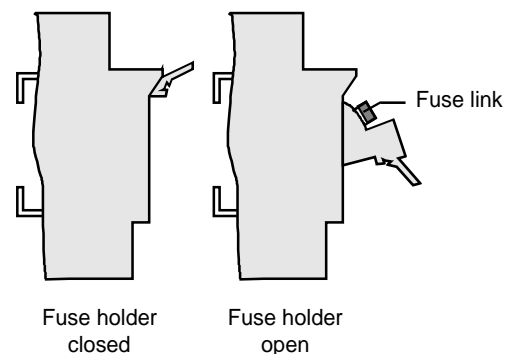


Fig. 5.2 Fuse holder

5.2.3 Replacing the fan transformer fuses (-F3, -F4)

The fuses are located in fuse holders. These are located in front of the air deflection plate, below the fan. The fuse holder must be opened to replace the fuses (→ Fig. 3.1 / Fig. 5.1 / Fig. 5.2).

5.2.4 Replacing the fan transformer (-T10)

The fan transformer is mounted above the electronics box behind a protective cover (→ Fig. 3.1).

- ◆ Tag and remove the connecting cables at the transformer.
- ◆ Loosen the screws at the bottom at the transformer mounting panel, secure the transformer so that it cannot fall, and remove the transformer after having released all of the screws.
- ◆ Mount the new fan transformer in the inverse sequence.

5.2.5 Replacing the starting capacitor


The starting capacitor (-C110) is mounted within the fan housing (→ Fig. 5.1).

- ◆ Remove the plug connections from the starting capacitor.
- ◆ Unbolt the starting capacitor.
- ◆ Install a new starting capacitor in the inverse sequence (4,5 Nm).

5.2.6 Replacing the capacitor bank

The capacitor assembly consists of three boards. Each board has a capacitor mounting element and a DC link bus connection.

- Remove the plug connections
- Release the mechanical retaining elements (three screws: two at the left, one at the right)
- Remove the capacitor by slightly raising them and withdrawing them from the drive converter towards the front.

	CAUTION The capacitors weight up to 15 kg depending on the drive converter rating.
---	--

- Install a new capacitor bank in the inverse sequence.

5.2.7 Replacing SML and SMU

SML Snubber Module Lower
SMU Snubber Module Upper

- ◆ Remove the capacitors
- ◆ Release the mounting screws (4 × M8 (torque: 8 - 10 Nm), 1 × M4 (max. 1.8 Nm))
- ◆ Remove the SML / SMU

Install the new board in the reverse sequence.

5.2.8 Removing and installing the module busbars

♦ Removal

- remove the capacitors
- release the bolts holding the module busbars
 - Bolts M8 power connections
 - M6 mounting and distance pieces
 - M4 snubber circuitry
- remove the SMU / SML insulation
- lift out the module busbars

♦ Installation

NOTE

There must be a 4 mm clearance between the positive and negative busbars. Thus, when installing the module busbars, a template must be used (refer to Fig. 5.3), e.g. a 4 mm-thick plastic piece.

- hold the module busbars and insulation in place SMU / SML (M6)
- the template is inserted in the module busbars instead of the DC link busbars
- insert the SML- and SMU board (tighten-up the module connections (M8, torque: 8-10 Nm)
- tighten-up the M6 nut on the distance studs (6 Nm)
- connect-up the snubber resistors (M4 bolts, torque: max. 1.8 Nm)
- tighten-up the power connections (M8 bolts, torque: 13 Nm)
- remove the template from the module busbars.

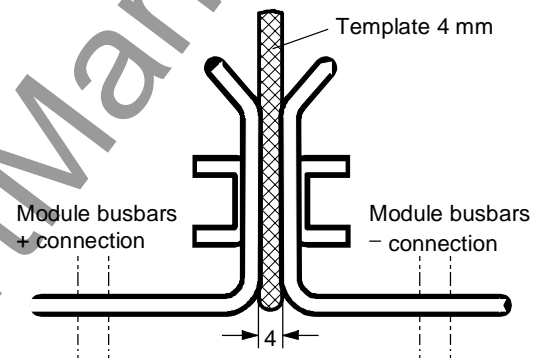


Fig. 5.3 Install the module busbars

5.2.8.1 Replacing the balancing resistor

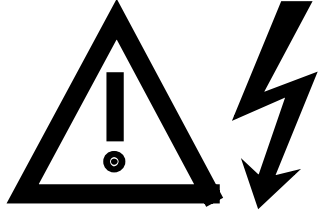
The balancing resistor is located at the rear mounting plane on the heatsink between the inverter modules, i.e. behind the capacitors and the module busbars.


- ♦ Remove the capacitors
 - remove the module busbars
 - remove IGD
 - release the mounting bolts and remove the balancing resistor.

Installation in the reverse sequence.

- ♦ The balancing resistor is tightened-up with 1.8 Nm.
A uniform coating of heat conducting paste must be applied to the base plate.
Observe the correct contact assignment!

5.2.9 Replacing boards

	WARNING
	<p>The boards may only be replaced by qualified personnel.</p> <p>It is not permissible that the boards are withdrawn or inserted under voltage.</p> <p>Death, severe bodily injury or significant material damage might result if these instructions are not observed.</p>

	CAUTION
	<p>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).</p>

NOTE
<p>When replacing the IVI board and (or) the IGD board, ensure that the fiber-optic cable is inserted up to its end stop!</p>

5.2.9.1 Replacing the IVI

IVI Inverter-Value Interface

The IVI is bolted to the rear of the electronics box

- ◆ Remove the electronics module to the endstop
- ◆ Remove the ground connection at the electronics module
 - Remove all of the boards from the electronics box and place them down on a suitable surface which cannot be statically charged-up
 - Remove both mounting bolts from the electronics box (Fig. 5.6)
 - Release the electronics box and remove towards the front.
 - Remove the ABO (Adaption Board)
 - Release the fiber-optic cables
 - Unbolt the IVI and remove
 - Install the new IVI in the inverse sequence

5.2.9.2 Replacing the VDU and VDU resistor

VDU Voltage-Dividing Unit

VDU and VDU resistor are only available for drive converters with higher supply voltages. The VDU mounting bracket is part of the electronic module assembly.

◆ VDU

- Remove the plug connectors
- Release the mounting bolt
- Remove the VDU

Install the new VDU in the inverse sequence.

◆ VDU resistor

- Release the cable ties
- Remove the plug connections
- Unbolt the VDU resistor

Install the new VDU resistor in the inverse sequence

5.2.9.3 Replacing the PSU

PSU Power-Supply Unit (Power Supply)

- ◆ Remove the VDU and VDU resistor (if available)
- ◆ Remove the VDU mounting panel
- ◆ Release the plug connections on the PSU
- ◆ Release the bolts (six Torx M4) on the PSU
- ◆ Remove the PSU

Install the new PSU in the inverse sequence

5.2.9.4 Replacing the IGD

IGD IGBT-Gate Drive

The IGD is located behind the module busbars and consists of a board.

- ◆ Remove the capacitors
- ◆ Remove SML and SMU
- ◆ Remove the module busing
- ◆ Remove the nine fiber-optic cables from the top of the IGD (observe the note under the section "Replacing boards").
- ◆ Remove the P15 feeder cable.
- ◆ Release the retaining screws and remove the IGD.
- ◆ Install the new IGD in the inverse sequence.

5.2.9.5 Replacing the TDB

TDB Thyristor Drive Board (thyristor gating and pre-charging circuit)

The TDB is located in front of the thyristor modules (Fig. 5.5). These are located between the fan assembly and inverter in the rectifier section.

- ◆ Remove the cover (release the screws, and then first release the righthand- and then the lefthand side).
- ◆ Remove connectors X246, X11, X12 and X13.
- ◆ Release the PUD and NUD connections of pre-charging resistors R₁ and R₂ (M4, Torx).
- ◆ Release the connections to phases U, V, W.
- ◆ Release connections NUD1, NUD2, NUD3.
- ◆ Remove the board.
- ◆ Insert the new TDB in the inverse sequence.

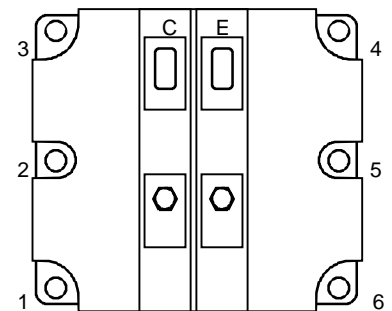
5.2.10 Replacing the snubber resistor

- ◆ Remove the capacitors
- ◆ Remove the SML- and SMU modules
- ◆ Remove the module busbars
- ◆ Release the mounting bolts ($2 \times M5$, torque: max. 1.8 Nm) and remove the snubber resistor
- ◆ A uniform coating of heat conducting paste must be applied to the resistor

Install the new snubber resistor in the inverse sequence.

5.2.10.1 Replacing the IGBT modules

- ◆ Replace as for IGD, but additionally
- ◆ Remove the mounting bolts of the defective IGBT modules and remove the IGBT.
- ◆ Install the new IGBT module. Observe the following:
 - Coat the module mounting surface with a **thin and uniform** coating of heat conducting paste.
 - Tighten-up the IGBT module mounting bolts with 3 Nm, observe the sequence (Fig. 5.4).
 - Modules with the same type designation, e.g. FZxxxRYYKF4 must be installed.



Tighten-up the IGBT modules

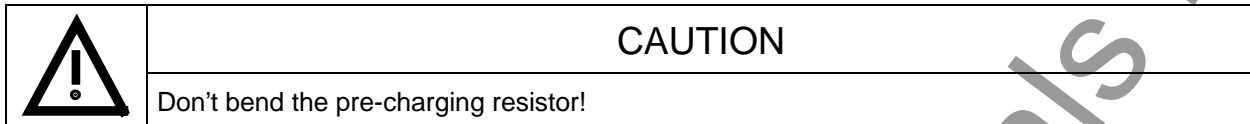
1. By hand ($\approx 0,5$ Nm),
sequence: 2 - 5 - 3 - 6 - 1 - 4
2. tighten-up with 3 Nm,
sequence: 2 - 5 - 3 - 6 - 1 - 4

Fig. 5.4 Tighten-up IGBT modules

5.2.11 Replacing pre-charging resistors (R₁, R₂)

These are located to the right next to the TDB board in the rectifier section (Fig. 5.5).

- ◆ Remove the cover (loosen the screws, then release first the righthand- and then the lefthand side).
- ◆ Release the PUD and NUD connections of the pre-charging resistors (M4, Torx).
- ◆ Release and remove the pre-charging resistors.
- ◆ Install the new pre-charging resistor with a $20 \text{ Nm} \pm 10 \%$ torque.



- ◆ Mounting and connecting-up must be executed in the inverse sequence.

5.2.12 Replacing the thyristor modules (V₁ to V₃)

Replace as for the TDB, in addition Fig. 5.5

- ◆ Release C + D– connecting cable of the optional terminals
- ◆ Release the C and D busbar connections between the rectifier and inverter
- ◆ Release connections U, V, W of the modules
- ◆ Release the connections between the modules and C(+) busbar
- ◆ Remove the C(+) connecting lug
- ◆ Release the connections between the modules and D(–) busbar
- ◆ Remove the D(–) connecting lug
- ◆ Release the module retaining bolts (M6, Torx)
- ◆ Remove the module (weight 500 g)
- ◆ Clean the contact surface
- ◆ Apply a thin uniform coating of heat conducting paste to the new module. Tightening torque of the retaining bolt: $6 \text{ Nm} \pm 15 \%$
- ◆ Mount in the inverse sequence. Tightening torque of the electrical connections (C and D): $12 \text{ Nm} (+ 5 \%, - 10 \%)$.

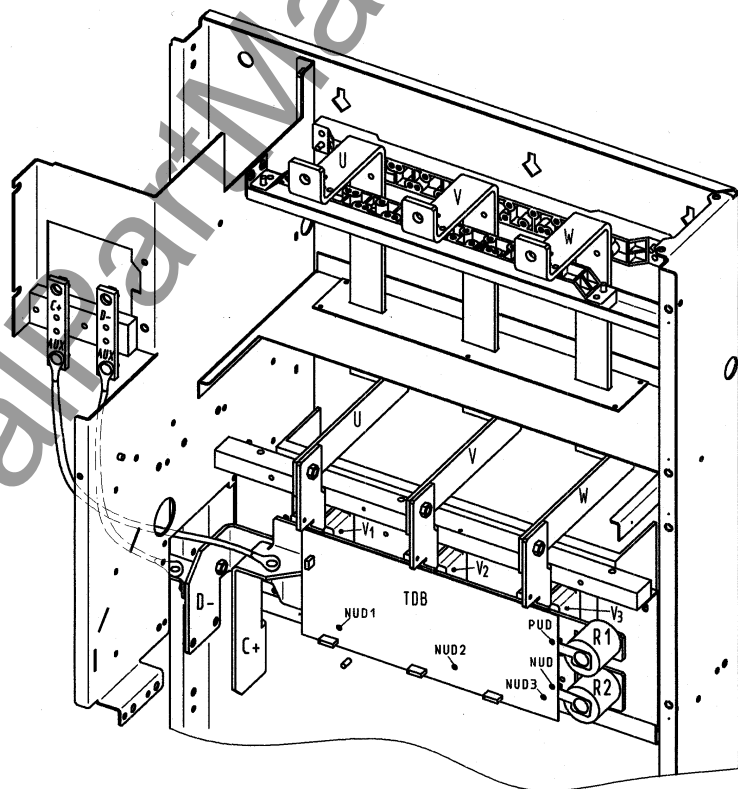


Fig. 5.5 TDB board, pre-charging resistors and thyristor modules V₁, V₂, V₃

5.2.12.1 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.

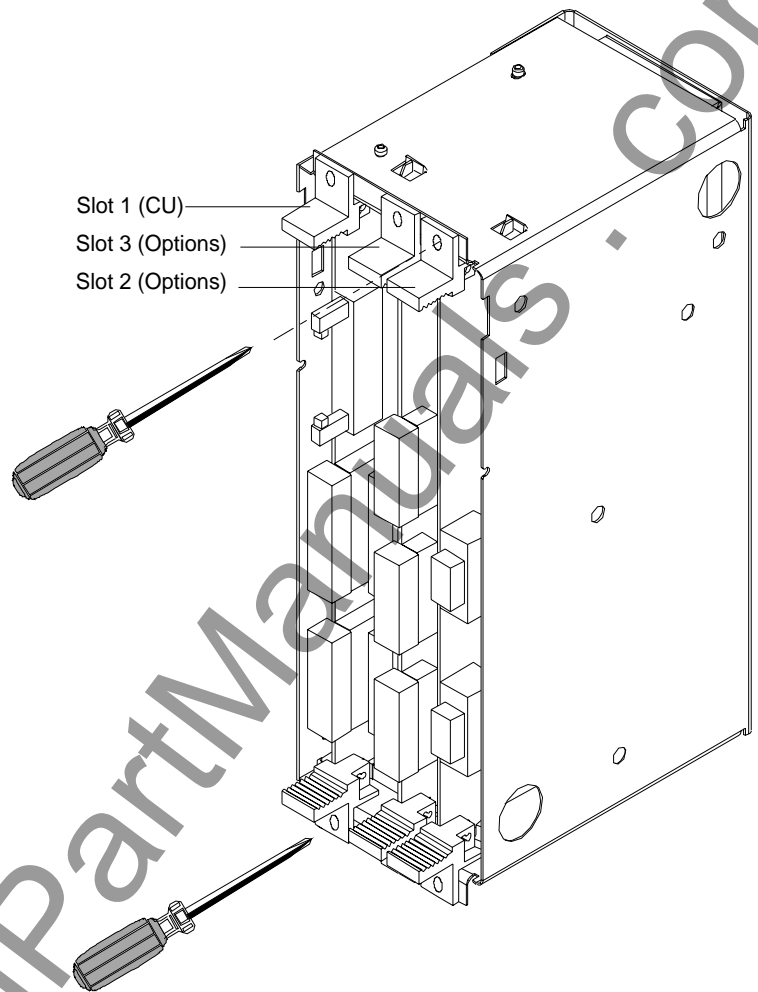


Fig. 5.6 Electronics box equipped with CU (slot 1) and options (slot 2 (right) and 3 (middle))

5.2.12.2 Replacing the PMU (Parameterization Unit)

- ◆ Remove the ground cable at the side panel.
- ◆ Carefully depress the snap on the adapter section and remove the PMU with adapter section from the electronics box.
- ◆ Withdraw connector X108 on the CU
- ◆ Carefully withdraw the PMU board out of the adapter section towards the front using a screwdriver.
- ◆ Install the new PMU board in the inverse sequence.

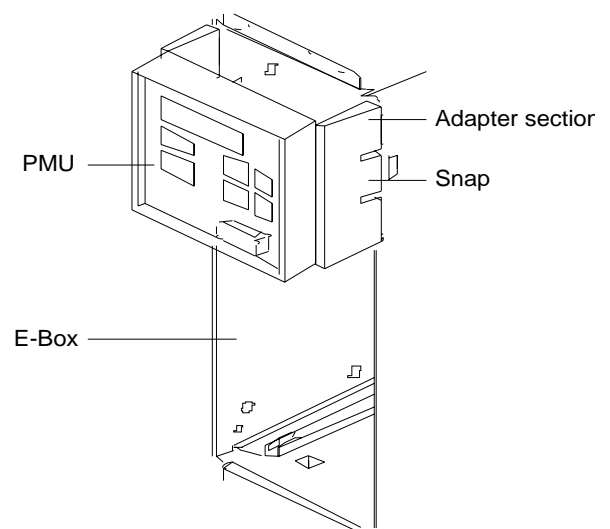


Fig. 5.7 PMU with adapter section on the E box

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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 be inserted in the electronics box. If only one option is used, it must always be inserted at slot 2 (right).

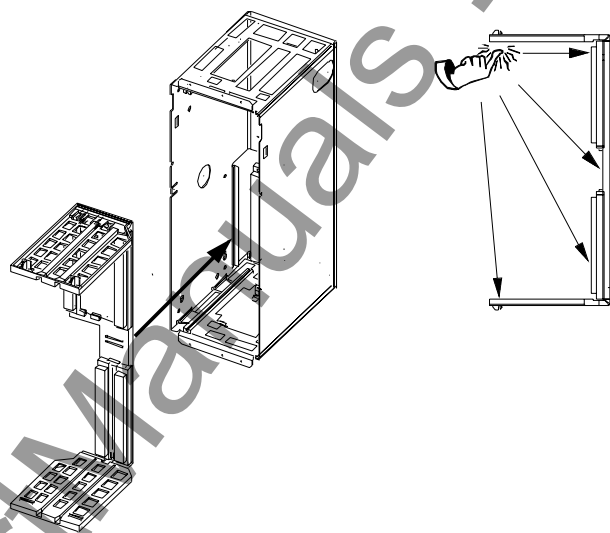


Fig. 6.1 Installing the Local Bus Adapter

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 may 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.

Designation	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
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
SSB	Safety OFF (Safe Stop Board) Option K80	Description	6SE7080-0AX87-1JB0

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 (see 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.

Designation	Description	Order No.	
		Board description	
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	6SX7010-0AC01
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

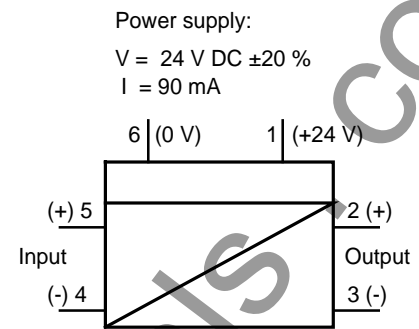


Fig. 6.2 Isolating amplifiers

6.5 Power section

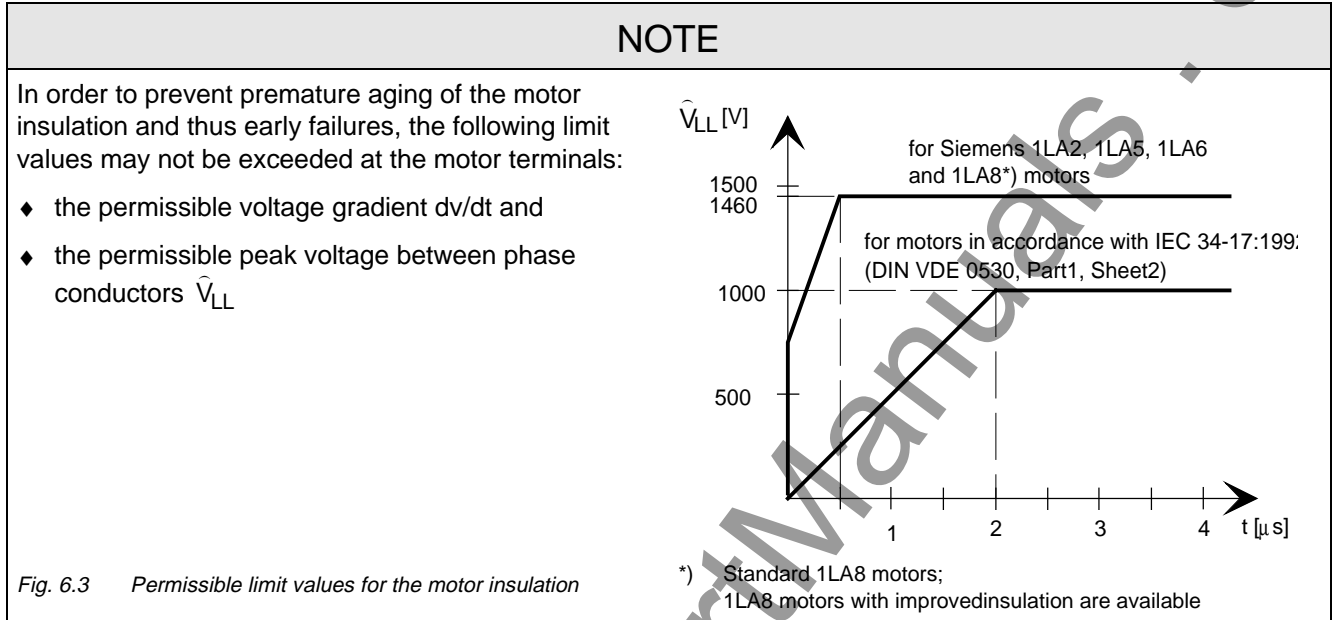
Options	Description/function
Circuit-breaker	Power-up
Line fuses	Protects the motor feeder and limits the short-circuit current
Commutating reactor	Reduces harmonic feedback into the supply
Input filter, A1	Maintains the radio interference suppression level acc. to EN55011
Braking units	Converts regenerative power into heat
Braking resistors	Load resistor for the braking unit
L03	Basic noise interference suppression for TN supply networks

Table 6.7 Power section options

6.5.1 Output reactor, dv/dt 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.



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

Characteristics of the output reactors and dv/dt filters:

	Output reactor	dv/dt filter
Reduces the current peaks for long cables	yes	yes
Reduces the voltage gradient (rate of rise) dv/dt at the motor terminals	slightly	yes
Limits the amplitude of the transient voltage peaks at the motor terminals to the following typical values $\leq 800 \text{ V}$ at 3AC 400 V to 460 V $\leq 1000 \text{ V}$ at 3AC 500 V to 575 V $\leq 1250 \text{ V}$ at 3AC 660 V to 690 V	no	yes
Generates sinusoidal motor voltages and currents	no	no
Reduces the supplementary losses in the motor	slightly	slightly
Reduces motor noise (corresponding to direct online operation)	slightly	slightly

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	
	380 V to 460 V AC	500 V to 690 V AC	380 V to 460 V AC	500 V to 690 V AC
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		$f_{max} \leq 300$ Hz	
V/f textile	$f_{mot N} = f_{max} \leq 600$ Hz		not possible	

Table 6.9 Output reactor design

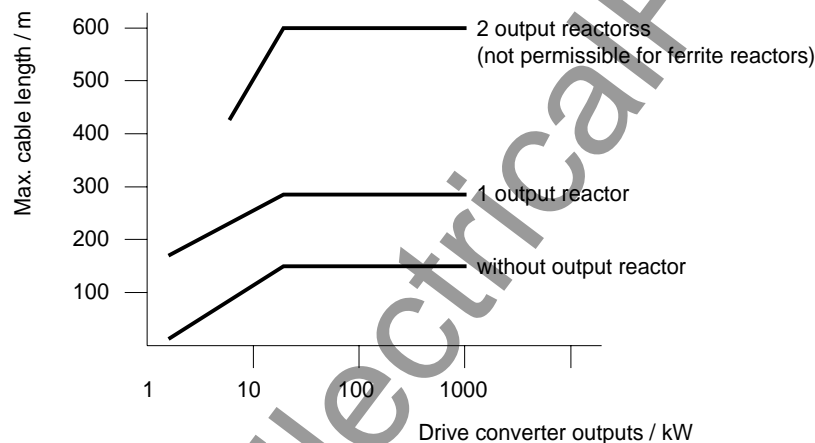


Fig. 6.4 Permissible cable lengths with and without output reactors

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) $dv/dt \leq 500 \text{ V}/\mu\text{s}$
- ◆ Transient peak voltage at the motor terminals:
 - $\hat{U}_{\text{typ.}} \leq 800 \text{ V}$ for $380 \text{ V} \leq U_N \leq 460 \text{ V}$ (3 ph. AC)
 - $\hat{U}_{\text{typ.}} \leq 1000 \text{ V}$ for $500 \text{ V} \leq U_N \leq 575 \text{ V}$ (3 ph. AC)
 - $\hat{U}_{\text{typ.}} \leq 1250 \text{ V}$ for $660 \text{ V} \leq U_N \leq 690 \text{ V}$ (3 ph. AC).

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)

NOTE

The dv/dt filter is designed for a pulse frequency $f_p = 3 \text{ kHz}$ and can be operated at pulse frequencies $f_p \leq 3 \text{ kHz}$.

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 $\leq 3 \text{ kHz}$.

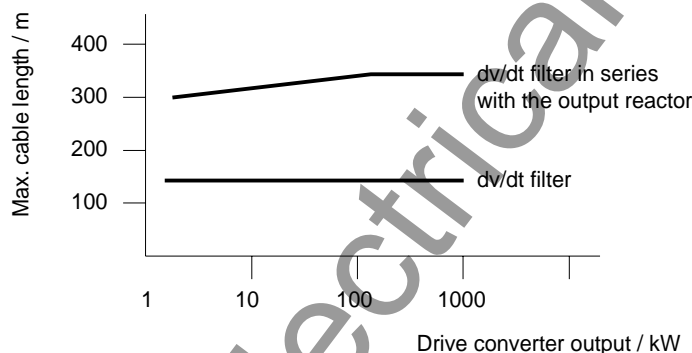


Fig. 6.5 Permissible cable lengths with dv/dt filter

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 Selection criteria for the output reactor or dv/dt filter

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

	Voltage range		
	380 V - 500 V (AC)	525 V - 575 V (AC)	660 V - 690 V (AC)
Motors, acc. to IEC 34-17:1992 (DIN VDE 0530, Part 1, Sheet 2)	dv/dt filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5.	dv/dt filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5.	dv/dt filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5.
Siemens motors 1LA2, 1LA5, 1LA6, 1LA8 1).	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 required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5.	dv/dt filter required! Cable lengths in accordance with the Section „dv/dt filter“, Fig. 6.5.
Siemens motors 1LA8 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.	An output filter is not required. For longer motor cable lengths, output reactors are required in accordance with Section „Output reactor“, Fig. 6.4.
1) Standard 1LA8 motors for drive converter operation 2) 1LA8 motors with a better insulation			

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

6.5.2 Basic noise suppression (option L03)

This option may only be used for TN supply networks (with grounded neutral point). It is used to reduce the cable-conducted radio interference voltages. This option has a supportive effective in conjunction with the radio interference suppression filter.

6.6 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 6.11 Operator control options



Fig. 6.6 OP1

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7 Spare Parts

7.1 Converter 380 V to 460 V 3 AC

Part code No.	Designation	Order number	No.	Used in
-G25	PSU2 power supply board	6SE7038-6GL84-1JA1	1	6SE7035-1EK20 6SE7036-0EK20
-A10	CU2 open- and closed-loop control board (VC)	6SE7090-0XX84-0AF0	1	6SE7035-1EK20 6SE7037-0EK20
-A100, -A110, -A200, -A210, -A300, -A310	IGBT transistor module	6SY7000-0AC77	6	6SE7035-1EK20 6SE7036-0EK20
-A109, -A209, -A309	SMU3 inverter snubber board	6SE7038-6EK84-1GF0	3	6SE7035-1EK20 6SE7036-0EK20
-A119, -A219, -A319	SML3 inverter snubber board	6SE7038-6EK84-1GG0	3	6SE7035-1EK20 6SE7036-0EK20
-A20	IVI inverter interface board	6SE7038-6GL84-1BG2	1	6SE7035-1EK20 6SE7036-0EK20
-A26	ABO normalization board	6SE7035-1EJ84-1BH0	1	6SE7035-1EK20
-A26	ABO normalization board	6SE7036-0TK84-1BH0	1	6SE7036-0EK20
-A29	IGD7 inverter gating board	6SE7035-1EJ84-1JC1	1	6SE7035-1EK20 6SE7036-0EK20
-A30	PMU operator control/parameterizing unit	6SE7090-0XX84-2FA0	1	6SE7035-1EK0 6SE7036-0EK20
	DC link capacitors, complete with mounting assembly	6SY7000-0AC31	3	6SE7035-1EK20
	DC link capacitors, complete with mounting assembly	6SY7000-0AD07	3	6SE7036-0EK20
-C110	MKP capacitor for the fan	6SY7000-0AC35	1	6SE7035-1EK20 6SE7036-0EK20
-E1	Nozzle for the radial fan	6SY7000-0AB65	1	6SE7035-1EK20 6SE7036-0EK20
-E1	Radial fan	6SY7000-0AB68	1	6SE7035-1EK20 6SE7036-0EK20
-F101, -F102	Fused load disconnecter	6SY7000-0AA26	2	6SE7035-1EK20 6SE7036-0EK20
-F3, -F4	Fused load disconnecter	6SY7000-0AC24	2	6SE7035-1EK20 6SE7036-0EK20
-F3, -F4	Fuse insert	6SY7000-0AC23	2	6SE7035-1EK20 6SE7036-0EK20
-F101, -F102	Fuse insert	6SY7000-0AB62	2	6SE7035-1EK20 6SE7036-0EK20
-R100, -R200, -R300	Balancing resistor	6SY9705	3	6SE7035-1EK20 6SE7036-0EK20
-R100, -R200, -R300	Balancing resistor	6SY7000-0AA76	3	6SE7041-1TK20
-R109, -R119, -R209, -R219, -R309, -R319	Snubber resistor	6SY7000-0AB18	6	6SE7035-1EK20 6SE7036-0EK20

Part code No.	Designation	Order number	No.	Used in
-R10, -R20, -R30	NTC resistor (temperature measurement.)	6SY7000-0AD10	3	6SE7035-1EK20 6SE7036-1EK20
-R1, -R2	Pre-charging resistor	6SY7000-0AC94	2	6SE7035-1EK20 6SE7036-1EK20
-R1, -R2	Pre-charging resistor accessories	6SY7000-0AD12	2	6SE7035-1EK20 6SE7036-1EK20
-T10	Transformer	6SY7000-0AB60	1	6SE7035-1EK20 6SE7036-1EK20
-V1, -V2, -V3	Thyristor module	6SY7000-0AC95	3	6SE7035-1EK20 6SE7036-1EK20
-A24	Thyristor gating TDB	6SE7038-6GL84-1HJ0	1	6SE7035-1EK20 6SE7036-1EK20
ACCESSORIES	Connector set, SIMOVERT VC	6SY7000-0AC50	1	6SE7035-1EK20 6SE7036-0EK20

Table 7.1 Spare parts

7.2 Converter 500 V to 575 V 3AC

Part code No.	Designation	Order number	No.	Used in
-G25	PSU2 power supply board	6SE7038-6GL84-1JA1	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-A28	VDU voltage divider board	6SE7038-6GL84-1JB0	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-R28	VDU resistor	6SY7000-0AC33	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-A10	CU2 open- and closed-loop control board (VC)	6SE7090-0XX84-0AF0	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-A100, -A110, -A200, -A210, -A300, -A310	IGBT transistor module	6SY7000-0AD04	6	6SE7033-0FK20
-A100, -A110, -A200, -A210, -A300, -A310	IGBT transistor module	6SY7000-0AC37	6	6SE7033-5FK20 6SE7034-5FK20
-A109, -A209, -A309	SMU3 inverter snubber board	6SE7038-6EK84-1GF0	3	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-A119, -A219, -A319	SML3 inverter snubber board	6SE7038-6EK84-1GG0	3	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-A20	IVI inverter interface board	6SE7038-6GL84-1BG2	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-A26	ABO normalization board	6SE7033-0UJ84-1BH0	1	6SE7033-0FK20
-A26	ABO normalization board	6SE7033-5UJ84-1BH0	1	6SE7033-5FK20
-A26	ABO normalization board	6SE7034-5UK84-1BH0	1	6SE7034-5FK20

Part code No.	Designation	Order number	No.	Used in
-A29	IGD7 inverter gating board	6SE7033-5GJ84-1JC0	1	6SE7033-0FK20
-A29	IGD7 inverter gating board	6SE7034-5HK84-1JC0	1	6SE7033-5FK20 6SE7034-5FK20
-A30	PMU operator control/parameterizing unit	6SE7090-0XX84-2FA0	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
	DC link capacitors, complete with mounting assembly	6SY7000-0AD00	3	6SE7033-0FK20
	DC link capacitors, complete with mounting assembly	6SY7000-0AC32	3	6SE7033-5FK20
	DC link capacitors, complete with mounting assembly	6SY7000-0AD08	3	6SE7034-5FK20
-C110	MKP capacitor for the fan	6SY7000-0AC35	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-E1	Nozzle for the radial fan	6SY7000-0AB65	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-E1	Radial fan	6SY7000-0AB68	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-F101, -F102	Fused load disconnect	6SY7000-0AA26	2	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-F3, -F4	Fused load disconnect	6SY7000-0AC24	2	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-F3, -F4	Fuse insert	6SY7000-0AC23	2	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-F101, -F102	Fuse insert	6SY7000-0AB62	2	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-R100, -R200, -R300	Balancing resistor	6SY9705	3	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-R109, -R119, -R209, -R219, -R309, -R319	Snubber resistor	6SY7000-0AB18	6	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-R10, -R20, -R30	NTC resistor (temperature measurement)	6SY7000-0AD10	3	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-R1, -R2	Pre-charging resistor	6SY7000-0AC94	2	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-R1, -R2	Pre-charging resistor accessories	6SY7000-0AD12	2	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-T10	Transformer	6SY7000-0AB73	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
-V1, -V2, -V3	Thyristor module	6SY7000-0AC96	3	6SE7033-0FK20 6SE7033-5FK20

Part code No.	Designation	Order number	No.	Used in
-V1, -V2, -V3	Thyristor module	6SY7000-0AC97	3	6SE7034-5FK20
-A24	Thyristor gating TDB	6SE7038-6GL84-1HJ0	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20
ACCESSORIES	Connector set, SIMOVERT VC	6SY7000-0AC50	1	6SE7033-0FK20 6SE7033-5FK20 6SE7034-5FK20

Table 7.2 Spare parts

7.3 Converter 660 V to 690 V 3 AC

Part code No.	Designation	Order number	No.	Used in
-G25	PSU2 power supply board	6SE7038-6GL84-1JA1	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-A28	VDU voltage divider board	6SE7038-6GL84-1JB0	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-R28	VDU resistor	6SY7000-0AC33	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-A10	CU2 open- and closed-loop control board (VC)	6SE7090-0XX84-0AF0	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-A100, -A110, -A200, -A210, -A300, -A310	IGBT transistor module	6SY7000-0AD04	6	6SE7033-0HK20
-A100, -A110, -A200, -A210, -A300, -A310	IGBT transistor module	6SY7000-0AC37	6	6SE7033-5HK20 6SE7034-5HK20
-A109, -A209, -A309	SMU3 inverter snubber board	6SE7038-6EK84-1GF0	3	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-A119, -A219, -A319	SML3 inverter snubber board	6SE7038-6EK84-1GG0	3	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-A20	IVI inverter interface board	6SE7038-6GL84-1BG2	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-A26	ABO normalization board	6SE7033-0WJ84-1BH0	1	6SE7033-0HK20
-A26	ABO normalization board	6SE7033-5WJ84-1BH0	1	6SE7033-5HK20
-A26	ABO normalization board	6SE7034-5WK84-1BH0	1	6SE7034-5HK20
-A29	IGD7 inverter gating board	6SE7033-5GJ84-1JC0	1	6SE7033-0HK20
-A29	IGD7 inverter gating board	6SE7034-5HK84-1JC0	1	6SE7033-5HK20 6SE7034-5HK20

Part code No.	Designation	Order number	No.	Used in
-A30	PMU operator control/parameterizing unit	6SE7090-0XX84-2FA0	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
	DC link capacitors, complete with mounting assembly	6SY7000-0AC32	3	6SE7033-0HK20 6SE7033-5HK20
	DC link capacitors, complete with mounting assembly	6SY7000-0AD08	3	6SE7034-5HK20
-C110	MKP capacitor for the fan	6SY7000-0AC35	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-E1	Nozzle for the radial fan	6SY7000-0AB65	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-E1	Radial fan	6SY7000-0AB68	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-F101, -F102	Fused load disconnect	6SY7000-0AA26	2	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-F3, -F4	Fused load disconnect	6SY7000-0AC24	2	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-F3, -F4	Fuse insert	6SY7000-0AC23	2	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-F101, -F102	Fuse insert	6SY7000-0AB62	2	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-R100, -R200, -R300	Balancing resistor	6SY9705	3	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-R109, -R119, -R209, -R219, -R309, -R319	Snubber resistor	6SY7000-0AB18	6	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-R10, -R20, -R30	NTC resistor (temperature measurement)	6SY7000-0AD10	3	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-R1, -R2	Pre-charging resistor	6SY7000-0AC94	2	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-R1, -R2	Pre-charging resistor accessories	6SY7000-0AD12	2	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-T10	Transformer	6SY7000-0AB72	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
-V1, -V2, -V3	Thyristor module	6SY7000-0AC96	3	6SE7033-0HK20 6SE7033-5HK20
-V1, -V2, -V3	Thyristor module	6SY7000-0AC97	3	6SE7034-5HK20
-A24	Thyristor gating TDB	6SE7038-6GL84-1HJ0	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20
ACCESSORIES	Connector set, SIMOVERT VC	6SY7000-0AC50	1	6SE7033-0HK20 6SE7033-5HK20 6SE7034-5HK20

Table 7.3 Spare parts

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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 components:

ABS: PMU support panel
LOGO

PC: Covers

PP: Insulating boards
bus retrofit

LDPE: Capacitor ring

PA6.6: Fuse holders, mounting rail, capacitor holder, cable
retainer, connecting strips, terminal strip, supports, PMU
adapter, covers

PS: Fan housing

UP: Tensioning profile
retaining bolts

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.

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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 Part 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 Δ EN 60529
– standard	IP00	
– option	IP20	
Protection class	I	DIN VDE 0106 Section 1
Radio interference level		DIN VDE 0875 Section 11 Δ EN 55011
– standard	without	
– option	A1	EN55011
Noise immunity		EN50082-2
Mechanical strength		DIN IEC 68-2-6 / 06.90

	Frequency range	Constant amplitude of the	
	Hz	deflection mm	acceleration m/s ² (g)
– when stationary (in op.)	10 to 58	0.075	
	above 58 to 500		9.8 (1)
– during transport	5 to 9	3.5	
	above 9 to 500		9.8 (1)

Cooling, fan current, sound pressure level				
Fan voltage / frequency	V / Hz	230 / 50	230 / 60	
Fan current	A	2.45	3.6	
Airflow \dot{V}	m ³ /s	0.46	0.464	
Sound pressure level, chassis *)	dB(A)	77	77.5	
Sound pressure level, chassis in ASI 1 A PED-IP20 cabinet *)	dB(A)	70.5	71.5	
Sound pressure level, chassis in ASI 1 A PED-IP42 cabinet with dirt filter, 400 mm high cabinet top cover *)	dB(A)	70.5	71	

*) Secondary conditions: Room height 6 m, clearance to the next reflecting wall surface 4 m.

Drive converter types							
VC	6SE70...	35-1EK20	36-0EK20				
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V _n Input Output	V	3 AC 380 ... 460 ± 15 % 3 AC 0 ... Rated input voltage					
Rated frequency f _n Input Output	Hz	50/60 ± 6 % VC U/f = const 0 ... 600 U = const 8 ... 300					
Rated current I _n Input Output	A	510 510	590 590				
DC link voltage V _{dn}	V	510...620					
Rated output	kVA	335...406	388...470				
Auxiliary power supply	V	DC 24 (20-30) (1,8 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	464	536				
Base load time	s	240					
Overcurrent	A	694	802				
Overcurrent time	s	60					
Losses, power factor							
Power factor Supply cosφ _{1N} Converter cosφ _U		> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.				
Efficiency η – Pulse frequency 2,5 kHz		0,980	0,980				
Power loss – Pulse frequency 2,5 kHz	kW	7.1 at 400 V 7.5 at 460 V	8.2 at 400 V 8.7 at 460 V				
Dimensions, weights							
Type		K	K				
Width Height Depth	mm	800 1750 550	800 1750 550				
Weight – IP00	kg	455	455				

Drive converter types							
VC	6SE70...	33-0FK20	33-5FK20	34-5FK20			
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V _N Input Output	V	3 AC 500 ... 575 ± 15 % 3 AC 0 ... Rated input voltage					
Rated frequency f _N Input Output	Hz	50/60 ± 6 % VC U/f = const 0 ... 600 U = const 8 ... 300					
Rated current I _N Input Output	A	297 297	354 354	452 452			
DC link voltage V _{DN}	V	675...780					
Rated output	kVA	257...296	306...352	391...450			
Auxiliary power supply	V	DC 24 (20-30) (1,8 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	270	322	411			
Base load time	s	240					
Overcurrent	A	403	481	614			
Overcurrent time	s	60					
Losses, power factor							
Power factor Supply cosφ _{1N} Converter cosφ _U		> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.			
Efficiency η – Pulse frequency 2,5 kHz		0,977	0,978	0,979			
Power loss – Pulse frequency 2,5 kHz	kW	5.8 at 500 V 6.1 at 575 V	6.8 at 500 V 7.1 at 575 V	8.3 at 500 V 8.5 at 575 V			
Dimensions, weights							
Type		K	K	K			
Width	mm	800	800	800			
Height		1750	1750	1750			
Depth		550	550	550			
Weight – IP00	kg	455	455	455			

Drive converter types							
VC	6SE70...	33-0HK20	33-5HK20	34-5HK20			
Rated voltage, rated frequency, rated current, rated output							
Rated voltage in V _n Input Output	V	3 AC 660 ... 690 ±15 % 3 AC 0 ... Rated input voltage					
Rated frequency f _n Input Output:	Hz	50/60 ± 6 % VC U/f = const 0 ... 600 U = const 8 ... 300					
Rated current I _n Input Output	A	297 297	354 354	452 452			
DC link voltage V _{dn}	V	890...930					
Rated output	kVA	339...355	404...423	516...540			
Auxiliary power supply	V	DC 24 (20-30) (1,8 A without Options; with Options refer to Section 6.1)					
Loading Class II acc. to EN 60146-1-1							
Rated current	A	270	322	411			
Base load time	s	240					
Overcurrent	A	403	481	614			
Overcurrent time	s	60					
Losses, power factor							
Power factor Supply cosφ _{1N} Converter cosφ _U		> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.	> 0,98 < 0,92 ind.			
Efficiency η – Pulse frequency 2,5 kHz		0,980	0,980	0,981			
Power loss – Pulse frequency 2,5 kHz	kW	6.6 at 660 V 6.6 at 690 V	7.4 at 660 V 7.5 at 690 V	8.9 at 660 V 9.1 at 690 V			
Dimensions, weights							
Type		K	K	K			
Width	mm	800	800	800			
Height		1750	1750	1750			
Depth		550	550	550			
Weight – IP00	kg	455	455	455			

9.1 De-rating for an increased cooling medium temperature

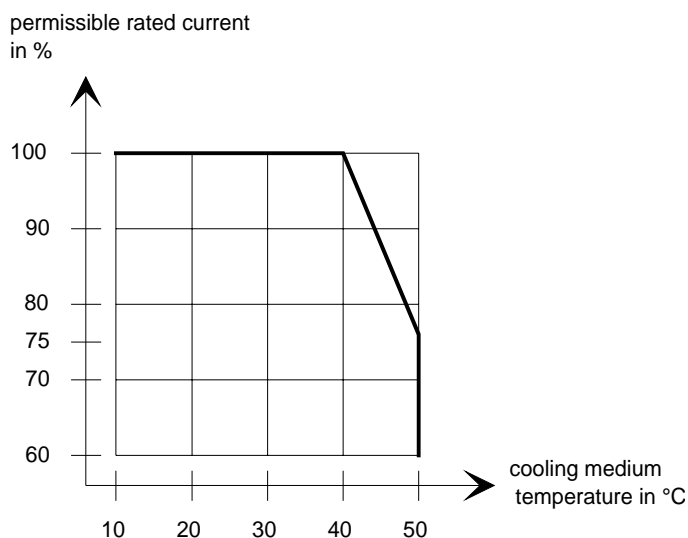


Fig. 9.1 Max. permissible rated current as a function of the cooling medium temperature

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. 9.2). Installation altitudes > 4000 m above sea level are not permissible.

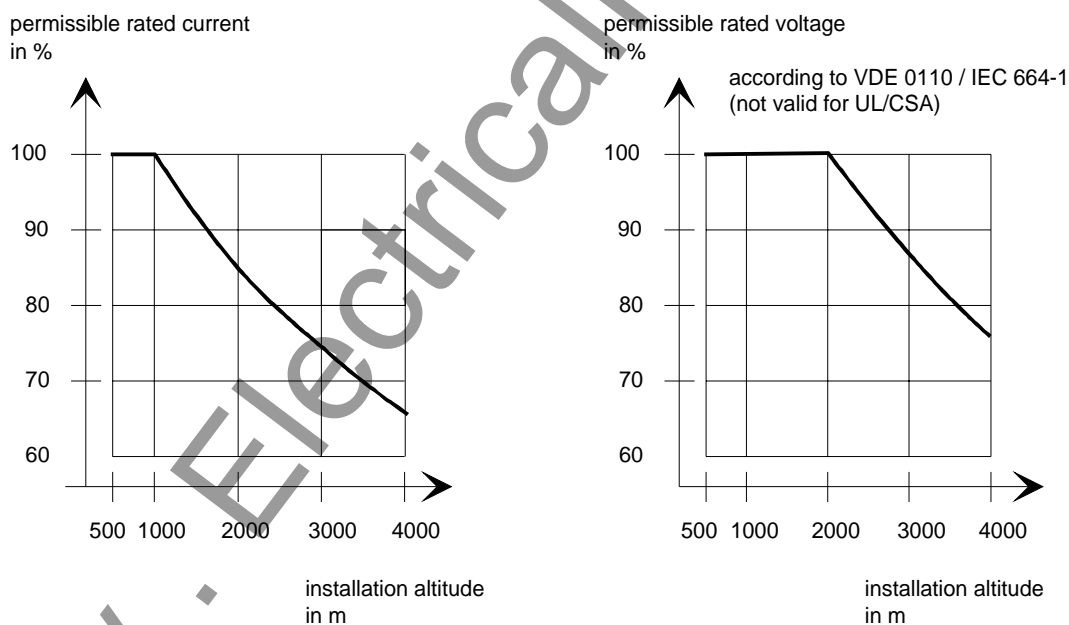


Fig. 9.2 Max. permissible rated current and rated voltage as a function of the installation altitude

9.3 De-rating as a function of the pulse frequency

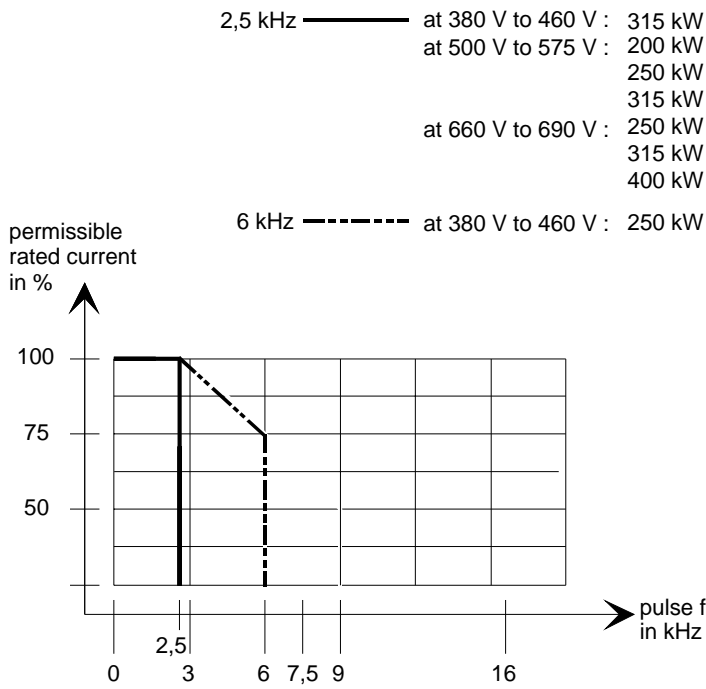


Fig. 9.3 Max. permissible rated current as a function of the pulse frequency

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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	Beliebig sinnvoll/sinnloser Kommentar
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

11 Addresses

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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,
part 1

- 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 2 and 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.476 000 0001.00 WB EMC

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 chassis units 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 relevant 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:

The 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 specific equipment characteristics and features.

*) acc. to EN 10204 (DIN 50049)

ASF 1 D/U 4102x

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The following versions have appeared so far:

Version	Internal Item number
AB	476 962.4000.76 J AB-76

Version AB consists of the following chapters

Chapters	Changes	Pages	Version date
0 General		9	08.97
1 Description	First Edition	3	08.97
2 Transport, Unpacking, Installation	First Edition	5	08.97
3 Connecting-up	First Edition	5	08.97
4 Operator control	First Edition	2	08.97
5 Maintenance	First Edition	9	08.97
6 Options	First Edition	9	08.97
7 Spare Parts	First Edition	5	08.97
8 Environmental friendliness	First Edition	1	08.97
9 Technical Data	First Edition	6	08.97
10 Appendix	First Edition	4	08.97
11 Adresses	First Edition	2	08.97
12 Certificates	First Edition	3	08.97