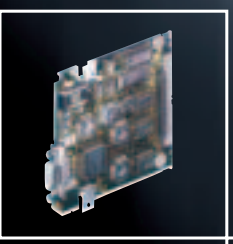
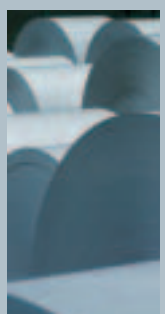
Catalog DA 65.10 • 2003/2004



vector control

SIMOVERT MASTERDRIVES VC

Single-Motor and
Multi-Motor Drives
0.55 kW to 2300 kW



SIEMENS

Configuring with PATH Plus

With the PATH Plus program, three-phase drives fed by frequency converters for SIMOVERT® MASTERDRIVES Vector Control and Motion Control units can be configured easily and quickly.

The program is a powerful engineering tool which supports the user in all stages of configuration - from power supply to the motor.

Menu-guided selection and layout of the frequency converters enable the system components and the motors necessary for a specific drive task to be determined. Automatically displayed information makes fault-free planning possible.

A comprehensive help system also supports the first-time user of the program. PATH Plus provides a logical and easy-to-use dialog procedure to guide the planning engineer towards a reproducible and economically efficient drive configuration, starting with the mechanical requirements of the machine and the drive task involved. The technical data of the frequency converters and motors, the selected system components and the necessary accessories are listed in detail.

PATH Plus enables drives to be configured on the basis of a load characteristic or a load cycle and enables planning of applications such as the following:

- traversing and hoisting gear,
- slewing gear,
- spindle drives,
- center winders and
- thrust crank.

PATH Plus also includes a comfortable graphic display for showing

- torque, speed, output, current, velocity and acceleration versus time and
- torque versus rotational speed.

Supply harmonic disturbances can also be calculated and graphically displayed.

The planning and configuring results can be stored, printed out or copied to other user programs via the clipboard.

PATH Plus is available with either a German or English user interface.

You can download the demo version of PATH Plus from the following Internet address:
http://www.siemens.com/motioncontrol
(products&systems/drive systems/software)
or use the fax form attached to the catalog.

If you need the full version of PATH Plus, contact your local Siemens office and quote the following order number:
6SW1710-0JA00-2FC0
You will find the address in the appendix to this catalog.

SIMOVERT MASTERDRIVES Vector Control

0.55 kW to 2300 kW

Catalog DA 65.10
2003/2004

Supersedes:
Catalog DA 65.10 · 2001

The products in this catalog are also included in the CD-ROM catalog CA 01
Order No.:
E86060-D4001-A100-B9-7600

Contact your local Siemens representative for further information.

The products and systems described in this catalog are manufactured under application of a quality management system certified by DQS in accordance with DIN EN ISO 9001 and DIN EN ISO 14001. The DQS Certificate is recognized in all EQ Net countries.

SIEMENS

Selection and Ordering Data

Note!

The technical data is intended for general information.
Please observe the operating instructions and the references indicated on the products for installation, operation and maintenance.

- The technical data, selection and ordering data (Order Nos.), accessories and availability are subject to alteration.
- All dimensions in this catalog are stated in mm.

Vector Control
Overview

SIMOVERT® MASTERDRIVES Vector Control

Overview

Applications

Top solutions with engineered drives

The SIMOVERT MASTERDRIVES Vector Control frequency converters are voltage-source DC link converters with fully digital technology and IGBT inverters which, in conjunction with Siemens three phase AC motors, provide high-performance, economical drives for all industrial sectors and applications.

SIMOVERT MASTERDRIVES – system-based drive technology
A uniform, modular series of standard units

The SIMOVERT MASTERDRIVES Vector Control series of converters is both uniform and modular in design.

- The power output of the standard units ranges from 0.55 kW to 2300 kW.
- All internationally standard supply voltages from 380 V to 690 V are covered.
- Depending on the application and the required output, there are four types of housing design available: the Compact PLUS unit, the compact unit, the chassis unit and the cabinet unit.
- The hardware and software modules enable tailored and cost effective drive solutions.

As a counterpart to extremely high-performance VC control on the motor side, the SIMOVERT MASTERDRIVES AFE (Active Front End) unit ensures optimum energy supply on the line side as well with its active, line-angle-oriented vector control. SIMOVERT MASTERDRIVES AFE units are characterized by

- freedom from system perturbations, i.e. a very favorable overall power factor
- commutation failure-protected operation even in the event of supply dips and power failure
- the possibility of reactive power compensation
- four-quadrant operation.

The units are designed as:

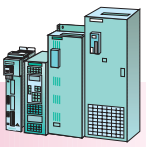
- converters for connection to a 3-phase AC system
- inverters for connection to a DC bus
- rectifier units for supplying power to the DC bus.

A wide spectrum of system components and accessories rounds off the range of products.

SIMOVERT MASTERDRIVES The tailored solution

All SIMOVERT MASTERDRIVES share a consistently uniform design. Throughout the whole power range, the units (converters, inverters) and system components (rectifier units, braking units) have a uniform design and a uniform connection system.

Compact PLUS/compact and chassis units · cabinet units



They can be combined in many ways and arranged side by side to match every possible drive requirement.

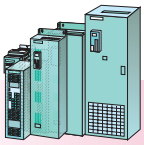
Being system modules, they can be used to create the most suitable drive system, whether this involves single drives or multi-motor drives.

Customer-specific solutions

Cabinets and system configurations for power output ranges from 0.55 kW to 6000 kW can be created to match specific customer requirements, with either air-cooling or water-cooling in our application workshop.

Examples of such applications are

- multi-motor drives (steelworks and rolling mills, the paper and plastic-film industries) and
- single drives
  - in adapted design (e.g. marine drives)
  - for test stands (e.g. with Active Front End for low supply stressing).



Compact PLUS/compact and chassis units · cabinet units

Applications

SIMOVERT MASTERDRIVES with water-cooling – for harsh environments

The compact and chassis converters and inverters are also available with water-cooling. By installing in appropriate cabinets, high degrees of protection are achieved in a closed system, thus making them suitable for use in any harsh industrial environment.

New! The Compact PLUS series

The youngest member of the SIMOVERT MASTERDRIVES Vector Control family with power outputs of 0.55 kW to 18.5 kW rounds off the product range in the lower power output range. The Compact PLUS series is ideal for applications in machines where only limited space is available.

SIMOVERT MASTERDRIVES – electromagnetically compatible in any environment

The SIMOVERT MASTERDRIVES frequency converters comply with the relevant EMC standard for power electronics.

EMC compliant installation enables them to be used in industry and residential buildings.

Designed for world-wide use

The SIMOVERT MASTERDRIVES satisfy the relevant international standards and regulations – from the European EN standard and IEC to UL and CSA.

Quality in accordance with DIN ISO 9001

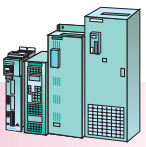
The quality standards according to which the SIMOVERT MASTERDRIVES are manufactured are high and have been acclaimed. All aspects of production, i.e. development, mechanical design, manufacturing, order processing and the logistics supply center of the SIMOVERT MASTERDRIVES, have been certified by an independent authority in accordance with DIN ISO 9001.

Engineering technology with maximum benefit to the customer

The advantages to the customer are apparent:
- solutions, optimized with regard to price and performance
- high quality,
- maximum reliability

and as a result
- flexible production and
- optimized processes.

Our world-wide service and sales network provides all our customers and SIMOVERT MASTERDRIVES users with a direct line to:
- individual advice
- planning
- training and
- service.



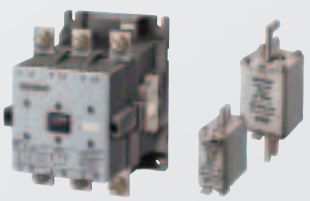
Unit and system components

Converters and Inverters

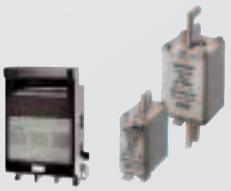
Rectifier units

Braking units and braking resistors

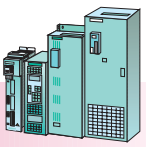
Line-side switching and protection components



DC link components



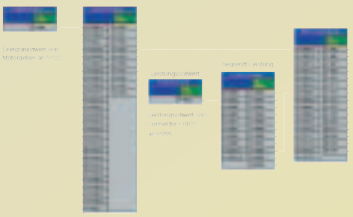
Load-side components



Electronic and software options

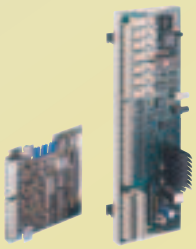
Operator control and visualization

Control



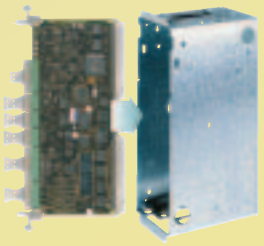
Communication

Interface and expansion boards



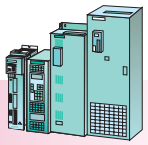
Technology boards

Integration of option boards



SIMOVERT MASTERDRIVES Vector Control

Overview



Order number examples

Compact PLUS/compact and chassis units · cabinet units

Compact PLUS units, compact and chassis units

e.g. **6SE7031–0EE60–Z**

SIMOVERT MASTERDRIVES 6SE7 series

Compact PLUS units, compact units, chassis units

Multiplier for output current
e.g.: 2 ≙ × 1
3 ≙ × 10
4 ≙ × 100

Example:
Multiplier = 10
First two positions of output current: 10
Output current rounded off = 100 A

First two positions for output current

Supply voltage code e.g. **E** ≙ 3 AC 380 V – 480 V

Size e.g. chassis size **E**

Control version 6 ≙ SIMOVERT MASTERDRIVES Vector Control

Function release

Supplementary order codes for options

Cabinet units

e.g. **6SE7131–6FD61–3BA0–Z**

SIMOVERT MASTERDRIVES 6SE7 series

Cabinet units

Multiplier for output current
e.g.: 2 ≙ × 1
3 ≙ × 10
4 ≙ × 100

Example:
Multiplier = 10
First two positions of output current: 16
Output current rounded off = 160 A

First two positions for output current

Supply voltage code e.g. **F** ≙ 3 AC 500 V – 600 V

Size e.g. Cabinet size **D**, width 1200 mm

Control version 6 ≙ SIMOVERT MASTERDRIVES Vector Control

Mechanical version e.g. **1** ≙ size, chassis units E to G

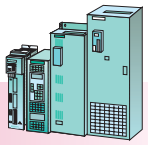
Electrical version e.g. **3** ≙ converter, single-quadrant

Function release

Supplementary order codes for options

Vector Control
System Description

2



2

SIMOVERT MASTERDRIVES converters

The SIMOVERT MASTERDRIVES Vector Control series of converters consists of modular, high-performance components. These components can be combined for individual applications.

Converters and inverters

The SIMOVERT MASTERDRIVES are available as:

- converters for connection to a 3-phase AC system.
- inverters for connection to DC buses which are supplied with power by rectifier or rectifier/regenerative units.

The system of components enables a uniform layout, irrespective of whether converters or inverters are used. The components can be installed side by side in almost any combination, even if they are different in size, enabling considerable space savings to be made.

As system modules, they can be used to obtain the right solution to match any drive task, whether single or multi-motor.

The SIMOVERT MASTERDRIVES converter series covers a power output ranging from 0.55 kW to 2300 kW (see Fig. 2/1), application cabinets up to 6000 kW.

The units have a uniform connection system: the line-voltage and DC link terminals are located on top and the motor terminals at the bottom.

The modular and uniform design of the electronic options enables optimized matching to all drive requirements with regard to both technology and communication.

Easy handling and installation and a high level of uniformity were essential factors in the development of the SIMOVERT MASTERDRIVES. This is demonstrated by the standardized housings, mounting and connection levels, as well as by the connections to signal and bus cables.

The SIMOVERT MASTERDRIVES are available as Compact PLUS units, compact units, chassis units and as cabinet units.

- Compact PLUS units are the specialists for limited space conditions. The "BOOKSIZE" format in IP20 degree of protection and the ideal connection system of the units makes the design of extremely compact multi-motor drives possible. Compact PLUS units can be mounted into 300 mm deep cabinets.
- Compact units are designed in the space-saving "BOOKSIZE" format with IP20 degree of protection . The units are simply hung from a standard DIN G rail and secured at the bottom of the cabinet with a screw fastening. Compact units can be mounted into ≥ 400 mm deep cabinets.
- Chassis units are designed with IP00 degree of protection. The covers conform with the safety regulations to DIN VDE 0113, Part 5 and DIN VDE 0106, Part 100 (VBG 4). IP20 degree of protection can also be achieved with an optional enclosure kit.

The Compact PLUS units as well as the compact and chassis units can be installed without any space between them.

- Cabinet units are supplied as converters with IP20 degree of protection as standard. Cabinets with higher degrees of protection are also available (see Section 4). The converter cabinet units are ready-to-connect cabinets for single and group drives with options available for every possible application.

Designs available:

- Single-quadrant operation, 6/12 pulse, line-commutated
- Four-quadrant operation, 6-pulse, line-commutated
- Four-quadrant operation, self-commutated with Active Front End.

Rectifier units and rectifier/regenerative units

Types of DC voltage supply units

There are two types of DC supply units for supplying one or more inverters:

- The rectifier unit is a 6-pulse rectifier bridge with pre-charging circuit and enables the flow of energy from the power system to the DC voltage bus (single-quadrant operation).

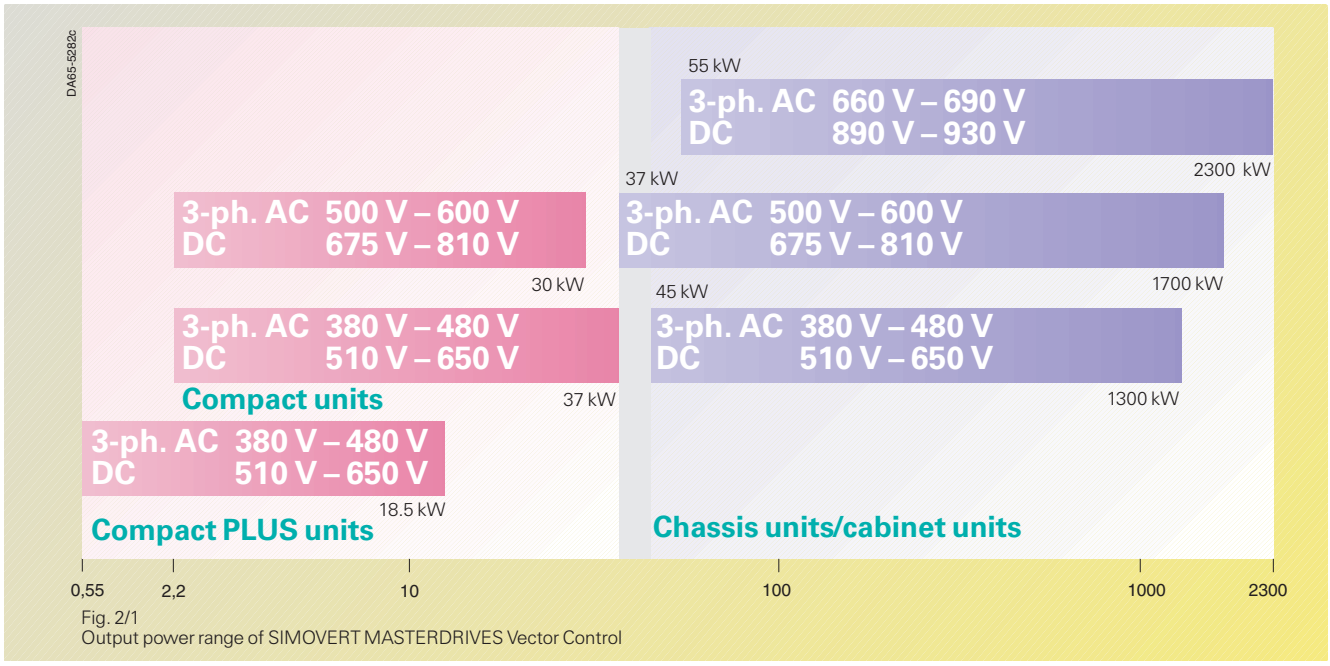


Fig. 2/1
Output power range of SIMOVERT MASTERDRIVES Vector Control

- The rectifier/regenerative unit consists of two anti-parallel 6-pulse thyristor bridges and enables the flow of energy in both directions, i.e. energy can be fed back into the power system (4-quadrant operation). The regenerating bridge is connected via an autotransformer (option).

12-pulse operation

Converters for 12-pulse operation are supplied by two parallel-connected rectifier or rectifier/regenerative units with the same output rating.

They are connected to the supply via a three-winding transformer with two secondary windings electrically displaced by 30 °. In this way, system perturbations are considerably reduced. The relevant harmonic currents of the fifth and seventh order are almost eliminated when compared to 6-pulse operation.

Optimum power infeed is ensured by the self-commutating, pulsed rectifier/regenerative AFE (Active Front End) unit. Its core components are an inverter with a CUSA control unit and it generates a regulated DC voltage from a three-phase supply. On the three-phase side, rapid vector control subordinate to this DC voltage control impresses an almost sinusoidal current towards the supply so that, with the help of the line-side clean power filter, system perturbations are kept to a minimum. Vector control also enables power factor (cos φ) setting and enabling reactive power compensation as well, whereby the drive's power requirement has priority. A bigger advantage is that, due to the underlying principle of this method, inverter stalling with fuse tripping cannot occur when there is a power failure, even during regenerative operation.

Single-quadrant operation, four-quadrant operation

Units for single-quadrant operation can only work in motoring mode. For regenerative mode, a braking unit/braking resistor is necessary. Units for four-quadrant operation can return regenerative energy to the three-phase supply. This may be necessary, for example, when drives with a large rotating mass have to be braked frequently or rapidly.

System components

In addition to the converter, inverter and rectifier basic units, the system components enable tailor-made solutions to meet the drive requirements.

The system components can be broken down as follows:

- Overcurrent protector units (OCP) for rectifier/regenerative units

  In the case of line-commutating rectifier/regenerative units, the occurrence of undervoltages or voltage dips can cause the inverter to stall and the fuse to trip during regenerative mode. This can mean that the equipment may have to be shut down for a longer period.

  In order to avoid this, the overcurrent protector unit (OCP) can be used in combination with the line-commutated rectifier/regenerative unit (R/R unit) for four-quadrant operation. It prevents fuse tripping by triggering an IGBT in the DC link so that the IGBT cuts off the power. This is of particular advantage in the case of large group drives.

  As soon as the fault has been acknowledged, the equipment is ready for operation.

- Braking units and braking resistors
- Electronic options e.g. technology, communication and interface boards
- Other system components such as switching and protection devices, line reactors and output reactors and radio interference suppression filters.

Control functions

Control types

The SIMOVERT MASTERDRIVES Vector Control standard software contains two principal control types:

- Frequency control by means of the *V/f*-characteristic curve
  with or without speed feedback and for textile applications. Frequency control is suitable for simple applications and for high level synchronism within group drives.
- Vector control (field-oriented control)
  for dynamic applications in the form of frequency control (without encoder) or speed/torque control (with encoder). The vector control method achieves a dynamic performance which is comparable to that of a DC drive. This is based on precise modeling of the motor and two current components which influence the flux and the torque with a control frequency of 2.5 kHz. Using this vector control method, torque setpoints can be held and limited.

  In the 1:10 speed range, the field-oriented control system of SIMOVERT MASTERDRIVES Vector Control does not require a speed encoder and is largely independent of motor parameters.

The following uses of SIMOVERT MASTERDRIVES Vector Control require a speed encoder:

- High dynamic performance requirements
- Torque control in the control range > 1:10
- Low speeds
- Maximum speed accuracy.

The different types of control are described in detail in Section 6.

Software functions

The basic software contains a wide range of standard functions. These functions provide maximum user-friendliness regarding operator control and the highest degree of flexibility (setpoint selection, changeover between data sets, etc.). They also ensure universal operating conditions and a high level of operational safety (automatic restart, flying restart, DC injection braking, synchronization between converters, wobble generator, motor brake control, etc.).

These functions are described in Section 6.

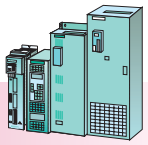
Free function blocks

Using the free function blocks contained in the basic software, the drives can be adapted to the most varied of applications. Simple control systems can thus be created and technology requirements can be dealt with in a decentralized manner.

The function blocks available in SIMOVERT MASTERDRIVES Vector Control can be classified as follows:

- Control blocks
- Signal conversion blocks
- Computing blocks
- Logic blocks
- Signalling blocks
- Timers.

For a detailed description, see Section 6.



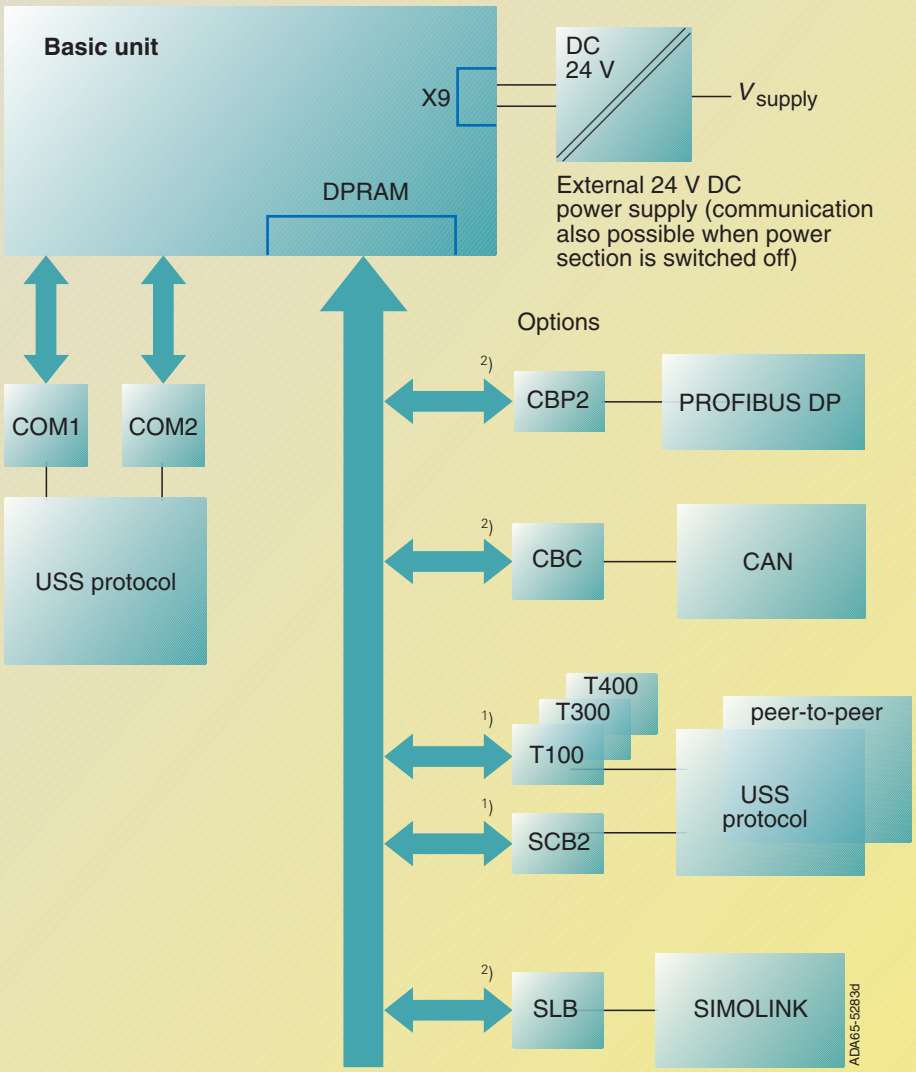


Fig. 2/2
Overview of interfaces

1) Not available for Compact PLUS units.
2) Only two option boards may be used at one time with the Compact PLUS units.

The SIMOVERT MASTERDRIVES Vector Control units have several serial interfaces for communicating with, e.g. higher-level PLC systems, PCs etc. The interfaces can be classified as follows:

- Basic version:
  Two serial interfaces, COM1 and COM2, as standard on the basic unit
- Options:
  Communication and interface boards for different transmission protocols or bus systems.

Interfaces on the basic unit

Compact and chassis units

- Serial interface 1 (COM1) is located on the PMU operator control and parameterizing unit. It is a 9-pole SUB D socket (X300) as an RS485 or RS232 interface (see page 2/7).
- Serial interface 2 (COM2) is located on the X101 control terminal strip of the CUVC board as an RS485 interface (see page 2/8).

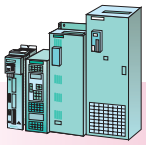
Compact PLUS units

COM1 and COM2 are connected to the X103 SUB-D socket. COM2 is also connected to the X100 connector. COM1 is designed as an RS232 interface and COM2 is designed as an RS485 interface.

Both serial interfaces of the basic unit work with the USS® protocol, are bus-capable (with up to 31 nodes) and enable maximum data transfer rates of 38.4 kbit/s.

USS protocol

The USS protocol is a Siemens-specific transmission protocol for drive technology and is implemented as a standard protocol on all interfaces of the basic units. The USS protocol enables bus operation of up to a maximum of 32 nodes on the basis of the RS485 transmission system.



Data is exchanged in accordance with the master-slave access procedure. The USS protocol only allows mono-master operation. This means one master and 31 slaves. Masters can be higher-level systems such as the SIMATIC S5, S7 and PCs or non-Siemens automation systems. SIMOVERT MASTERDRIVES are always slaves.

From an application point of view, the USS protocol is used for the following two applications:

- Data transmission between a PC and one or several MASTERDRIVES for start-up and parameterization of the units using the Drive ES and DriveMonitor engineering tools. The user-friendly operator control panel OP1S also communicates to the SIMOVERT MASTERDRIVES using of the USS protocol. COM1 is used for linking up to the PC or the OP1S.
- Communication via the USS protocol to higher-level automation systems such as the SIMATIC S5, SIMATIC S7 or to non-Siemens systems. For this link, COM2 is usually used.

Parallel operation of COM1 and COM2 is possible without any restrictions.

See also documentation: "SIMOVERT MASTERDRIVES, Anwendung der seriellen Schnittstellen mit USS-Protokoll," Order No.: 6SE7087-6CX87-4KB0. This documentation is available in German only.

Options: Communication and interface boards

The PROFIBUS DP and CAN serial fieldbus systems can be linked up by means of the communication boards, CBP (Communication Board PROFIBUS DP) or CBC (Communication Board CAN).

Fast data exchange between the MASTERDRIVES units is possible by means of the SLB (SIMOLINK Board) communication board.

In addition to this, the SCB1 and SCB2 interface boards (Serial Communication Board) are available for the USS protocol and peer-to-peer protocol.

The SCB1 and SCB2 are only available for compact and chassis units (not available for Compact PLUS units).

The communication and interface boards can be integrated as options into the electronics box. How the option boards may be installed and combined in the electronics box is described in Section 6 „Integrating the options in the electronics box".

SIMOLINK

SIMOLINK (Siemens Motion Link) is a company-specific development for Siemens drive technology.

SIMOLINK is mainly used for extremely fast and strictly cyclical exchange of process data (control information, setpoints, actual values and additional information) between individual MASTERDRIVES units or between MASTERDRIVES units and a higher-level control system with synchronization of all connected nodes to a common system clock pulse.

SIMOLINK is a digital, serial data transmission protocol using fiber-optic cables as the transmission medium (plastic or glass).

Peer-to-peer protocol

The peer-to-peer protocol is also a company-specific addition to Siemens drive technology.

The difference between peer-to-peer and SIMOLINK is that peer-to-peer does not allow synchronization of the drives. The transmission speed is also considerably slower than with SIMOLINK.

A peer-to-peer connection means a "connection between equal partners". In contrast to the classic master-slave bus systems (e.g. PROFIBUS DP), one and the same converter can be both the master (setpoint source) and the slave (setpoint sink).

Peer-to-peer connection is via the RS485 interface. A special high-speed protocol is used requiring little management. The transmission rate is up to 187.5 kbit/s.

Each drive can receive setpoints and actual values from the preceding drive via its peer receive terminal and transmit data to the subsequent drive via its transmit terminal.

Transmission protocols and fieldbus systems

PROFIBUS DP

For Siemens drive technology, PROFIBUS DP is the standard bus system for all field applications.

The PROFIBUS DP is specified in the European standard, EN 50 170, and enables cyclical data exchange between the MASTERDRIVES units and higher-level systems such as the SIMATIC S7.

In addition to process control data, PROFIBUS DP also carries information for parameterization and diagnosis of the drives.

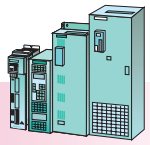
The extended functionality of Motion Control with PROFIBUS DP (e.g. slave-to-slave communication between drives) is supported by the CBP2 board.

CAN according to CiA

The CAN protocol (Controller Area Network) is specified in the international proposal ISO DIS 11898 where, however, only the electrical parts of the physical layer and the data link layer (Layers 1 and 2 in the ISO/OSI layers reference model) are specified. In their recommendation DS 102-1, the CiA (CAN in Automation, an international association of users and manufacturers) defined the bus interface and the bus medium for use as an industrial fieldbus.

The specifications in ISO-DIS 11898 and in DS 102-1 are complied with by the CBC communication board.

The CBC communication board only supports CAN Layers 1 and 2. Higher-level additional communication specifications of the different user organizations such as CAN open of the CiA are not supported.



Operator control and visualization

Compact PLUS/compact and chassis units · cabinet units

2

SIMOVERT MASTER-DRIVES Compact PLUS, compact, chassis and cabinet type units have a unified operator control and visualization concept.

The converters, inverters and rectifier units can either be controlled and visualized from the unit itself or externally:

From the unit itself

- via the PMU operator control and parameterizing unit available in the standard version
- the optional OP1S user-friendly operator control panel
- or a PC with Drive ES or DriveMonitor, see Fig. 2/3.

Externally via

- the control terminal strip
- the COM1 or COM2 base unit serial interfaces
- the communication boards and/or the technology boards (options), see Fig. 2/4.

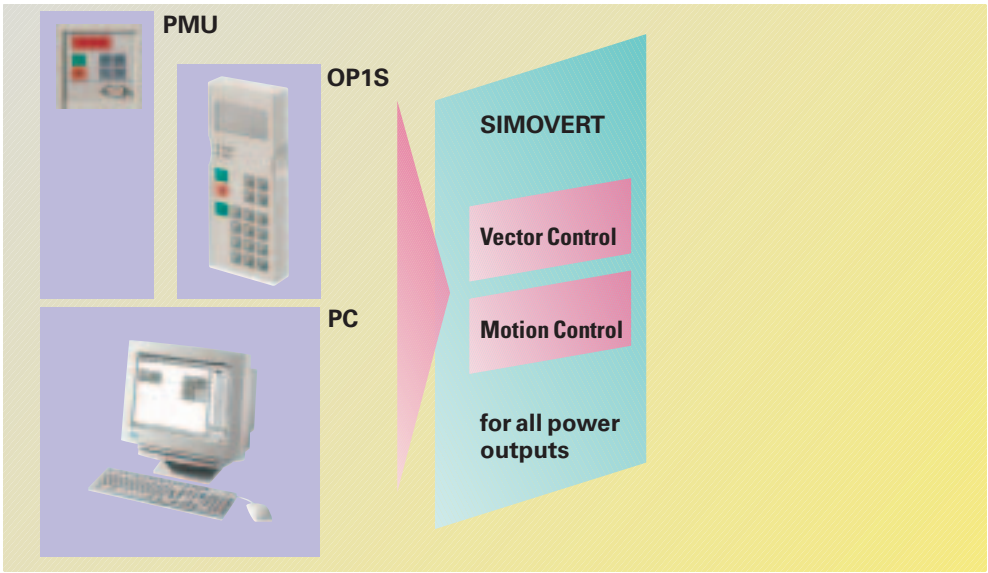


Fig. 2/3
Operator control and visualization from the unit

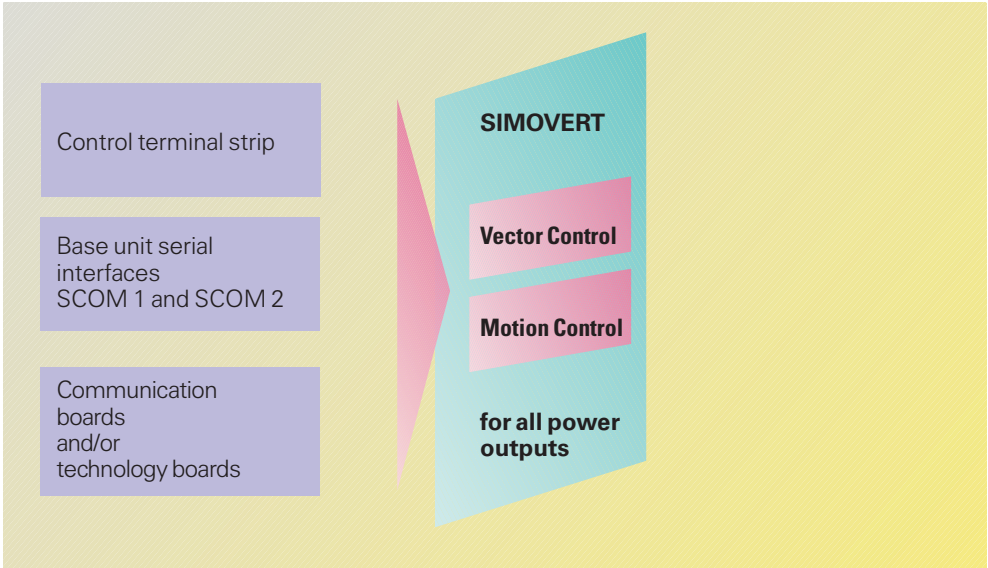
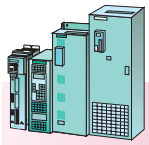


Fig. 2/4
External operator control and visualization



PMU operator control and parameterizing unit

The parameterizing unit available in the standard version of all the units is mounted on the front panel or, in the case of chassis type units, on a bracket located in front of the electronics box.

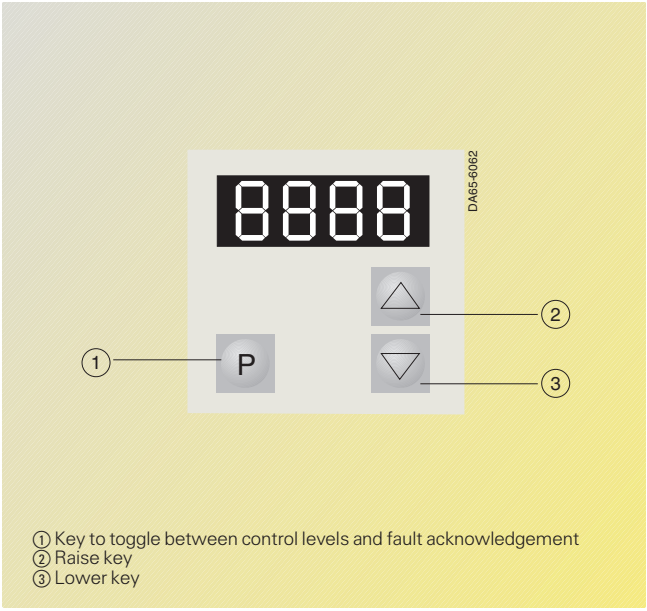
The operator control and parameterizing unit includes the following functions:

- Start-up of converter, inverter, rectifier unit
- Operator control: ON/OFF (not for Compact PLUS units); raise/lower setpoint; clockwise/counter-clockwise rotation (not for Compact PLUS units)
- Display of setpoints and actual values
- Displaying and changing parameters
- Display of converter status
- Display of alarm and fault messages.

The serial interface 1 (COM1) as a 9-pin SUB D socket (X300) is provided on the operator control and parameterizing unit of the compact and chassis units as a RS485 or RS232 interface.

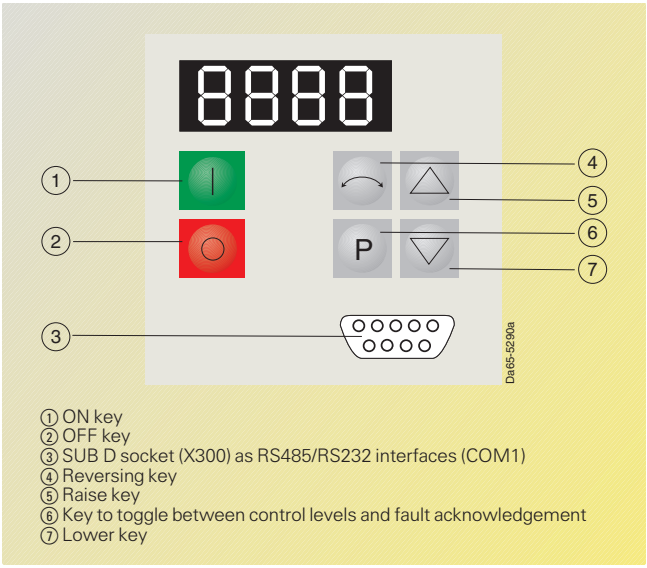
The optional OP1S user-friendly operator control panel or a PC with operator control software (Drive ES or DriveMonitor) can be connected to this interface. (Refer to Fig. 2/7 and the table below).

Compact PLUS units use the SUB D socket X103 for connecting a PC. The user-friendly operator control panel OP1S can also be connected to the X103 but cannot be mechanically installed to the front cover of the Compact PLUS converters and inverters. The OP1S can only be mounted on the front cover of the Compact PLUS rectifier units.



① Key to toggle between control levels and fault acknowledgement
② Raise key
③ Lower key

Fig. 2/5
PMU operator control and parameterizing unit for Compact PLUS units



① ON key
② OFF key
③ SUB D socket (X300) as RS485/RS232 interfaces (COM1)
④ Reversing key
⑤ Raise key
⑥ Key to toggle between control levels and fault acknowledgement
⑦ Lower key

Fig. 2/6
PMU operator control and parameterization unit for compact and chassis units

Pin assignment of the SUB D socket X300 or X103

Pin	Function, information
1	Not assigned
2	Receive line RS232 (V24)
3	Transmit and receive line, RS485 standard, two-wire, positive differential input/output
4	Boot (control signal for software update)
5	Reference potential supply voltage (M5)
6	Supply voltage, 5 V (P5)
7	Transmit line RS232 (V24)
8	Transmit and receive line RS485 standard, two-wire, negative differential input/output
9	Reference potential for RS232 or RS485 interface (with reactor)

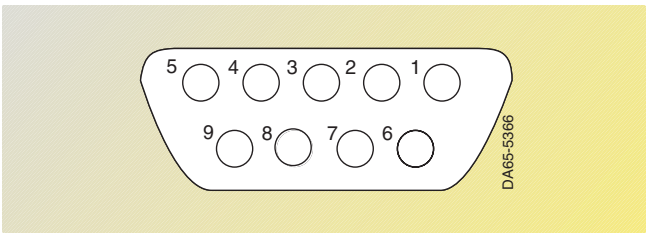
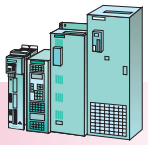


Fig. 2/7
Pin assignment of the SUB D socket X300 or X103



2

OP1S user-friendly operator control panel

The OP1S operator control panel is an optional input/output device which can be used for parameterizing the units. Parameterization is menu-guided and is performed by selecting the parameter number and then entering the parameter value. Plain-text displays greatly facilitate parameterization.

Parameter and parameter value descriptions, as well as text displays in English, German, Spanish, French and Italian, are included in the standard version.

The OP1S is capable of permanently storing parameter sets. It can therefore be used for archiving parameter settings and for transferring parameter sets from one unit to another.
Its storage capacity is sufficient to store 5 CUVC board parameter sets. It is not possible to store data sets of the technology boards (e.g. T100, T300).

On the rear of the OP1S is a 9-pin SUB D connector via which power is supplied and communication with the connected units takes place.

The OP1S operator control panel may be plugged directly onto the SUB D socket of the PMU operator control and parameterizing unit and screwed into the front panel. The OP1S operator panel can also be used as a remote-control device. The cable between the PMU and the OP1S must not exceed 50 m. If longer than 5 m, a 5 V voltage supply with a current capability of at least 400 mA must be included on the OP1S end as shown in Fig. 2/10.

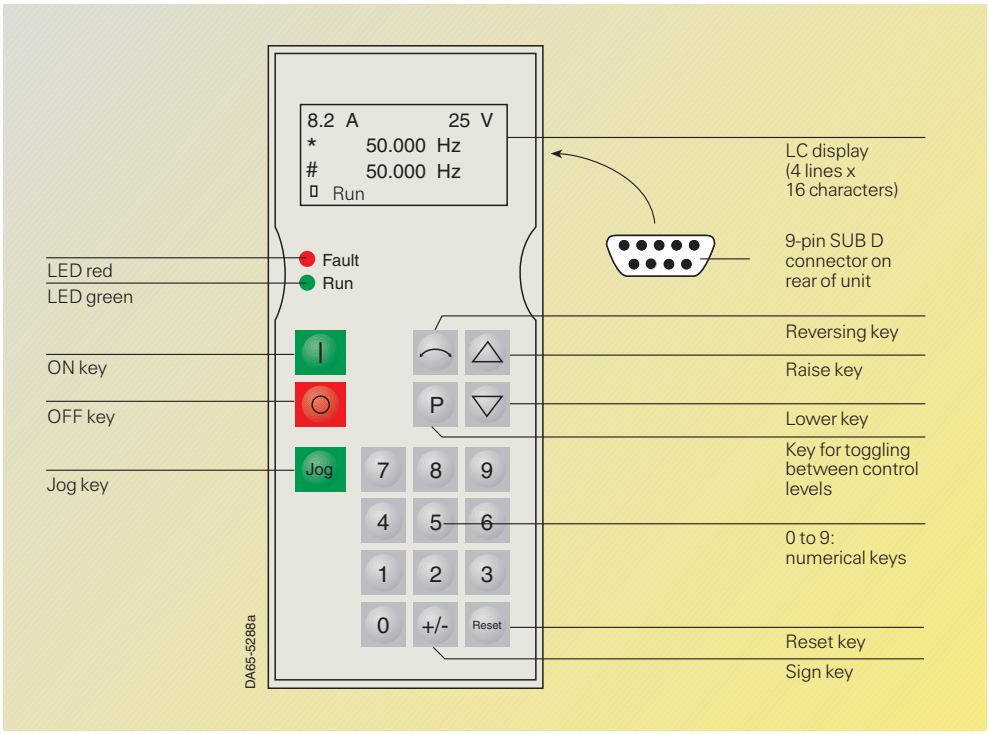


Fig. 2/8
View of the OP1S

OP1S connections via RS485	Pin	Designation	Description
	1		
	2		
	3	RS485 P	Data via RS485 interface
	4		
	5	M 5	Ground
	6	P 5	5 V voltage supply
	7		
	8	PS485 N	Data via RS485 interface
	9		Reference potential

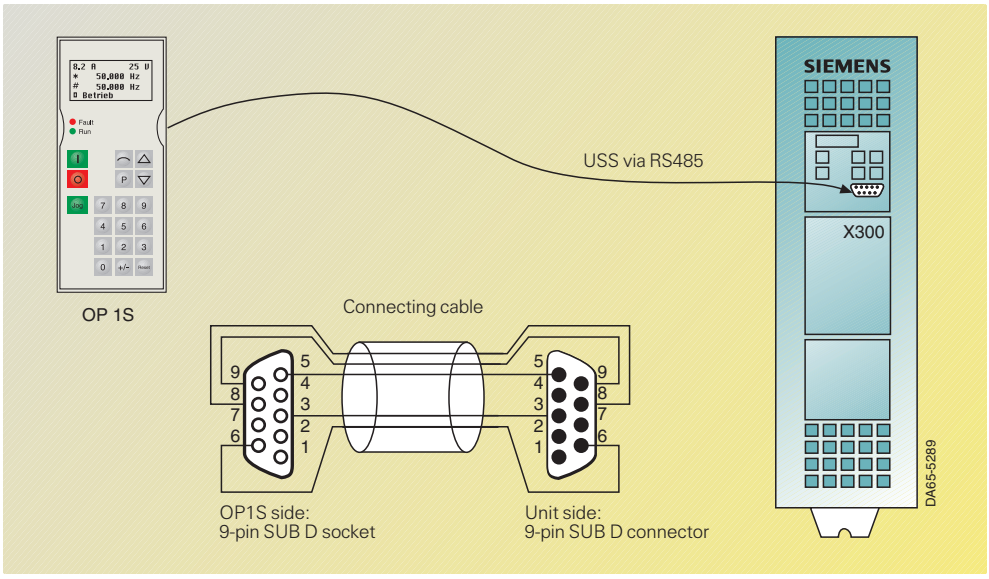


Fig. 2/9
OP1S point-to-point connection up to a cable length of 5 m

The OP1S and the unit to be operated communicate with each other via a serial interface (RS485) using the USS protocol (see Fig. 2/9). During communication, the OP1S assumes the function of a master and the connected units of slaves.

The OP1S can be operated at transfer speeds of 9.6 kbit/s and 19.2 kbit/s and is capable of communicating with up to 31 slaves (address 1 to 31). It can be used in a point-to-point link (operator control of one unit) or with a bus configuration (operator control of several units).

Control terminal strip

All the necessary operating and monitoring functions for SIMOVERT MASTERDRIVES are accessible via the control terminal strip:

- Control commands, e.g. ON/OFF, inverter enable, ramp-function generator enable, setpoint enable, fixed setpoint selection, acknowledgement, etc.
- Analog setpoint inputs, e.g. speed setpoint, torque setpoint

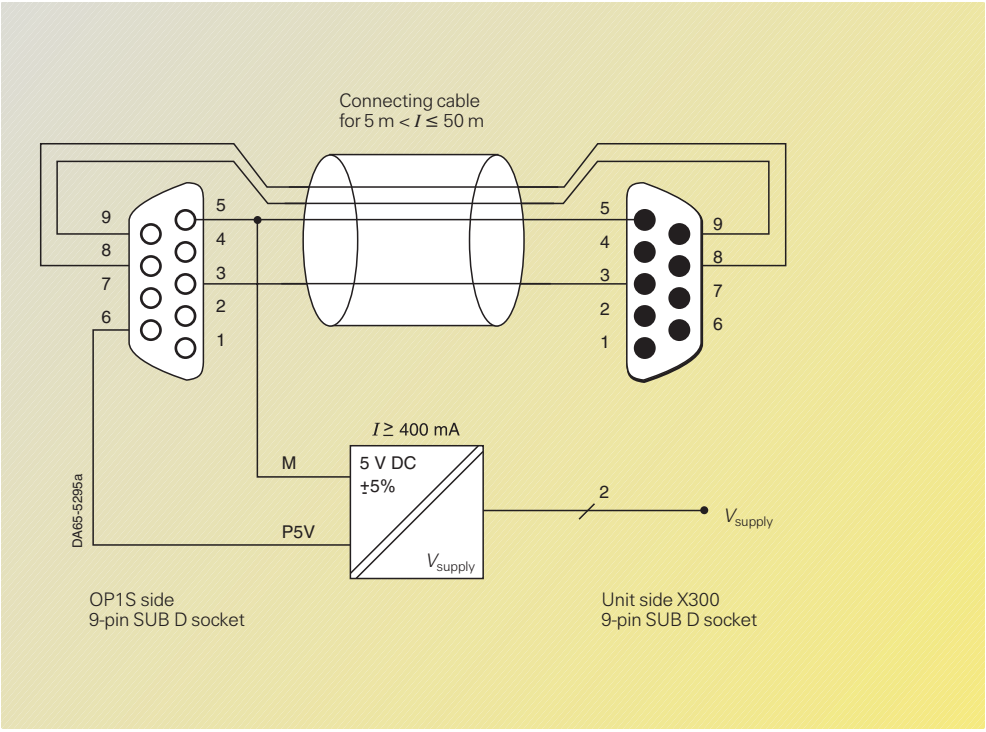


Fig. 2/10
OP1S in a point-to-point link with up to 50 m of cable

- Analog outputs of internally calculated quantities, e.g. motor current, speed, motor voltage, frequency
- Status messages, e.g. ready, run, fault.

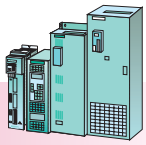
For the assignment of the control terminal strips: refer to page 6/35 and the following.

External 24 V voltage supply and main-contactor control

The electronics boards obtain their power supply from the power section (DC link) via a switch-mode power supply of the SIMOVERT MASTERDRIVES. If the DC link is discharged, power can no longer be supplied in this way. If the electronics boards are to be active even when the power section has been switched off, they must be supplied with 24 V DC via the X9 control terminal strip (see page 6/45).

The Compact PLUS inverters must always be supplied externally with 24 V DC.

SIMOVERT MASTERDRIVES have a parameterizable binary output. This output is pre-assigned to control an external main contactor via the ON command of the SIMOVERT MASTERDRIVES. In conjunction with the main contactor, the electronics boards must be supplied with 24 V DC via the X9 control terminal strip.



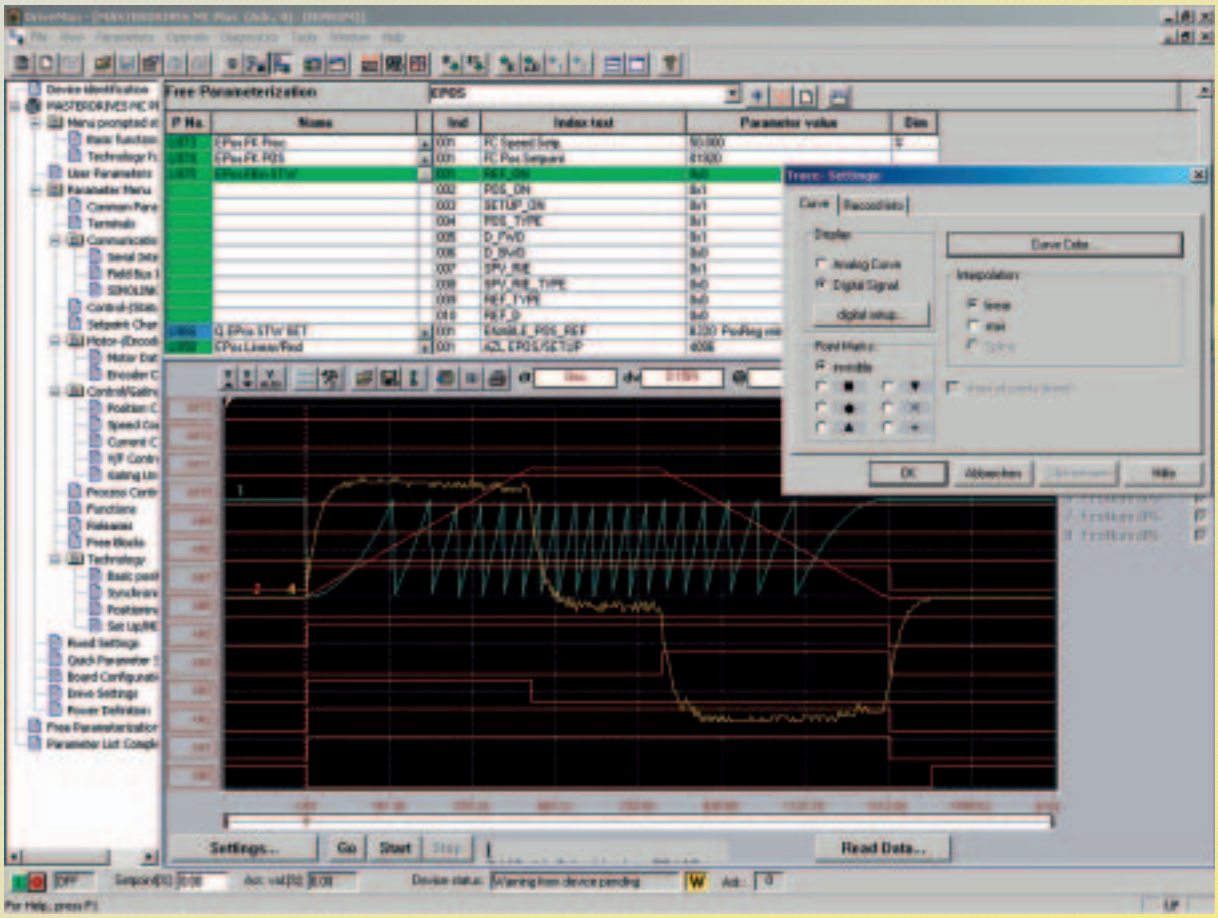


Fig. 2/11
Trace Function with DriveMonitor

The up-to-date version of DriveMonitor on CD-ROM (Windows) is part of the standard scope of supply

DriveMonitor performance characteristics

- Setting and monitoring of all basic-unit parameters via individually creatable tables
- Reading, writing, managing, printing and comparison of parameter sets
- Handling of process data (control commands, setpoints)
- Diagnostics (faults, alarms, fault memory)
- Offline and online operation
- Parameterization of the T100, T300 and T400 technology boards
- Graphic display of the trace-memory function for analysis
- Menu-assisted parametrization during commissioning.

PC configuration (hardware and software equipment)

- PC with Pentium II or comparable processor
- Operating systems
  - Windows 98/ME or
  - Windows NT/2000/ XP Professional
- Main memory of at least 32 MB RAM with Windows 98/ME, 64 MB RAM with Windows NT/2000/ XP Professional
- CD-ROM drive (24 x)
- Screen resolution 800 x 600 or higher
- Free hard-disk memory of 200 MB for minimum requirements
- Recommended system requirements
  - Pentium II/500 MHz or higher
  - Main memory of 256 MB RAM
  - Windows 98/ME/NT/ 2000/XP Professional
  - CD-ROM drive (24 x)
  - Screen resolution 800 x 600 or higher
  - Free hard-disk memory of 500 MB

For stand-alone operation (USS)

- RS232 serial interface (for one unit, point-to-point)
- RS485 serial interface (for several units, bus operation), e.g. with the RS232/RS485 interface converter, SU1.

Link-up to automation systems

SIMOVERT MASTERDRIVES can easily be linked up to any automation system, such as a PLC or an industrial PC (Fig. 2/12). The automation system controls the drives according to the requirements of the process. To do this, control data and setpoints are cyclically transmitted to the drives. The latter transmit status data and actual values back to the automation system. Even process-related parameter adaption of the drives is possible (e.g. in the case of a change in recipe).

The fieldbus system is responsible for transporting the information. This is preferably PROFIBUS DP, an open fieldbus standardized in EN 50 170 and supported by many automation systems.

An alternative, which is especially cost effective and easy to install in any automation system, is the USS protocol.

Finally, links to other fieldbus systems (e.g. CAN) round off the communication possibilities of SIMOVERT MASTERDRIVES.

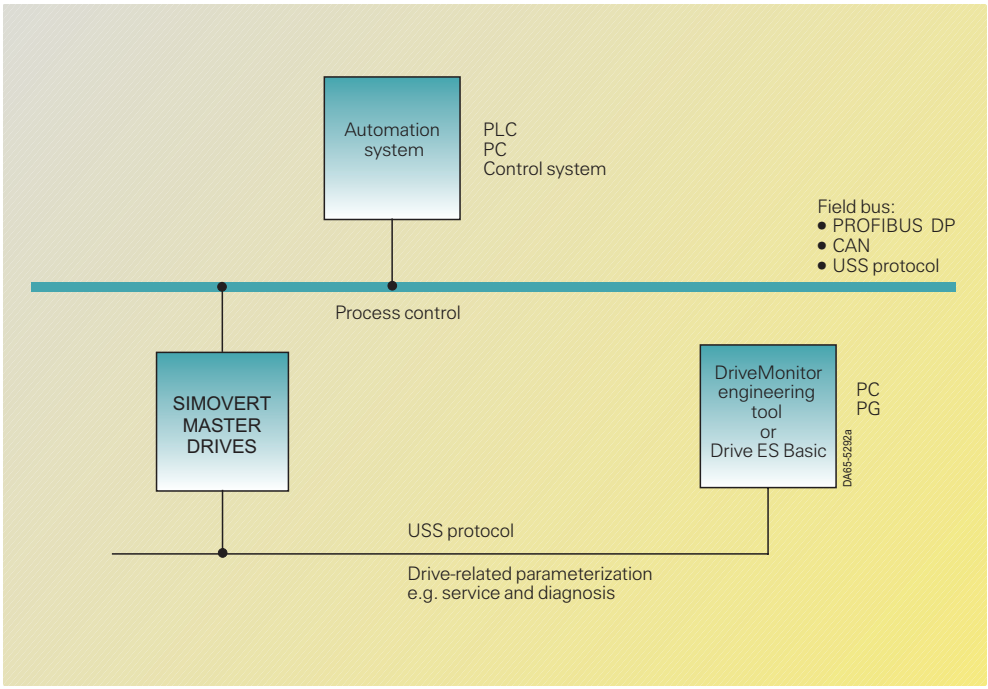
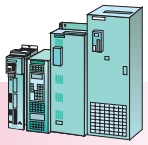


Fig. 2/12
Link between SIMOVERT MASTERDRIVES and a higher-level automation system

In order to ensure that the drive can perform its process-specific task, its parameters must be individually adapted in the start-up phase. The DriveMonitor and Drive ES engineering tools are available for this purpose for the operating systems Windows 98/ME/NT/2000 and XP Professional.

DriveMonitor is supplied free of charge with each drive. Both programs guide the commissioning engineer in a structured manner through the unit parameters and during operation act as service and diagnostic tools.

While only the bus-capable USS protocol is used for communication with the DriveMonitor units, Drive ES Basic also works directly via PROFIBUS DP.



Integrating drives in SIMATIC S5

The SIMATIC optional software "DVA_S5" is available for integrating SIMOREG® and SIMOVERT variable-speed drives into a SIMATIC S5 higher-level control system.

The software supports communication between SIMATIC and Siemens drive units (SIMOVERT MASTERDRIVES) via PROFIBUS DP and the USS protocol. This software enables the SIMATIC programmer to integrate communication with the drives into his control program without the need for detailed knowledge of the indicated communication systems, SIMATIC communication and the mechanisms of drive-related user data transfer. Programming time and costs are therefore reduced.

Example programs are available for demonstrating the required configuration steps and can be directly adopted by the user in his application.

Detailed documentation on every software component is included in the scope of supply.

Example of the user interface for a drive using PPO type 1 (SIMATIC S5, PROFIBUS DP communication)

DBW n	Communication control word (KSTW)		Communication control	
DBW n + 2	Internal			
DBW n + 4	Communication indicator word		Communication tracking	
DBW n + 6	Internal		PKW attempt counter	
DBW n + 8	Pafe 1-Byte, Pafe 2-Byte		Parameter error	
DBW n + 10	Parameter ID	PKE		
DBW n + 12	Index	IND	Intermediate memory for current PKW task	
DBW n + 14	Parameter value 1	PWE1		
DBW n + 16	Parameter value 2	PWE2		
DBW n + 18	Parameter ID	PKE		
DBW n + 20	Index	IND	PKW area	
DBW n + 22	Parameter value 1	PWE1		
DBW n + 24	Parameter value 2	PWE2		transmit mailbox
DBW n + 26	Control word (STW)	PZD1	PZD area	
DBW n + 28	Main setpoint (HSW)	PZD2		
DBW n + 30	Parameter ID	PKE		
DBW n + 32	Index	IND	PKW area	
DBW n + 34	Parameter value 1	PWE1		
DBW n + 36	Parameter value 2	PWE2		receive mailbox
DBW n + 38	Status word (ZSW)	PZD1	PZD area	
DBW n + 40	Main actual-value (HIW)	PZD2		
(n = 2, 4, 6 ...)				

Software requirements

- STEP 5 – version 6.x and higher (DVA_S5).

Software functions

One or more data blocks form the user interface (see overview above) for the transfer of user data between the SIMATIC program and the drives.

Two function blocks are available for transmitting and receiving these user data.

A further function block supports generation and presetting of the data blocks necessary for communication.

The performance characteristics are as follows:

- Generation of data blocks for communication depending on the configured bus configuration
- Presetting of these data blocks
- Cyclic user data transfer
- Execution and monitoring of parameter tasks.

Integrating drives in SIMATIC S7 with Drive ES

The engineering and process control of SIMOVERT MASTERDRIVES in combination with a SIMATIC S7 and STEP® 7 ≥ V5.0 is particularly user-friendly and convenient.

If the optional Software Drive ES (Drive Engineering System) is installed on the same software platform (PC or PG) then the engineering of the complete system can take place via the STEP 7 Manager. Data transportation is handled by the S7 system bus PROFIBUS DP (see Fig. 2/13).

The optional software Drive ES combines the previously individual steps of configuring (hardware configuring, parameter assignment, technology functions) and the control functions between SIMATIC S7 and SIMOVERT MASTERDRIVES, in one software tool.

Fully integrated in the STEP 7 Manager, Drive ES consists of four packages with different functions.

Drive ES Basic is used for convenient startup and for servicing and diagnostics during plant operation. The great advantage compared to DriveMonitor is in the system-wide data management of drive and automation data of a project in the STEP 7 Manager, as well as the use of the complete communication possibilities of SIMATIC S7. This includes e.g. the communication via ROUTING as well as the use of the SIMATIC teleservice.

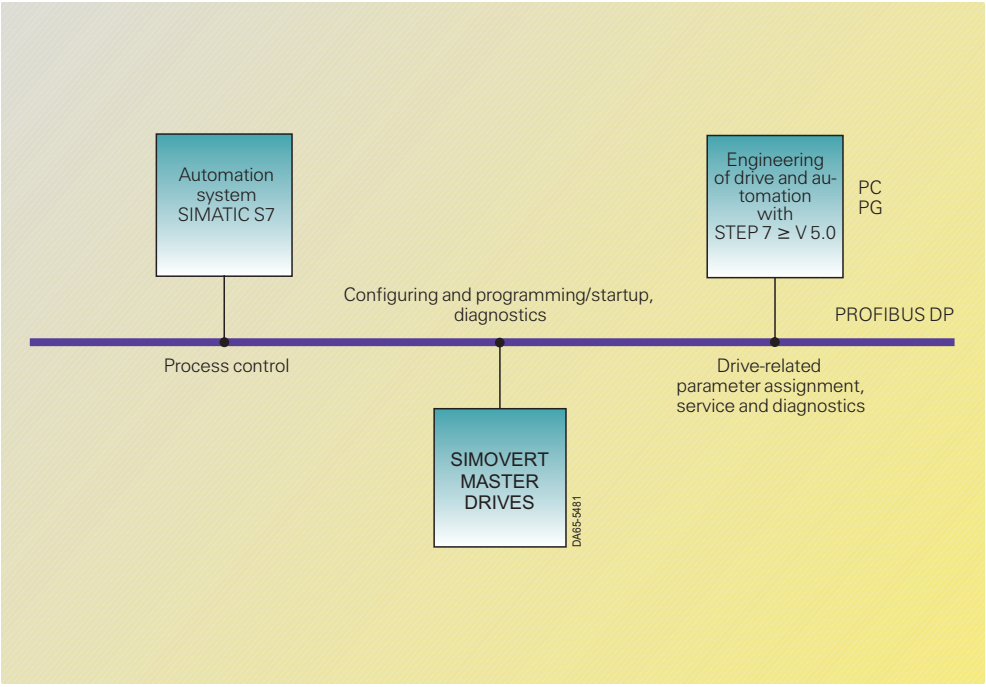
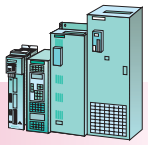


Fig. 2/13
Integration of SIMOVERT MASTERDRIVES in the SIMATIC S7 automation system

The functions provided in SIMOVERT MASTERDRIVES (base unit, free block and technology functions) can be graphically configured using Drive ES Graphic together with the SIMATIC tool CFC (Continuous Function Chart).

Drive ES SIMATIC makes a whole library of function blocks available. The communication between SIMATIC S7 and Siemens drives (e.g. SIMOVERT MASTERDRIVES) can then be configured using preconfigured CPU function blocks and simple parameter assignment. Furthermore, incorporation of drives with PROFIBUS DP interface via Drive ES PCS7 in SIMATIC PCS7 is possible.

In joint operation with the PROFIBUS DP communication board CBP2, Drive ES supports additional functionalities such as clock synchronization of drives, slave-to-slave communication between drives and flexible configuration of the cyclic messages (see page 6/57).



Engineering package Drive ES

2

With Drive ES (*D*rive *E*ngineering *S*ystem) the SIMOVERT MASTERDRIVES series may be fully integrated into the SIMATIC automation world with regard to communication, configuring and data management.

Drive ES consists of four individually available software packages: Drive ES Basic, Drive ES Graphic, Drive ES SIMATIC and Drive ES PCS7.

- Drive ES Basic is the basic software for assigning parameters to all drives online and offline, and the basis for Drive ES Graphic software.
- Drive ES Graphic is the software for the graphical online and offline configuring of BICO function blocks. Requirements are an installed Drive ES Basic and an installed SIMATIC CFC ≥ V 5.1 (graphic programming tool, see Catalog ST 70, Industrial software).
- Drive ES SIMATIC requires STEP 7 to be installed. It provides its own SIMATIC block library, allowing simple and reliable programming of the PROFIBUS DP interface in the SIMATIC CPU for the drives.
- Drive ES PCS7 requires PCS7 to be installed, ≥ Version 5.0. Drive ES PCS7 provides a block library with function blocks for the drives and the associated faceplates for the operator station. It is therefore possible for an operator to control the drives from the PCS7 process control system.

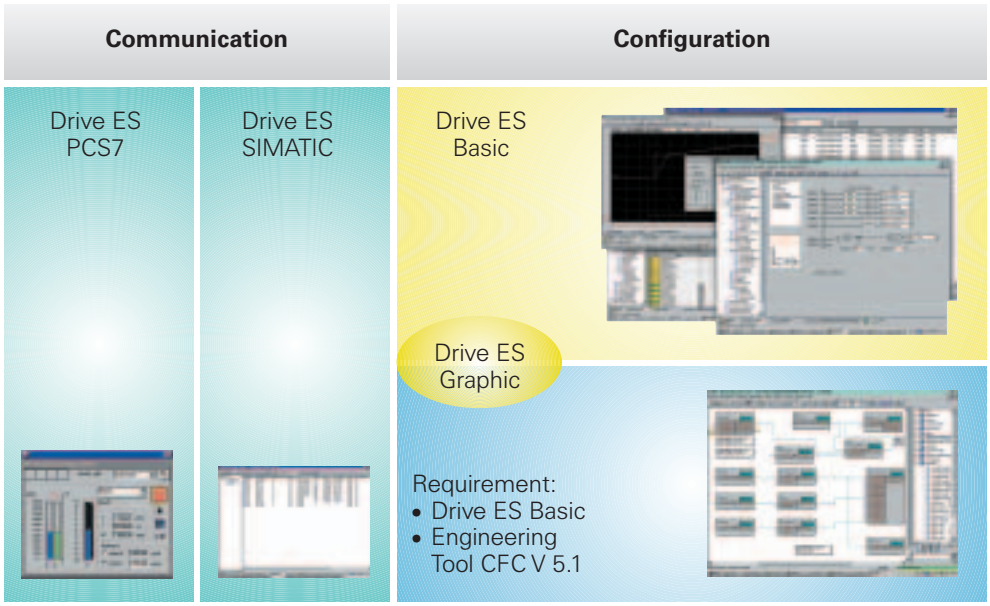


Fig. 2/14
Product structure Drive ES

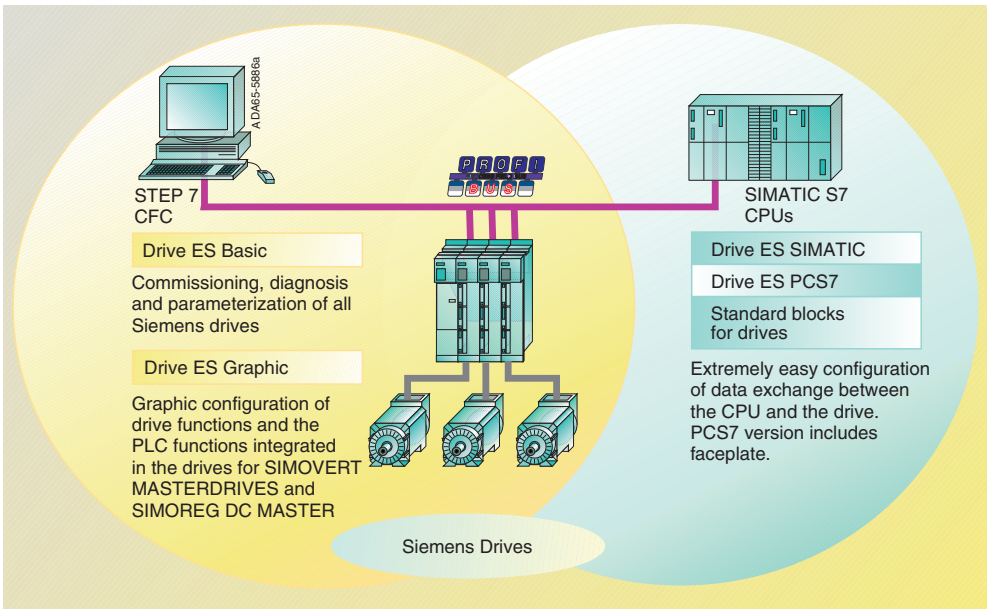


Fig. 2/15
Distribution of tasks for the Drive ES range

Drive ES Basic

- Drive ES is based on the user interface of the SIMATIC manager.
- Parameters and charts of drives are available in the SIMATIC manager (system-wide data management).
- Drive ES ensures the unique assignment of parameters and charts to a drive.
- Archiving of a SIMATIC project including drive data.
- Facility for using SIMATIC Teleservice (V5).
- Communication via PROFIBUS DP or USS with the drive.

Functions

- Trace evaluation for SIMOVERT MASTERDRIVES.
- Reading out of the fault memory for SIMOVERT MASTERDRIVES.
- Upread and download of parameter sets (as a complete file or as difference file from factory setting).
- Free assembly and editing of parameter sets.
- Utilization of script files.
- Guided commissioning for SIMOVERT MASTERDRIVES.

Installation with STEP 7

Drive ES Basic can be installed as an option for STEP 7 ≥ V 5.0, becoming homogeneously integrated in the SIMATIC environment.

Installation without STEP 7

Drive ES Basic can also be installed without STEP 7, by providing its own drive manager (based on the SIMATIC manager).

Drive ES Graphic

- Function charts are saved drive specific in SIMATIC CFC format.
- Configuring of drive functions in BICO technology with SIMATIC CFC.
- Offline functionality.
- Test mode (online functionality) with Change connection, Change value, Activate block.
- Readback and reverse documentation.
- For SIMOVERT MASTERDRIVES vector control software version ≥ 3.2 and motion control software version ≥ 1.3.

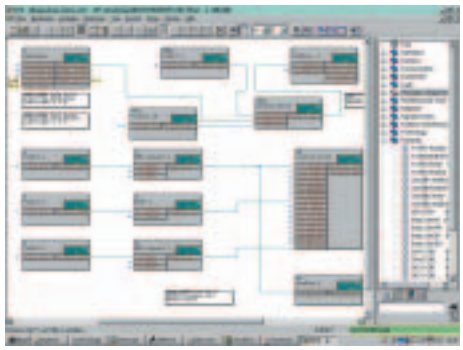


Fig. 2/16
Graphic programming with Drive ES Graphic and CFC

Drive ES SIMATIC

- Provides function blocks and examples of projects for the SIMATIC CPU which handle communication via PROFIBUS DP or USS with Siemens drives.
- Communication set-up via parameters as opposed to programming.

Features

- Blocks in STEP 7 design; symbolic addressing; function blocks with entity data, online help.
- Can be used in all SIMATIC programming and configuring environments such as LAD, CSF, STL, SCL, CFC.
- New block structure: modular individual functions for run time-optimized programming.

Block functions

- Writing and reading of process data of freely configurable length and consistency.
- Cyclic and acyclic exchange of parameters, monitoring of communication, reading out of fault memory from SIMOVERT MASTERDRIVES.
- Parameter download via the CPU to the drive.

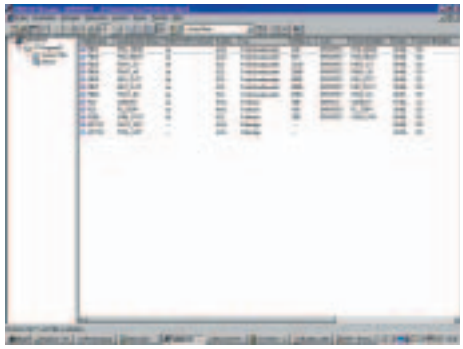


Fig. 2/17
Integrating drives into the STEP 7 manager

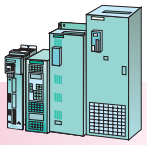
- Complete reparameterization after converter exchange at the push of a button from the CPU.

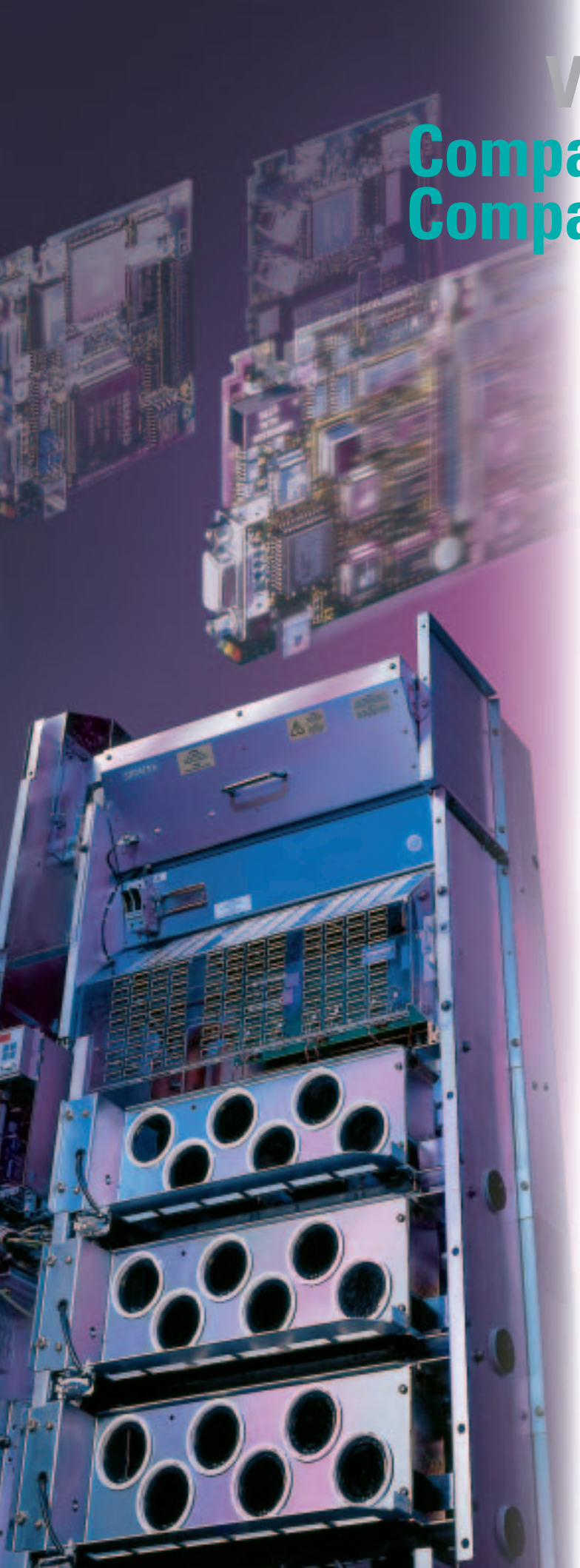
Drive ES PCS7

- Incorporates the drives with PROFIBUS DP interface in PCS7.
- Can be used from STEP 7 or PCS7 V 5 on.

Block functions

- Image and control blocks for incorporating drives in PCS7 (SIMOVERT MASTERDRIVES with speed interface).





Vector Control
Compact PLUS, Compact and Chassis Units

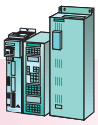


Fig. 3/1
Compact PLUS units

Fig. 3/2
Compact units

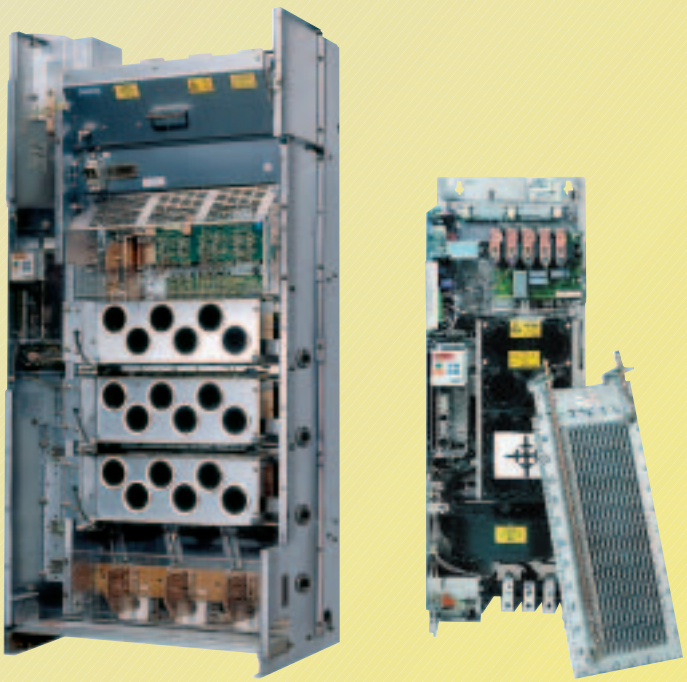
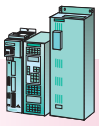


Fig. 3/3
Chassis units



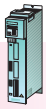
Converters, inverters, AFE inverters, rectifier units, rectifier/regenerative units and braking units

Cooling type	Forced ventilation with integral fan
Air-cooled Permissible ambient and cooling-medium temperature during operation	0 °C to +40 °C (reduction curves for +40 °C < T < +50 °C, see page 6/3)
Water-cooled ● Cooling water inlet temperature ● Permissible ambient temperature during operation	 +5 °C to +38 °C 0 °C to +40 °C
Permissible ambient temperature during storage and transport	–25 °C to +70 °C
Installation altitude	≤ 1000 m above sea level (100 % load capability) > 1000 m to 4000 m above sea level (for reduction curves, see Section 6)
Humidity rating	Relative humidity ≤ 85 %, moisture condensation not permissible
Climatic category	Class 3K3 to EN 60 721-3-3
Environmental class	Class 3C2 to EN 60 721-3-3
Insulation	Pollution degree 2 to DIN VDE 0110-1 (HD 625. 1 S1: 1996), moisture condensation not permissible
Overvoltage category	Category III to DIN VDE 0110-1 (HD 625. 1 S1: 1996)
Degree of protection	To EN 60 529: Compact PLUS units: IP20; chassis units: IP00 (IP20 optional)
Protection class	Class I to EN 61 140
Shock protection	To DIN VDE 0106 Part 100 and BGV A2 (previously VBG 4)
Radio-interference suppression ● Standard ● Options	To EMC product standard EN 61 800-3 for variable-speed drives No radio-interference suppression Class B1 or Class A1 to EN 61 800-3
Additional information	The units are motor-side ground-fault protected, short-circuit proof and may be operated under no-load conditions.
Paint finish	For indoor installation
Mechanical specifications ● during operation ● during transport	To EN 60 068-2-6 10 Hz to 58 Hz constant deflection 0.075 mm 58 Hz to 500 Hz constant acceleration 9.8 m/s² (1 g) 5 Hz to 9 Hz constant deflection 3.5 mm 9 Hz to 500 Hz constant acceleration 9.8 m/s² (1 g)

Approvals according to UL/CSA[1]	UL File No.	CSA File No.
● Converters and inverters	E 145 153	LR 21927
● Rectifier units and rectifier/regenerative units[2]	E 145 153	LR 21927
● Braking units and braking load resistors[2]	E 145 153	LR 21927
● Braking resistors for Compact PLUS units	E 233 422	210040 (Certificate 1185101)
● d*v*/d*t*- and sinusoidal filter[2]	E 145 153	LR 21927
● Radio-interference suppression filter type 6SE70 ...[2]	E 145 153	LR 21927
● Line commutating and output reactors (iron)	E 103 902	
● 3NE1 series fuses are	E 167 357	

1) UL and CSA approval is not valid for units and system components 3 AC 660 V – 690 V and 890 V – 930 V DC.

2) UL and CSA approval only in combination with SIMOVERT MASTERDRIVES converters or inverters.



Technical characteristics of the Compact PLUS units

The converter has an integrated brake chopper. For regenerative mode, an external braking resistor is additionally required.

Additional Compact PLUS inverters can be connected to the converter via the DC link busbars. The total rating of the inverters to be connected can be up to the rating of the converter, e.g. a 5.5 kW converter can supply a 4 kW inverter and two 0.75 kW inverters.

A switch-mode power supply unit fed from the DC link supplies the control electronics of the converter. The control electronics can also be supplied with 24 V DC from an external source via the X9 connector strip, e.g. in order to maintain communication with a higherlevel control unit when the power section is switched off (DC link discharged).

The switch-mode power supply unit of a converter can also supply the power for the control electronics of an additional two inverters.

The control electronics of the inverters are always supplied with 24 V DC from an external source via the X100 connector strip. The position of the X100 connector strip is the same for all units and enables simple wiring of the 24 DC V power supply.

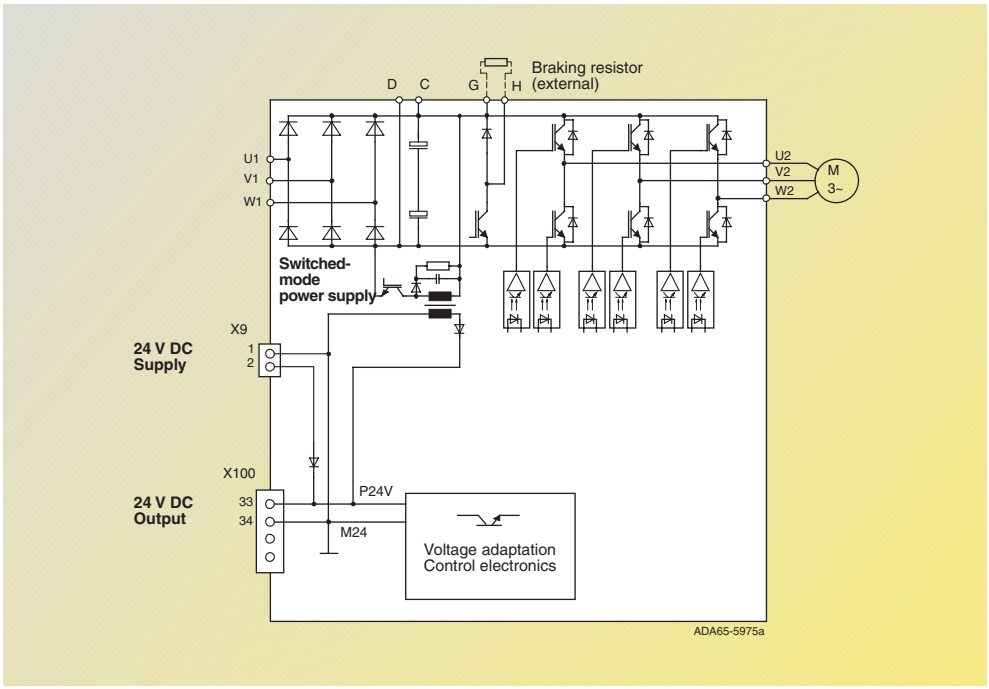


Fig. 3/4
Converter

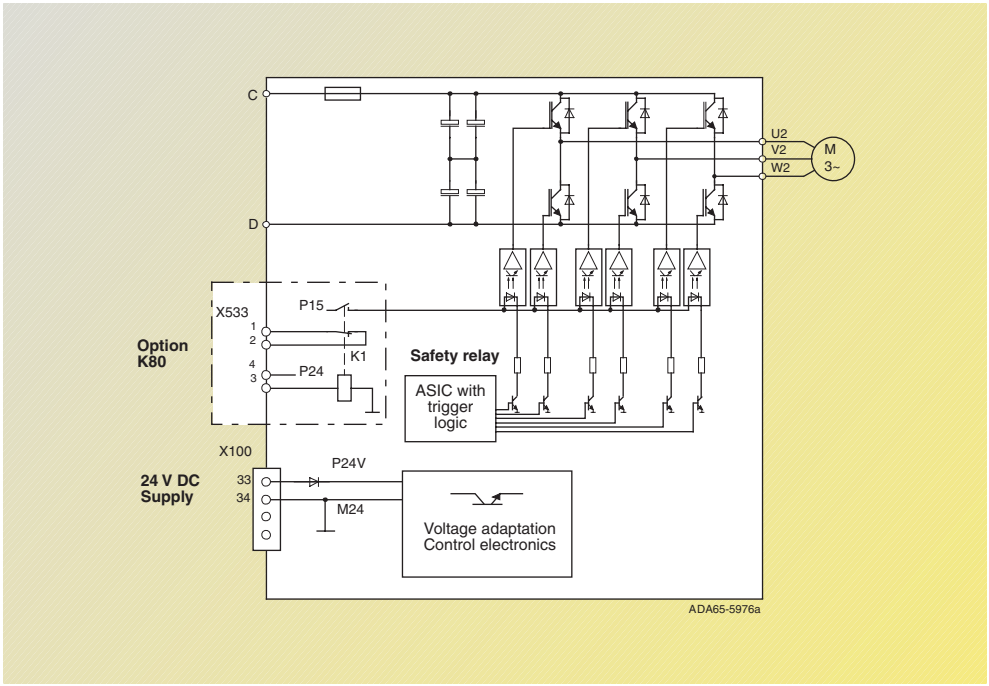


Fig. 3/5
Inverter with "Safe Stop" option

Optional devices

Safe Stop (K80)

With an appropriate external protective circuit, unexpected starting of the drive is prevented in accordance with EN 954-1, Safety Category 3.

Operation from an earth-free power supply (L20)

Converters without radio interference suppression capacitors for connection to IT networks.

Note:

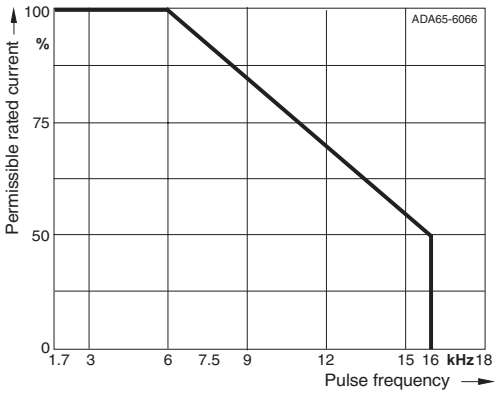
Rectifier units and inverters are suitable for operation connected to an earth-free power supply. The control electronics are always earthed (PELV circuit).

Technical data for Compact PLUS units

Rated voltage	
Supply voltage V_{supply}	3 AC 380 V – 15 % to 480 V +10 %
DC link voltage V_D[1])	DC 510 V – 15 % to 650 V +10 %
Output voltage Converter	3 AC 0 V to V_{supply}
Inverter	3 AC 0 V to 0.75 x V_D
Rated frequency	
Supply frequency	50/60 Hz (± 6 %)
Output frequency – V/f = constant	0 Hz to 200 Hz (500 Hz for textile)
– V = constant	8 Hz to 300 Hz
Pulse frequency	
Minimum pulse frequency	1.7 kHz
Factory setting	2.5 kHz
Maximum setting	16 kHz
Load class II to EN 60 146-1-1	See also Section 6, Engineering Information
Base load current	0.91 x rated output current
Short-time current	1.36 x rated output current for 60 s or 1.60 x rated output current for 30 s
Cycle time	300 s
Power factor • fundamental • overall	 ≥ 0.98 0.93 to 0.96
Efficiency	0.96 to 0.98

Reduction curves

For reduction factors due to different installation conditions (installation altitude, ambient temperature), see Section 6.



Max. adjustable pulse frequency depending on output and type of construction:

for Compact PLUS units
16 kHz

Options for Compact PLUS units

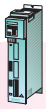
The Compact PLUS units can be ordered supplied with the following options in the table.

For a description of the options, see page 3/93. For the selection and ordering data of the units with optional electronic boards, see page 3/85 and the following as well as Section 6.

Supplementary order code		Converter	Inverter
K80	Safe Stop	●	●
L20	Operation with an IT supply	●	■
M08	Coated boards	in preparation	in preparation

■ Standard
● Option possible

1) For max. DC link voltage for operation with AFE, see table on page 3/25.



Selection and ordering data

Compact PLUS converters

Nominal power rating	Rated output current	Base load current	Short-time current[1]	Supply current[2] Single-motor drive	Line current[3] Multi-motor drive		Power loss at 2.5 kHz single-motor drive (multi-motor drive)	Braking power with integrated braking chopper		
								Smallest permissible value of external braking resistor R_{min}	Rated braking power P_{20} with R_{min}	Short-time braking power P_3 with R_{min}
	I_N	I_G								
kW	A	A	A	A	A	Order No.	kW	Ω	kW	kW
Supply voltage 3-ph. 380 V to 480 V AC										
0.55	1.5	1.4	2.4	1.7	2.6	**6SE7011–5EP60**	0.05 (0.05)	80	5	7.5
1.1	3.0	2.7	4.8	3.3	5.3	**6SE7013–0EP60**	0.07 (0.08)	80	5	7.5
1.5	5.0	4.6	8.0	5.5	8.8	**6SE7015–0EP60**	0.10 (0.11)	80	5	7.5
3	8.0	7.3	12.8	8.8	14	**6SE7018–0EP60**	0.14 (0.16)	40	10	15
4	10.0	9.1	16.0	11.0	18	**6SE7021–0EP60**	0.15 (0.17)	40	10	15
5.5	14.0	12.7	22.4	15.4	25	**6SE7021–4EP60**	0.17 (0.20)	20	20	30
7.5	20.5	18.7	32.8	22.6	36	**6SE7022–1EP60**	0.22 (0.26)	20	20	30
11	27.0	24.6	43.2	29.7	48	**6SE7022–7EP60**	0.29 (0.34)	11	36	54
15	34.0	30.9	54.4	37.4	60	**6SE7023–4EP60**	0.39 (0.46)	11	36	54

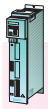
Compact PLUS inverters

Nominal power rating	Rated output current	Base load current	Short-time current[1]	Rated DC link current		Power loss at 2.5 kHz
	I_N	I_G				
kW	A	A	A	A	Order No.	kW
DC voltage 510 V to 650 V DC						
0.75	2.0	1.8	3.2	2.4	**6SE7012–0TP60**	0.05
1.5	4.0	3.6	6.4	4.8	**6SE7014–0TP60**	0.06
2.2	6.1	5.6	9.8	7.3	**6SE7016–0TP60**	0.07
4	10.2	9.3	16.3	12.1	**6SE7021–0TP60**	0.09
5.5	13.2	12.0	21.1	15.7	**6SE7021–3TP60**	0.14
7.5	17.5	15.9	28.0	20.8	**6SE7021–8TP60**	0.17
11	25.5	23.2	40.8	30.3	**6SE7022–6TP60**	0.22
15	34.0	30.9	54.4	40.5	**6SE7023–4TP60**	0.30
18.5	37.5	34.1	60.0	44.6	**6SE7023–8TP60**	0.35

1) Short-time current = **1.6 x I_N** for **30 s** or **1.36 x I_N** for **60 s**.

2) Rated supply current for converter without additional inverter. If the converter feeds additional inverters, the rated supply current is **1.76 x I_N**. See also Engineering Information, Section 6.

3) Converter feeds additional inverter; Supply current = **1.76 x I_N**.



Dimensions W x H x D	For dimension drawing, see Section 7	Weight, approx.	Cooling air requirement	Sound pressure level L_{pA} (1 m)	Power connections –Terminals for supply line finely stranded/ multi-stranded	Motor finely stranded/ multi-stranded	Auxiliary current requirement 24 V DC Max. version (max. at 20 V)
mm	No.	kg	m^3/s	dB	mm^2	mm^2	A
45 x 360 x 260	1	3.4	0.002	18	4 / 4	4 / 4	1.3
67.5 x 360 x 260	1	3.9	0.009	40	4 / 4	4 / 4	1.3
67.5 x 360 x 260	1	4.1	0.009	40	4 / 4	4 / 4	1.3
90 x 360 x 260	1	4.5	0.018	37	4 / 4	4 / 4	1.3
90 x 360 x 260	1	4.5	0.018	37	4 / 4	4 / 4	1.3
135 x 360 x 260	2	10.8	0.041	48	10 / 16	10 / 16	1.5
135 x 360 x 260	2	10.9	0.041	48	10 / 16	10 / 16	1.5
180 x 360 x 260	2	14.7	0.061	59	25 / 35	16 / 25	1.9
180 x 360 x 260	2	14.9	0.061	59	25 / 35	16 / 25	1.9

Dimensions W x H x D	For dimension drawing, see Section 7	Weight, approx.	Cooling air requirement	Sound pressure level L_{pA} (1 m)	Power connections DC bus	–Terminals for motor finely stranded/ multi-stranded	Auxiliary current requirement 24 V DC Max. version (max. at 20 V)
mm	No.	kg	m^3/s	dB	DIN 46 433	mm^2	A
45 x 360 x 260	3	3.0	0.002	18	E-Cu 3 x 10	4 / 4	1.3
67.5 x 360 x 260	3	3.4	0.009	40	E-Cu 3 x 10	4 / 4	1.3
67.5 x 360 x 260	3	3.4	0.009	40	E-Cu 3 x 10	4 / 4	1.3
90 x 360 x 260	3	3.8	0.018	37	E-Cu 3 x 10	4 / 4	1.3
135 x 360 x 260	4	8.8	0.041	48	E-Cu 3 x 10	10 / 16	1.5
135 x 360 x 260	4	8.9	0.041	48	E-Cu 3 x 10	10 / 16	1.5
135 x 360 x 260	4	9.0	0.041	48	E-Cu 3 x 10	10 / 16	1.5
180 x 360 x 260	4	12.7	0.061	59	E-Cu 3 x 10	16 / 25	1.7
180 x 360 x 260	4	12.9	0.061	59	E-Cu 3 x 10	16 / 25	1.7

Technical characteristics of compact and chassis units

The converter is designed as a single unit, i.e. a converter cannot supply additional inverters via its DC link connections "C" and "D". A braking unit (for regenerative mode) or system components, e.g. d*v*/d*t*-filters, are connected to terminals "C" and "D". The converter is connected to a three-phase power system. The precharging circuit for charging the DC link capacitors is already integrated.

Inverters are connected to the DC voltage supply via terminals "C" and "D". The DC voltage is supplied, for example, via an AFE self-controlled rectifier/regenerative unit or a rectifier unit. The rectifier unit precharges the DC link capacitors when the DC voltage supply is switched on, i.e. it is not permissible for the inverter to be directly connected to a charged DC busbar (see Engineering Information, Part 6). The A – D and J – L type of construction inverters have integrated DC link fuses as a standard feature. In the case of the E – G chassis units, integrated DC link fuses can be ordered as an option.

The control electronics of converters and inverters are supplied from the DC link via a switch-mode power supply unit. The control electronics can also be supplied with 24 V DC from an external source via the X9 connector strip, e.g. in order to maintain communication with a higher-level control unit when the power section is off (DC link discharged).

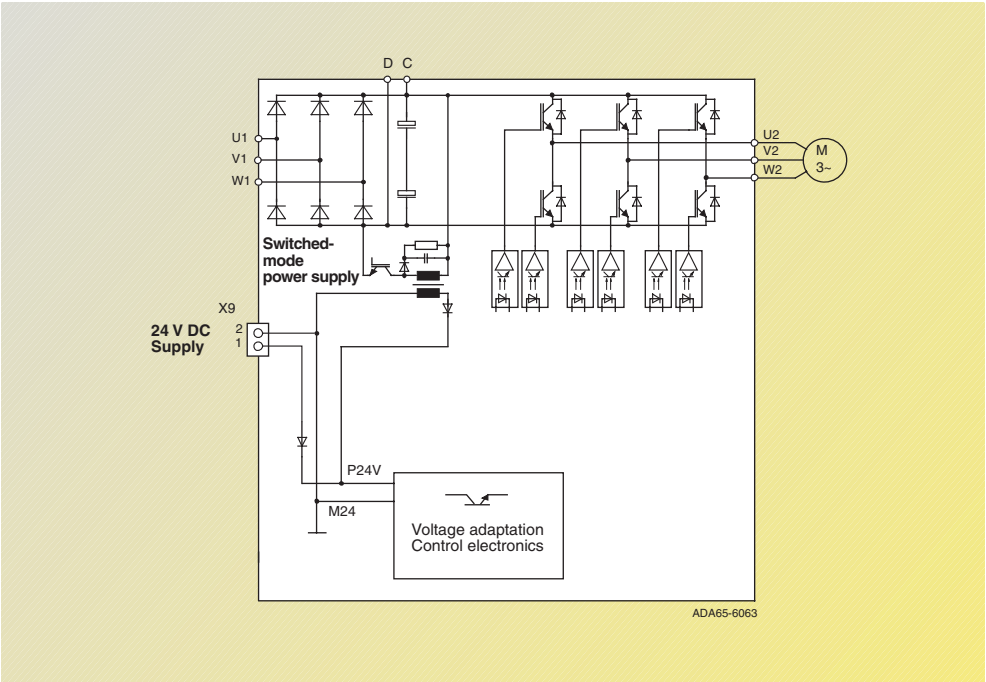


Fig. 3/6
Converters

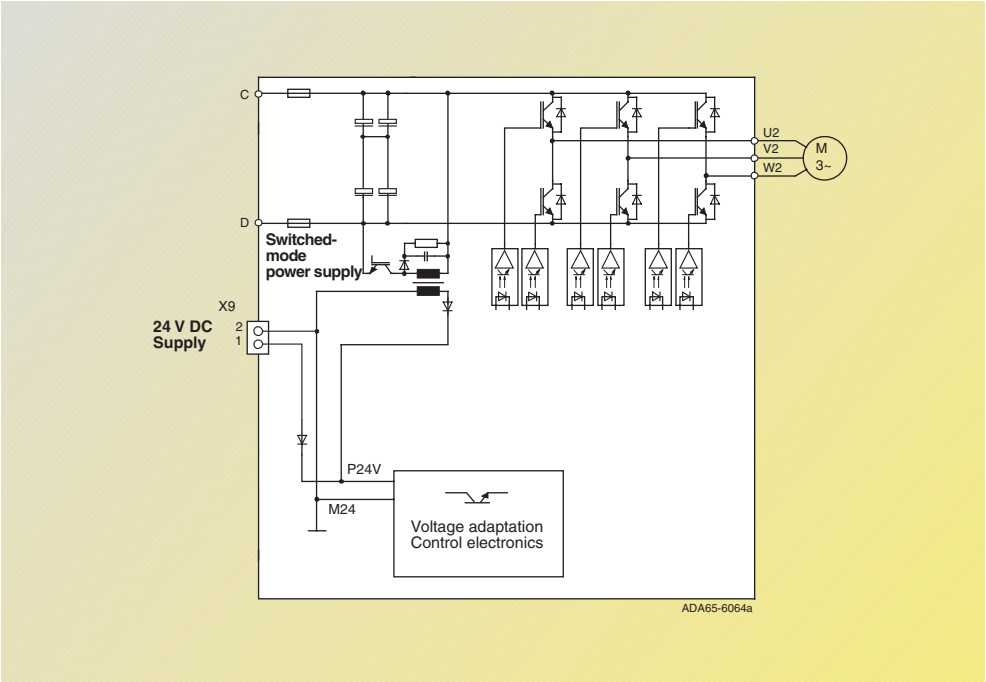


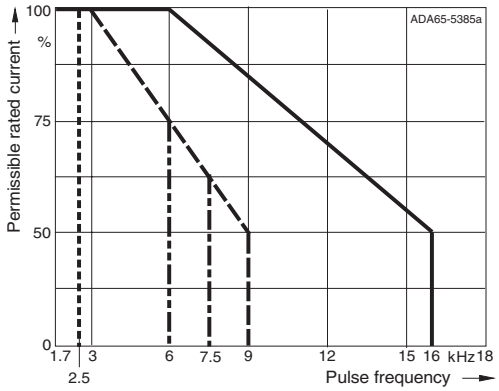
Fig. 3/7
Inverters

Technical data for compact and chassis units

Rated voltage			
Supply voltage V_{supply}	3 AC 380 V – 15 % to 480 V +10 %	3 AC 500 V – 15 % to 600 V +10 %	3 AC 660 V – 15 % to 690 V +15 %
DC link voltage V_D [3])	DC 510 V – 15 % to 650 V +10 %	DC 675 V – 15 % to 810 V +10 %	DC 890 V – 15 % to 930 V +15 %
Output voltage Converter	3 AC 0 V to V_{supply}	3 AC 0 V to V_{supply}	3 AC 0 V to V_{supply}
Inverter	3 AC 0 V to 0.75 x V_D	3 AC 0 V to 0.75 x V_D	3 AC 0 V to 0.75 x V_D
Rated frequency			
Supply frequency	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)
Output frequency – V/f = constant	0 Hz to 200 Hz max. 500 Hz for textile depending on output rating	0 Hz to 200 Hz max. 500 Hz for textile depending on output rating	0 Hz to 200 Hz max. 300 Hz for textile depending on output rating
– V = constant	8 Hz to 300 Hz depending on output rating	8 Hz to 300 Hz depending on output rating	8 Hz to 300 Hz depending on output rating
Pulse frequency			
Minimum pulse frequency	1.7 kHz	1.7 kHz	1.7 kHz
Factory setting	2.5 kHz	2.5 kHz	2.5 kHz
Maximum setting	depending on output rating, up to 16 kHz	depending on output rating, up to 16 kHz	depending on output rating, up to 7.5 kHz
Load class II to EN 60 146-1-1	See also Section 6. Engineering Information		
Base load current	0.91 x rated output current		
Short-time current	1.36 x rated output current for 60 s or 1.60 x rated output current for units up to size G and a supply voltage of max. 600 V		
Cycle time	300 s		
Power factor • fundamental • overall	≥ 0.98 0.93 to 0.96		
Efficiency	0.96 to 0.98		

Reduction curves

For reduction factors due to different installation conditions (installation altitude, ambient temperature), see Section 6.



Max. adjustable pulse frequency depending on output rating and type of construction:

16 kHz — for types A, B, C and D
at 45 kW; 55 kW; 380 V to 480 V
at 37 kW; 45 kW; 500 V to 600 V

9 kHz — for type E, 200 V to 230 V
at 75 kW; 90 kW; 380 V to 480 V
at 55 kW; 500 V to 600 V

7.5 kHz — at 110 kW; 132 kW; 380 V to 480 V
at 75 kW; 90 kW; 500 V to 600 V
at 55 kW to 110 kW; 660 V to 690 V

6 kHz — at 160 kW to 250 kW; 380 V to 480 V
at 110 kW to 160 kW; 500 V to 600 V
at 132 kW to 200 kW; 660 V to 690 V

2.5 kHz — at 315 kW to 900 kW; 380 V to 480 V
at 200 kW to 1100 kW; 500 V to 600 V
at 250 kW to 2300 kW; 660 V to 690 V

Options for compact and chassis units

Compact and chassis units can be supplied ex works with the following options in the table.

■ Standard
● option possible
– not possible

For the selection and ordering data of the units with optional electronic boards, see page 3/85 and the following as well as Section 6.

Supplementary order code	Description of option	Converter size			Inverter size			
		A – D	E – G	K	A – D	E – G	J, K	L
K80	Safe Stop	– [1])	●	●	■	●	●	●
L03	Basic interference suppression	■	■	●	–	–	●	●
L20	Operation with an IT supply	●	●	■	■	■	■	■
L30	Integrated DC link fuses	–	–	–	■	●	■	■
L33	Without DC link fuses	■	■	■	●	■	–	–
M08	Coated boards	● [2])	–	–	● [2])	–	–	–
M20	IP20 panels	■	●	–	■	●	–	–
M65	Separate DC connection for dv/dt filter	–	–	●	–	–	●	■

For a description of options, see page 3/93.

1) Option possible with type D and supply voltage 3-ph. 380 V to 480 V AC.

2) Only for supply voltage 3-ph 380 V to 480 V AC and DC voltage 510 V to 650 V DC.

3) For max. DC link voltage for operation with AFE, see table on page 3/25.

Selection and ordering data

Nominal power rating	Rated output current	Base load current	Short-time current [1]	Rated DC link current	Supply current (only for converters)	Converter	Inverter	Power loss at 2.5 kHz		Dimensions W x H x D	For dimension drawing, see Section 7	Weight approx.
	I_{UN}	I_G	$I_{max.}$					Converter	Inverter			
kW	A	A	A	A	A	Order No.	Order No.	kW	kW	mm	No.	kg
Supply voltage 3-ph. 380 V to 480 V AC and DC voltage 510 V to 650 V DC												
400 V												
2.2	6.1	5.6	8.3	7.3	6.7	**6SE7016–1EA61**	**6SE7016–1TA61**	0.11	0.09	90 x 425 x 350	6	8.5
3	8	7.3	10.9	9.5	8.8	**6SE7018–0EA61**	**6SE7018–0TA61**	0.12	0.10	90 x 425 x 350	6	8.5
4	10.2	9.3	13.9	12.1	11.2	**6SE7021–0EA61**	**6SE7021–0TA61**	0.16	0.12	90 x 425 x 350	6	8.5
5.5	13.2	12	18.0	15.7	14.5	**6SE7021–3EB61**	**6SE7021–3TB61**	0.16	0.13	135 x 425 x 350	6	12.5
7.5	17.5	15.9	23.9	20.8	19.3	**6SE7021–8EB61**	**6SE7021–8TB61**	0.21	0.16	135 x 425 x 350	6	12.5
11	25.5	23.2	34.8	30.4	28.1	**6SE7022–6EC61**	**6SE7022–6TC61**	0.34	0.27	180 x 600 x 350	6	21
15	34	30.9	46.4	40.5	37.4	**6SE7023–4EC61**	**6SE7023–4TC61**	0.47	0.37	180 x 600 x 350	6	21
18.5	37.5	34.1	51.2	44.6	41.3	**6SE7023–8ED61**	**6SE7023–8TD61**	0.60	0.50	270 x 600 x 350	6	32
22	47	42.8	64.2	55.9	51.7	**6SE7024–7ED61**	**6SE7024–7TD61**	0.71	0.58	270 x 600 x 350	6	32
30	59	53.7	80.5	70.2	64.9	**6SE7026–0ED61**	**6SE7026–0TD61**	0.85	0.69	270 x 600 x 350	6	32
37	72	65.5	98.3	85.7	79.2	**6SE7027–2ED61**	**6SE7027–2TD61**	1.06	0.85	270 x 600 x 350	6	32
45	92	84	126	110	101	**6SE7031–0EE60**	**6SE7031–0TE60**	1.18	1.05	270 x 1050 x 365	8	65
55	124	113	169	148	136	**6SE7031–2EF60**	**6SE7031–2TF60**	1.67	1.35	360 x 1050 x 365	8	75
75	146	133	199	174	160	**6SE7031–5EF60**	**6SE7031–5TF60**	1.95	1.56	360 x 1050 x 365	8	75
90	186	169	254	221	205	**6SE7031–8EF60**	**6SE7031–8TF60**	2.17	1.70	360 x 1050 x 365	8	75
110	210	191	287	250	231	**6SE7032–1EG60**	**6SE7032–1TG60**	2.68	2.18	508 x 1450 x 465	8	160
132	260	237	355	309	286	**6SE7032–6EG60**	**6SE7032–6TG60**	3.40	2.75	508 x 1450 x 465	8	160
160	315	287	430	375	346	**6SE7033–2EG60**	**6SE7033–2TG60**	4.30	3.47	508 x 1450 x 465	8	180
200	370	337	503	440	407	**6SE7033–7EG60**	**6SE7033–7TG60**	5.05	4.05	508 x 1450 x 465	8	180
250	510	464	694	607	–	**–**	**6SE7035–1TJ60**	–	5.8	800 x 1400 x 565	10	350
250	510	464	694	607	561	**6SE7035–1EK60**	**–**	7.1	–	800 x 1750 x 565	12	400
315	590	537	802	702	–	**–**	**6SE7036–0TJ60**	–	6.6	800 x 1400 x 565	10	350
315	590	537	802	702	649	**6SE7036–0EK60**	**–**	8.2	–	800 x 1750 x 565	12	400
400	690	628	938	821	–	**–**	**6SE7037–0TJ60**	–	8.8	800 x 1400 x 565	10	350
400	690	628	938	821	759	**6SE7037–0EK60**	**–**	10.2	–	800 x 1750 x 565	12	400
500	860	782	1170	1023	–	**–**	**6SE7038–6TK60**	–	11.9	800 x 1750 x 565	10	520
630	1100	1000	1496	1310	–	**–**	**6SE7041–1TK60**	–	13.4	800 x 1750 x 565	10	520
710	1300	1183	1768	1547	–	**–**	**6SE7041–3TL60**	–	14.5	1100 x 1750 x 565	11	625

For units with larger nominal power rating (parallel switched units), see page 3/16.

1) Short-time current = **1.6 x I_{UN}**, possible for **30 s to 200 kW**. See Section 6.

2) See Engineering Information, Section 6.

Cooling air requirement	Sound pressure level L_{pA} (1 m)	Power connections – Terminals for sizes A to D – Lugs for sizes E to Q – Location: at top for AC/DC, at bottom for motor			Auxiliary current requirement			
		Finely stranded	Single- and multi-stranded	Retaining bolt	24 V DC Standard version max. at 20 V [2]	24 V DC Max. version max. at 20 V [2]	1-ph. or 2-ph. 230 V fan for inverters	
	50 Hz						50 Hz	60 Hz
m^3/s	dB	mm^2	mm^2		A	A	A	A
0.009	60	2.5 to 10	2.5 to 16		1.5	2.5	none	none
0.009	60	2.5 to 10	2.5 to 16		1.5	2.5	none	none
0.009	60	2.5 to 10	2.5 to 16		1.5	2.5	none	none
0.022	60	2.5 to 10	2.5 to 16		1.5	2.5	none	none
0.022	60	2.5 to 10	2.5 to 16		1.5	2.5	none	none
0.028	60	2.5 to 16	10 to 25		1.5	2.5	none	none
0.028	60	2.5 to 16	10 to 25		1.5	2.5	none	none
0.054	65	2.5 to 35	10 to 50		1.5	2.5	0.35	0.44
0.054	65	2.5 to 35	10 to 50		1.5	2.5	0.35	0.44
0.054	65	2.5 to 35	10 to 50		1.5	2.5	0.35	0.44
0.054	65	2.5 to 35	10 to 50		1.5	2.5	0.35	0.44
0.10	69		max. 2 x 70	M 10	1.7	2.7	0.35	0.44
0.14	69		max. 2 x 70	M 10	2.1	3.2	0.43	0.60
0.14	69		max. 2 x 70	M 10	2.1	3.2	0.43	0.60
0.14	69		max. 2 x 70	M 10	2.1	3.2	0.43	0.60
0.31	80		max. 2 x 150	M 12	2.3	3.5	0.76	1.1
0.31	80		max. 2 x 150	M 12	2.3	3.5	0.76	1.1
0.41	82		max. 2 x 150	M 12	2.3	3.5	0.95	1.4
0.41	82		max. 2 x 150	M 12	2.3	3.5	0.95	1.4
0.46	77		max. 2 x 300	M 12/M 16	3.0	4.2	2.2	3.4
0.46	77		max. 2 x 300	M 12/M 16	3.1	4.3	–	–
0.46	77		max. 2 x 300	M 12/M 16	3.0	4.2	2.2	3.4
0.46	77		max. 2 x 300	M 12/M 16	3.1	4.3	–	–
0.60	80		max. 4 x 300	M 12/M 16	3.0	4.2	4.5	6.9
0.60	80		max. 4 x 300	M 12/M 16	3.1	4.3	–	–
0.60	80		max. 4 x 300	M 12/M 16	3.0	4.2	4.5	6.9
0.88	82		max. 4 x 300	M 12/M 16	3.0	4.2	12.8	22.0
0.92	89		max. 6 x 300	M 12/M 16	3.0	4.2	12.8	22.0

Selection and ordering data

Nominal power rating	Rated output current	Base load current	Short-time current [1]	Rated DC link current	Supply current (only for converters)	Converter	Inverter	Power loss at 2.5 kHz		Dimensions Unit measurements W x H x D	Dimension drawing, see Sect. 7	Weight approx.
	I_{UN}	I_G	$I_{max.}$					Converter	Inverter			
kW	A	A	A	A	A	Order No.	Order No.	kW	kW	mm	No.	kg
Supply voltage 3-ph. 500 V to 600 V AC and DC voltage 675 V to 810 V DC												
500 V												
2.2	4.5	4.1	6.1	5.4	5.0	**6SE7014–5FB61**	**6SE7014–5UB61**	0.10	0.08	135 x 425 x 350	6	12.5
3	6.2	5.6	8.5	7.4	6.8	**6SE7016–2FB61**	**6SE7016–2UB61**	0.11	0.09	135 x 425 x 350	6	12.5
4	7.8	7.1	10.6	9.3	8.6	**6SE7017–8FB61**	**6SE7017–8UB61**	0.12	0.10	135 x 425 x 350	6	12.5
5.5	11	10	15	13.1	12.1	**6SE7021–1FB61**	**6SE7021–1UB61**	0.16	0.13	135 x 425 x 350	6	12.5
7.5	15.1	13.7	20.6	18	16.6	**6SE7021–5FB61**	**6SE7021–5UB61**	0.21	0.17	135 x 425 x 350	6	12.5
11	22	20	30	26.2	24.2	**6SE7022–2FC61**	**6SE7022–2UC61**	0.32	0.26	180 x 600 x 350	6	21
18.5	29	26.4	39.6	34.5	31.9	**6SE7023–0FD61**	**6SE7023–0UD61**	0.59	0.51	270 x 600 x 350	6	32
22	34	30.9	46.4	40.2	37.4	**6SE7023–4FD61**	**6SE7023–4UD61**	0.69	0.59	270 x 600 x 350	6	32
30	46.5	42.3	63.5	55.4	51.2	**6SE7024–7FD61**	**6SE7024–7UD61**	0.87	0.74	270 x 600 x 350	6	32
37	61	55	83	73	67	**6SE7026–1FE60**	**6SE7026–1UE60**	0.91	0.75	270 x 1050 x 365	8	65
45	66	60	90	79	73	**6SE7026–6FE60**	**6SE7026–6UE60**	1.02	0.84	270 x 1050 x 365	8	65
55	79	72	108	94	87	**6SE7028–0FF60**	**6SE7028–0UF60**	1.26	1.04	360 x 1050 x 365	8	75
75	108	98	147	129	119	**6SE7031–1FF60**	**6SE7031–1UF60**	1.80	1.50	360 x 1050 x 365	8	75
90	128	117	174	152	141	**6SE7031–3FG60**	**6SE7031–3UG60**	2.13	1.80	508 x 1450 x 465	8	160
110	156	142	213	186	172	**6SE7031–6FG60**	**6SE7031–6UG60**	2.58	2.18	508 x 1450 x 465	8	160
132	192	174	262	228	211	**6SE7032–0FG60**	**6SE7032–0UG60**	3.40	2.82	508 x 1450 x 465	8	180
160	225	205	307	268	248	**6SE7032–3FG60**	**6SE7032–3UG60**	4.05	3.40	508 x 1450 x 465	8	180
200	297	270	404	353	–	**–**	**6SE7033–0UJ60**	–	5.00	800 x 1400 x 565	10	350
200	297	270	404	353	327	**6SE7033–0FK60**	**–**	5.80	–	800 x 1750 x 565	12	400
250	354	322	481	421	–	**–**	**6SE7033–5UJ60**	–	5.60	800 x 1400 x 565	10	350
250	354	322	481	421	389	**6SE7033–5FK60**	**–**	6.80	–	800 x 1750 x 565	12	400
315	452	411	615	538	–	**–**	**6SE7034–5UJ60**	–	7.00	800 x 1400 x 565	10	350
315	452	411	615	538	497	**6SE7034–5FK60**	**–**	8.30	–	800 x 1750 x 565	12	400
400	570	519	775	678	–	**–**	**6SE7035–7UK60**	–	8.90	800 x 1750 x 565	10	520
450	650	592	884	774	–	**–**	**6SE7036–5UK60**	–	10.00	800 x 1750 x 565	10	520
630	860	783	1170	1023	–	**–**	**6SE7038–6UK60**	–	11.60	800 x 1750 x 565	10	520
800	1080	983	1469	1285	–	**–**	**6SE7041–1UL60**	–	14.20	1100 x 1750 x 565	11	625
900	1230	1119	1673	1464	–	**–**	**6SE7041–2UL60**	–	16.70	1100 x 1750 x 565	11	625

For units with larger nominal power rating (parallel switched units), see page 3/16.

1) Short-time current = **1.6 x I_{UN}**, possible for **30 s to 160 kW**. See Section 6.

2) See Engineering Information, Section 6.

Cooling air requirement	Sound pressure level L_{pA} (1 m)	Power connections – Terminals for sizes A to D – Lugs for sizes E to Q – Location: at top for AC/DC, at bottom for motor			Auxiliary current requirement			
		Finely stranded	Single- and multi-stranded	Retaining bolt	24 V DC Standard version max. at 20 V2)	24 V DC Max. version max. at 20 V2)	1-ph. or 2-ph. 230 V fan for inverters	
	50 Hz						50 Hz	60 Hz
m^3/s	dB (A)	mm^2	mm^2		A	A	A	A
0.022	60	2.5 to 10	2.5 to 16		1.5	2.5	none	none
0.022	60	2.5 to 10	2.5 to 16		1.5	2.5	none	none
0.022	60	2.5 to 10	2.5 to 16		1.5	2.5	none	none
0.022	60	2.5 to 10	2.5 to 16		1.5	2.5	none	none
0.022	60	2.5 to 10	2.5 to 16		1.5	2.5	none	none
0.028	60	2.5 to 16	10 to 25		1.5	2.5	none	none
0.054	65	2.5 to 35	10 to 50		1.5	2.5	0.35	0.44
0.054	65	2.5 to 35	10 to 50		1.5	2.5	0.35	0.44
0.054	65	2.5 to 35	10 to 50		1.5	2.5	0.35	0.44
0.10	69		max. 2 x 70	M 10	1.7	2.7	0.35	0.44
0.10	69		max. 2 x 70	M 10	1.7	2.7	0.35	0.44
0.14	69		max. 2 x 70	M 10	2.1	3.2	0.43	0.60
0.14	80		max. 2 x 70	M 10	2.1	3.2	0.43	0.60
0.31	80		max. 2 x 150	M 12	2.3	3.5	0.76	1.1
0.31	80		max. 2 x 150	M 12	2.3	3.5	0.76	1.1
0.41	82		max. 2 x 150	M 12	2.3	3.5	0.95	1.4
0.41	82		max. 2 x 150	M 12	2.3	3.5	0.95	1.4
0.46	77		max. 2 x 300	M 12/M 16	3.0	4.2	2.2	3.4
0.46	77		max. 2 x 300	M 12/M 16	3.1	4.3	–	–
0.46	77		max. 2 x 300	M 12/M 16	3.0	4.2	2.2	3.4
0.46	77		max. 2 x 300	M 12/M 16	3.1	4.3	–	–
0.46	77		max. 2 x 300	M 12/M 16	3.0	4.2	2.2	3.4
0.46	77		max. 2 x 300	M 12/M 16	3.1	4.3	–	–
0.60	80		max. 4 x 300	M 12/M 16	3.0	4.2	4.5	6.9
0.60	80		max. 4 x 300	M 12/M 16	3.0	4.2	4.5	6.9
0.88	82		max. 4 x 300	M 12/M 16	3.0	4.2	12.8	22.0
0.92	89		max. 6 x 300	M 12/M 16	3.0	4.2	12.8	22.0
0.92	89		max. 6 x 300	M 12/M 16	3.0	4.2	12.8	22.0

Selection and ordering data

Nominal power rating	Rated output current	Base load current	Short-time current	Rated DC link current	Supply current (only for converters)	Converter	Inverter	Power loss at 2.5 kHz		Dimensions Unit measurements W x H x D	Dimension drawing, see Sect. 7	Weight approx.
	I_{UN}	I_G	$I_{max.}$					Converter	Inverter			
kW	A	A	A	A	A	Order No.	Order No.	kW	kW	mm	No.	kg
Supply voltage 3-ph. 660 V to 690 V AC and DC voltage 890 V to 930 V DC												
690 V												
55	60	55	82	71	66	**6SE7026–0HF60**	**6SE7026–0WF60**	1.05	0.90	360 x 1050 x 365	8	75
75	82	75	112	98	90	**6SE7028–2HF60**	**6SE7028–2WF60**	1.47	1.24	360 x 1050 x 365	8	75
90	97	88	132	115	107	**6SE7031–0HG60**	**6SE7031–0WG60**	1.93	1.68	508 x 1450 x 465	8	160
110	118	107	161	140	130	**6SE7031–2HG60**	**6SE7031–2WG60**	2.33	2.03	508 x 1450 x 465	8	160
132	145	132	198	173	160	**6SE7031–5HG60**	**6SE7031–5WG60**	2.83	2.43	508 x 1450 x 465	8	180
160	171	156	233	204	188	**6SE7031–7HG60**	**6SE7031–7WG60**	3.50	3.05	508 x 1450 x 465	8	180
200	208	189	284	248	229	**6SE7032–1HG60**	**6SE7032–1WG60**	4.30	3.70	508 x 1450 x 465	8	180
250	297	270	404	353	–	**–**	**6SE7033–0WJ60**	–	5.80	800 x 1400 x 565	10	350
250	297	270	404	353	327	**6SE7033–0HK60**	**–**	6.60	–	800 x 1750 x 565	12	400
315	354	322	481	421	–	**–**	**6SE7033–5WJ60**	–	6.30	800 x 1400 x 565	10	350
315	354	322	481	421	389	**6SE7033–5HK60**	**–**	7.40	–	800 x 1750 x 565	12	400
400	452	411	615	538	–	**–**	**6SE7034–5WJ60**	–	7.80	800 x 1400 x 565	10	350
400	452	411	615	538	497	**6SE7034–5HK60**	**–**	9.10	–	800 x 1750 x 565	12	400
500	570	519	775	678	–	**–**	**6SE7035–7WK60**	–	9.40	800 x 1750 x 565	10	520
630	650	592	884	774	–	**–**	**6SE7036–5WK60**	–	11.00	800 x 1750 x 565	10	520
800	860	783	1170	1023	–	**–**	**6SE7038–6WK60**	–	13.90	800 x 1750 x 565	10	520
1000	1080	983	1469	1285	–	**–**	**6SE7041–1WL60**	–	17.20	1100 x 1750 x 565	11	625
1200	1230	1119	1673	1464	–	**–**	**6SE7041–2WL60**	–	22.90	1100 x 1750 x 565	11	625

For units with larger nominal power rating (parallel switched units), see page 3/16.

1) See Engineering Information, Section 6.

Cooling air requirement	Sound pressure level L_{pA} (1 m)	Power connections – Terminals for sizes A to D – Lugs for sizes E to Q – Location: at top for AC/DC, at bottom for motor			Auxiliary current requirement			
		Finely stranded	Single- and multi-stranded	Retaining bolt	24 V DC Standard version max. at 20 V[1])	24 V DC Max. version max. at 20 V[1])	1-ph. or 2-ph. 230 V fan for inverters	
	50 Hz						50 Hz	60 Hz
m³/s	dB	mm²	mm²		A	A	A	A
0.14	69		max. 2 x 70	M 10	2.1	3.2	0.43	0.60
0.14	69		max. 2 x 70	M 10	2.1	3.2	0.43	0.60
0.31	80		max. 2 x 150	M 12	2.3	3.5	0.76	1.1
0.31	80		max. 2 x 150	M 12	2.3	3.5	0.76	1.1
0.41	82		max. 2 x 150	M 12	2.3	3.5	0.95	1.4
0.41	82		max. 2 x 150	M 12	2.3	3.5	0.95	1.4
0.41	82		max. 2 x 150	M 12	2.3	3.5	0.95	1.4
0.46	77		max. 2 x 300	M 12/M 16	3.0	4.2	2.2	3.4
0.46	77		max. 2 x 300	M 12/M 16	3.1	4.3	–	–
0.46	77		max. 2 x 300	M 12/M 16	3.0	4.2	2.2	3.4
0.46	77		max. 2 x 300	M 12/M 16	3.1	4.3	–	–
0.46	77		max. 2 x 300	M 12/M 16	3.0	4.2	2.2	3.4
0.46	77		max. 2 x 300	M 12/M 16	3.1	4.3	–	–
0.60	80		max. 4 x 300	M 12/M 16	3.0	4.2	4.5	6.9
0.60	80		max. 4 x 300	M 12/M 16	3.0	4.2	4.5	6.9
0.88	82		max. 4 x 300	M 12/M 16	3.0	4.2	12.8	22.0
0.92	89		max. 6 x 300	M 12/M 16	3.0	4.2	12.8	22.0
0.92	89		max. 6 x 300	M 12/M 16	3.0	4.2	12.8	22.0

Selection and ordering data

Nominal power rating	Rated output current I_{UN}	Base load current I_G	Short-time current[1] $I_{max.}$	Rated DC link current	Inverter complete	Inverter/interphase transformer chassis	Total power loss at 2.5 kHz Parallel switching device	Dimensions Unit measurements W x H x D	Dimension drawing, see Section 7	Weight approx.
kW	A	A	A	A	Type[2]	Order No.	kW	mm	No.	kg
Supply voltage 3-ph. 380 V to 480 V AC and DC voltage 510 V to 650 V DC										
400 V										
900	1630	1483	2217	1940	**6SE7041-6TQ60**[3] without interphase transformer chassis	Master **6SE7038-6TK86-3AE0** Slave **6SE7038-6TK86-4AE0**	22.6	(2 x 800) x 1750 x 565	10 (2x)	1040
900	1630	1483	2217	1940	**6SE7041-6TM60**[4] with interphase transformer chassis	Master **6SE7038-6TK86-3AE0** Slave **6SE7038-6TK86-4AE0** interphase transformer chassis **6SE7041-6GS86-5AB1**	23.6	(2 x 800 + 508) x 1750 x 565	13	1400
1300	2470	2248	3359	2940	**6SE7042-5TN60**[3] without interphase transformer chassis	Master **6SE7041-3TL86-3AE0** Slave **6SE7041-3TL86-4AE0**	27.5	(2 x 1100) x 1750 x 565	11 (2x)	1350
Supply voltage 3-ph. 500 V to 600 V AC and DC voltage 675 V to 810 V DC										
500 V										
1000	1400	1274	1904	1666	**6SE7041-4UQ60**[3] without interphase transformer chassis	Master **6SE7038-6UK86-3BE0** Slave **6SE7038-6UK86-4AE0**	19.0	(2 x 800) x 1750 x 565	10 (2x)	1150
1000	1400	1274	1904	1666	**6SE7041-4UM60**[4] with interphase transformer chassis	Master **6SE7038-6UK86-3BE0** Slave **6SE7038-6UK86-4AE0** interphase transformer chassis **6SE7041-6GS86-5AB1**	20.0	(2 x 800 + 508) x 1750 x 565	13	1500
1100	1580	1438	2149	1880	**6SE7041-6UQ60**[3] without interphase transformer chassis	Master **6SE7038-6UK86-3AE0** Slave **6SE7038-6UK86-4AE0**	21.3	(2 x 800) x 1750 x 565	10 (2x)	1150
1100	1580	1438	2149	1880	**6SE7041-6UM60**[4] with interphase transformer chassis	Master **6SE7038-6UK86-3AE0** Slave **6SE7038-6UK86-4AE0** interphase transformer chassis **6SE7041-6GS86-5AB1**	22.3	(2 x 800 + 508) x 1750 x 565	13	1500
1500	2050	1866	2788	2440	**6SE7042-1UN60**[3] without interphase transformer chassis	Master **6SE7041-1UL86-3AE0** Slave **6SE7041-1UL86-4AE0**	27.0	(2 x 1100) x 1750 x 565	11 (2x)	1350
1700	2340	2129	3182	2785	**6SE7042-3UN60**[3] without interphase transformer chassis	Master **6SE7041-2UL86-3AE0** Slave **6SE7041-2UL86-4AE0**	31.7	(2 x 1100) x 1750 x 565	11 (2x)	1350
Supply voltage 3-ph. 660 V to 690 V AC and DC voltage 890 V to 930 V DC										
690 V										
1300	1400	1274	1904	1666	**6SE7041-4WQ60**[3] without interphase transformer chassis	Master **6SE7038-6WK86-3BE0** Slave **6SE7038-6WK86-4AE0**	22.6	(2 x 800) x 1750 x 565	10 (2x)	1150
1300	1400	1274	1904	1666	**6SE7041-4WM60**[4] with interphase transformer chassis	Master **6SE7038-6WK86-3BE0** Slave **6SE7038-6WK86-4AE0** interphase transformer chassis **6SE7041-6GS86-5AB1**	23.6	(2 x 800 + 508) x 1750 x 565	13	1500
1500	1580	1438	2149	1880	**6SE7041-6WQ60**[3] without interphase transformer chassis	Master **6SE7038-6WK86-3AE0** Slave **6SE7038-6WK86-4AE0**	25.5	(2 x 800) x 1750 x 565	10 (2x)	1150
1500	1580	1438	2149	1880	**6SE7041-6WM60**[4] with interphase transformer chassis	Master **6SE7038-6WK86-3AE0** Slave **6SE7038-6WK86-4AE0** interphase transformer chassis **6SE7041-6GS86-5AB1**	26.5	(2 x 800 + 508) x 1750 x 565	13	1500
1900	2050	1866	2788	2440	**6SE7042-1WN60**[3] without interphase transformer chassis	Master **6SE7041-1WL86-3AE0** Slave **6SE7041-1WL86-4AE0**	32.7	(2 x 1100) x 1750 x 565	11 (2x)	1350
2300	2340	2129	3182	2785	**6SE7042-3WN60**[3] without interphase transformer chassis	Master **6SE7041-2WL86-3AE0** Slave **6SE7041-2WL86-4AE0**	43.5	(2 x 1100) x 1750 x 565	11 (2x)	1350

1) Short-time current = **1.36 x I_{UN}**, for **60 s**.

2) For ordering master and slave unit together. Options only possible for master unit.

3) Delivery in two transport units. DC busbar system and signal cabling to be installed on-site.

4) Delivery in three transport units. DC busbar system and signal cabling to be installed on-site. Interphase transformer chassis connection package (for connecting to inverters) included in scope of delivery.

Cooling air requirement	Sound pressure level L_{pA} (1 m)	Power connections – Terminals for sizes A to D – Lugs for sizes E to Q – Location: at top for AC/DC, at bottom for motor			Auxiliary current requirement			
		Finely stranded	Single- and multi-stranded	Retaining bolt	24 V DC Standard version max. at 20 V[1]	24 V DC Max. version max. at 20 V[1]	1-ph. or 2-ph. 230 V fan for inverters	
	50 Hz						50 Hz	60 Hz
m^3/s	dB	mm^2	mm^2		A	A	A	A
1.70	87		max. 2 x 4 x 300	M 12/M 16	5.2	6.6	9	13.8
1.70	87		max. 2 x 4 x 300	M 12/M 16	5.2	6.6	9	13.8
1.84	91		max. 2 x 6 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.80	87		max. 2 x 4 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.80	87		max. 2 x 4 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.80	87		max. 2 x 4 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.80	87		max. 2 x 4 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.84	91		max. 2 x 6 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.84	91		max. 2 x 6 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.80	87		max. 2 x 4 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.80	87		max. 2 x 4 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.80	87		max. 2 x 4 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.80	87		max. 2 x 4 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.84	91		max. 2 x 6 x 300	M 12/M 16	5.2	6.6	25.6	44.0
1.84	91		max. 2 x 6 x 300	M 12/M 16	5.2	6.6	25.6	44.0

1) See Engineering Information, page 6/45.

Technical characteristics

These frequency converters bring together the whole experience gained with air-cooled SIMOVERT MASTERDRIVES with a water-cooling system. When built into the appropriate cabinets, high degrees of protection can be achieved, e.g. IP65.

Water-cooled units can only be supplied as compact and chassis units.

The heat loss of the frequency converters can be removed from the control cabinet, the control panel or the factory without any exchange of air.

The use of water-cooling power modules in drive engineering is a highly appropriate method of cooling as cooling water is available in many cases for production purposes.

The modularity and proven functionality with regard to control, communication, technology, operation and visualization of the SIMOVERT MASTERDRIVES is fully retained with this type of converter.

The water-cooled converters which come including the CUVC control module can be used to perform the most varied of tasks, such as those involving:

- injection moulding machines
- wire drawing machines
- glass drawing machines
- main propulsion drives for ships
- cement mills
- recycling industry and the
- textile industry.

Unit design

These units have the same design as the air-cooled MASTERDRIVES. In the heat sink area an air/water cooler is installed through which water from an external supply flows. The fan used in the air-cooled units is retained in order to ensure internal cooling of the boards, electronics box, capacitors and busbars. The performance data of the comparable air-cooled MASTERDRIVES have been retained. The unit has a supplementary cooling capacity under certain conditions (see technical data), i.e. the cooling circuit, in conjunction with the converter fan, is dimensioned so that it can remove more heat from the surrounding environment than the converter can produce.

Compact units 2.2 kW to 37 kW

The degree of protection for the units is IP20.

The cooling water lines may be connected from either above or below. The connections for cooling-water lines are on the side of the compact unit. The clearance required to an adjacent unit is approx. 65 mm.

Adapter sets for cooling water connection

The following adapter sets are available for the cooling water connection to the units:

- ½" adapter set for frame sizes A to F
- ¾" adapter kit for frame size G

The adapter set consists of cooling water hoses, hose clamps, jointing connectors (straight) with union nuts and washers.

For Order Nos. of the adapter sets, see footnotes 3) and 4) on pages 3/20 and 3/22.

Chassis units 37 kW to 200 kW

The degree of protection for the unit is IP00 (IP20 available as an option).

The cooling water lines can optionally be connected at the top or bottom.

Chassis units 250 kW to 400 kW

The degree of protection for the unit is IP00. Higher degrees of protection can be achieved by installing the units in system cabinets.

The cooling water lines can be connected at the bottom only.

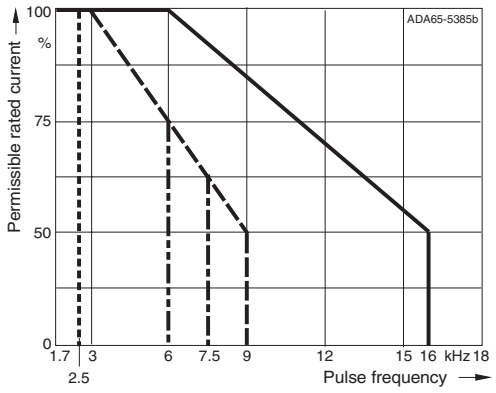
These units can only release their own heat losses to the cooling-water circuit. In relation to a comparable air-cooled unit, the fan for the internal cooling of the unit has a lower output and is therefore quieter.

Technical data

Rated voltage			
Supply voltage V_{supply}	3 AC 380 V – 15 % to 480 V +10 %	3 AC 500 V – 15 % to 600 V +10 %	3 AC 660 V – 15 % to 690 V +15 %
DC link voltage V_D	510 V DC –15 % to 650 V DC +10 %	675 V DC –15 % to 810 V DC +10 %	890 V DC –15 % to 930 V DC +15 %
Output voltage			
Converter	3 AC 0 V to V_{supply}	3 AC 0 V to V_{supply}	3 AC 0 V to V_{supply}
Inverter	3 AC 0 V to 0.75 x V_D	3 AC 0 V to 0.75 x V_D	3 AC 0 V to 0.75 x V_D
Rated frequency			
Supply frequency	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)
Output frequency			
– V/f = constant	0 Hz to 200 Hz (500 Hz for textile)	0 Hz to 200 Hz	0 Hz to 200 Hz
– V = constant	8 Hz to 300 Hz depending on output rating	8 Hz to 300 Hz depending on output rating	8 Hz to 300 Hz depending on output rating
Pulse frequency			
Minimum pulse frequency	1.7 kHz	1.7 kHz	1.7 kHz
Factory setting	2.5 kHz	2.5 kHz	2.5 kHz
Maximum setting	depending on output rating, up to 16 kHz	depending on output rating, up to 16 kHz	depending on output rating, up to 7.5 kHz
Load class II to EN 60 146-1-1	See also Section 6, Engineering Information		
Base load current	0.91 x rated output current		
Short-time current	1.36 x rated output current for 60 s or 1.60 x rated output current for 30 s for units up to size G and a supply voltage of max. 600 V.		
Cycle time	300 s		
Power factor			
• fundamental	≥ 0.98		
• overall	0.93 to 0.96		
Efficiency	0.96 to 0.98		
Water cooling			
Cooling-water inlet temperature (temperature of incoming water)	+5 °C to +38 °C	Depending on the cooling-water temperature and the ambient temperature, measures must be taken to provide protection against condensation in accordance with the Engineering Information (see Section 6). If antifreeze is added, the performance of the cooling system is reduced (lower heat conductance and greater viscosity). Recommended antifreeze is "Antifrogen N" available from Clariant (www.clariant.com). The antifreeze agent is intended to prevent damage in the event of plant shutdown and frost. Operation at temperatures of < 0 °C is not permissible even when antifreeze is used!	
Temperature increase of cooling water during rated operation	ca. 5 K		
Max. grain size of particles in water	< 0.1 mm		
pH level of cooling water	6.0 to 8.0		
Conductivity (proportion of water in the cooling water)	< 500 µS/cm		
Chloride	< 40 ppm		
Sulphate	< 50 ppm		
Total hardness	< 170 ppm		
Operating pressure			
Sizes B to G	max. 1 bar		
Size K	max. 2.5 bar		

Reduction curves

For reduction factors due to different installation conditions (installation altitude, ambient temperature), see Section 6.



Max. adjustable pulse frequency depending on output and type of construction:

16 kHz — for types B, C and D
at 45 kW; 55 kW; 380 V to 480 V
at 37 kW; 45 kW; 500 V to 600 V

9 kHz — at 75 kW; 90 kW; 380 V to 480 V
at 55 kW; 500 V to 600 V

7.5 kHz — at 110 kW; 132 kW; 380 V to 480 V
at 75 kW; 90 kW; 500 V to 600 V
at 55 kW to 110 kW; 660 V to 690 V

6 kHz — at 160 kW to 250 kW; 380 V to 480 V
at 110 kW to 160 kW; 500 V to 600 V
at 132 kW to 200 kW; 660 V to 690 V

2.5 kHz — at 315 kW to 400 kW; 380 V to 480 V
at 200 kW to 315 kW; 500 V to 600 V
at 250 kW to 400 kW; 660 V to 690 V

Options for water-cooled converters

Water-cooled converters can be ordered with the same options as the respective air-cooled converters. See page 3/9.

Selection and ordering data

Nominal power rating	Rated output current	Base load current	Short-time current [1]	Rated DC link current	Supply current	Converter	Power loss at 2.5 kHz	Dimensions Unit measurements W x H x D	Dimension drawing, see Sect. 7	Weight approx.	Cooling water requirement [2]	Pressure drop at V_N
	I_{UN}	I_G	$I_{max.}$								V_N	
kW	A	A	A	A	A	Order No.	kW	mm	No.	kg	l/min	bar
Supply voltage 3-ph. 380 V to 480 V AC												
400 V												
5.5	13.2	12	18	15.7	14.5	**6SE7021–3EB61–1AA1** [3]	0.16	135 x 425 x 350 + 65 [5]	6; 7	12	1.00	0.20
7.5	17.5	15.9	23.9	20.8	19.3	**6SE7021–8EB61–1AA1** [3]	0.21	135 x 425 x 350 + 65 [5]	6; 7	12	1.20	0.20
11	25.5	23.2	34.8	30.4	28.1	**6SE7022–6EC61–1AA1** [3]	0.34	180 x 600 x 350 + 65 [5]	6; 7	24	2.10	0.20
15	34	30.9	46.4	40.5	37.4	**6SE7023–4EC61–1AA1** [3]	0.47	180 x 600 x 350 + 65 [5]	6; 7	24	2.60	0.20
18.5	37.5	34.1	51.2	44.6	41.3	**6SE7023–8ED61–1AA1** [3]	0.60	270 x 600 x 350 + 65 [5]	6; 7	35	4.25	0.20
22	47	42.8	64.2	55.9	51.7	**6SE7024–7ED61–1AA1** [3]	0.71	270 x 600 x 350 + 65 [5]	6; 7	35	4.80	0.20
30	59	53.7	80.5	70.2	64.9	**6SE7026–0ED61–1AA1** [3]	0.85	270 x 600 x 350 + 65 [5]	6; 7	35	5.25	0.20
37	72	65.5	98.3	85.7	79.2	**6SE7027–2ED61–1AA1** [3]	1.06	270 x 600 x 350 + 65 [5]	6; 7	35	6.00	0.20
45	92	84	126	110	101	**6SE7031–0EE60–1AA1** [3]	1.18	270 x 1050 x 365	8; 9	55	7.25	0.20
55	124	113	169	148	136	**6SE7031–2EF60–1AA1** [3]	1.67	360 x 1050 x 365	8; 9	65	9.20	0.20
75	146	133	199	174	160	**6SE7031–5EF60–1AA1** [3]	1.95	360 x 1050 x 365	8; 9	65	10.20	0.20
90	186	169	254	221	205	**6SE7031–8EF60–1AA1** [3]	2.17	360 x 1050 x 365	8; 9	65	11.10	0.20
110	210	191	287	250	231	**6SE7032–1EG60–1AA1** [4]	2.68	508 x 1450 x 465	8; 9	155	16.10	0.20
132	260	237	355	309	286	**6SE7032–6EG60–1AA1** [4]	3.40	508 x 1450 x 465	8; 9	155	18.90	0.20
160	315	287	430	375	346	**6SE7033–2EG60–1AA1** [4]	4.30	508 x 1450 x 465	8; 9	165	22.40	0.20
200	370	337	503	440	407	**6SE7033–7EG60–1AA1** [4]	5.05	508 x 1450 x 465	8; 9	180	25.30	0.20
250	510	464	694	607	561	**6SE7035–1EK60–1AA0**	6.9	800 x 1750 x 565	12	400	27	0.11
315	590	537	802	702	649	**6SE7036–0EK60–1AA0**	8.0	800 x 1750 x 565	12	400	28	0.11
400	690	628	938	821	759	**6SE7037–0EK60–1AA0**	9.3	800 x 1750 x 565	12	460	30	0.13

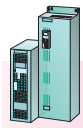
1) Short-time current = **1.6 x I_{UN}** is possible for **30 s to 200 kW**, see Section 6.

2) The indicated cooling water requirement applies to the nominal power rating of the converter and 100 % utilization of the additional cooling capacity with a feed/return water temperature rise of $\Delta T = 5$ K.

3) $^1/_2$"-adapter set for frame sizes A to F:
Order No.: **6SX7010–0AD00**.
The adapter set consists of 2 x 3 m cooling-water pipes, clamps, outlet end unions (straight) with union nuts and seals.

4) $^3/_4$"-adapter set for frame size G:
Order No.: **6SX7010–0AD01**.
The adapter set consists of 2 x 3 m cooling-water pipes, clamps, outlet end unions (straight) with union nuts and seals.

5) When installing the 2.2 to 37 kW compact units, a side clearance of about 65 mm must be allowed in addition to the value given in the table.



Maximum permissible operating pressure	Maximum additional cooling capacity[1]	Sound pressure level with standard protection degree IP20/IP00[2] L_{pA} (1 m)	Power connections – Terminals for sizes A to D – Lugs for sizes E to K – Location: at top for AC/DC, at bottom for motor			Auxiliary current requirement	
			Finely stranded	Single- and multi-stranded	Retaining bolt	24 V DC Standard version max. at 20 V[3]	24 V DC Max. version max. at 20 V[3]
		50 Hz					
bar	kW	dB	mm²	mm²		A	A
1.0	0.1	60	2.5 to 10	2.5 to 16		1.5	2.5
1.0	0.1	60	2.5 to 10	2.5 to 16		1.5	2.5
1.0	0.2	60	2.5 to 16	10 to 25		1.5	2.5
1.0	0.2	60	2.5 to 16	10 to 25		1.5	2.5
1.0	0.5	65	2.5 to 35	10 to 50		1.5	2.5
1.0	0.5	65	2.5 to 35	10 to 50		1.5	2.5
1.0	0.5	65	2.5 to 35	10 to 50		1.5	2.5
1.0	0.5	65	2.5 to 35	10 to 50		1.5	2.5
1.0	0.7	69		max. 2 x 70	M 10	1.7	2.7
1.0	0.7	69		max. 2 x 70	M 10	2.1	3.2
1.0	0.7	69		max. 2 x 70	M 10	2.1	3.2
1.0	0.7	69		max. 2 x 70	M 10	2.1	3.2
1.0	1.5	80		max. 2 x 150	M 12	2.3	3.5
1.0	1.5	80		max. 2 x 150	M 12	2.3	3.5
1.0	1.5	82		max. 2 x 150	M 12	2.3	3.5
1.0	1.5	82		max. 2 x 150	M 12	2.3	3.5
2.5	–	76		max. 2 x 300	M 12/M 16	3.1	4.3
2.5	–	76		max. 2 x 300	M 12/M 16	3.1	4.3
2.5	–	76		max. 4 x 300	M 12/M 16	3.1	4.3

1) Additional cooling of the control cabinet during operation under rated conditions depends on constructional conditions and especially on the difference between the cooling-water temperature and the ambient temperature of the cabinet. The additional cooling capacity as quoted is the maximum possible value which applies at a cooling-water temperature of +30 °C and a cabinet temperature of +40 °C.

2) Sound pressure level is reduced by about 3 to 5 dB according to the degree of protection IP54/IP65 and sealing of the cabinets.

3) See Engineering Information, page 6/45.

Selection and ordering data

Nominal power rating	Rated output current	Base load current	Short-time current [1]	Rated DC link current	Supply current	Converter	Power loss at 2.5 kHz	Dimensions Unit measurements W x H x D	Dimension drawing, see Sect. 7	Weight approx.	Cooling water requirement [2]	Pressure drop at V_N
	I_{UN}	I_G	$I_{max.}$								V_N	
kW	A	A	A	A	A	Order No.	kW	mm	No.	kg	l/min	bar
Supply voltage 3-ph. 500 V to 600 V AC												
500 V												
2.2	4.5	4.1	6.1	5.4	5.0	**6SE7014–5FB61–1AA1** [3]	0.10	135 x 425 x 350 + 65 [5]	6; 7	12	0.80	0.2
3	6.2	5.6	8.5	7.4	6.8	**6SE7016–2FB61–1AA1** [3]	0.11	135 x 425 x 350 + 65 [5]	6; 7	12	0.85	0.2
4	7.8	7.1	10.6	9.3	8.6	**6SE7017–8FB61–1AA1** [3]	0.12	135 x 425 x 350 + 65 [5]	6; 7	12	0.90	0.2
5.5	11	10	15	13.1	12.1	**6SE7021–1FB61–1AA1** [3]	0.16	135 x 425 x 350 + 65 [5]	6; 7	12	1.00	0.2
7.5	15.1	13.7	20.6	18	16.6	**6SE7021–5FB61–1AA1** [3]	0.21	135 x 425 x 350 + 65 [5]	6; 7	12	1.20	0.2
11	22	20	30	26.2	24.2	**6SE7022–2FC61–1AA1** [3]	0.32	180 x 600 x 350 + 65 [5]	6; 7	24	2.00	0.2
18.5	29	26.4	39.6	34.5	31.9	**6SE7023–0FD61–1AA1** [3]	0.59	270 x 600 x 350 + 65 [5]	6; 7	35	3.10	0.2
22	34	30.9	46.4	40.2	37.4	**6SE7023–4FD61–1AA1** [3]	0.69	270 x 600 x 350 + 65 [5]	6; 7	35	3.45	0.2
30	46.5	42.3	63.5	55.4	51.2	**6SE7024–7FD61–1AA1** [3]	0.87	270 x 600 x 350 + 65 [5]	6; 7	35	4.15	0.2
37	61	55	83	73	67	**6SE7026–1FE60–1AA1** [3]	0.91	270 x 1050 x 365	8; 9	55	6.20	0.2
45	66	60	90	79	73	**6SE7026–6FE60–1AA1** [3]	1.02	270 x 1050 x 365	8; 9	55	6.85	0.2
55	79	72	108	94	87	**6SE7028–0FF60–1AA1** [3]	1.26	360 x 1050 x 365	8; 9	65	7.55	0.2
75	108	98	147	129	119	**6SE7031–1FF60–1AA1** [3]	1.80	360 x 1050 x 365	8; 9	65	9.65	0.2
90	128	117	174	152	141	**6SE7031–3FG60–1AA1** [4]	2.13	508 x 1450 x 465	8; 9	155	14.00	0.2
110	156	142	213	186	172	**6SE7031–6FG60–1AA1** [4]	2.58	508 x 1450 x 465	8; 9	155	15.70	0.2
132	192	174	262	228	211	**6SE7032–0FG60–1AA1** [4]	3.40	508 x 1450 x 465	8; 9	180	18.90	0.2
160	225	205	307	268	248	**6SE7032–3FG60–1AA1** [4]	4.05	508 x 1450 x 465	8; 9	180	21.40	0.2
200	297	270	404	353	327	**6SE7033–0FK60–1AA0**	5.70	800 x 1750 x 565	12	400	20	0.06
250	354	322	481	421	389	**6SE7033–5FK60–1AA0**	6.60	800 x 1750 x 565	12	400	23	0.08
315	452	411	615	538	497	**6SE7034–5FK60–1AA0**	8.05	800 x 1750 x 565	12	400	28	0.11
Supply voltage 3-ph. 660 V to 690 V AC												
690 V												
55	60	55	82	71	66	**6SE7026–0HF60–1AA1** [3]	1.05	360 x 1050 x 365	8; 9	65	6.75	0.2
75	82	75	112	98	90	**6SE7028–2HF60–1AA1** [3]	1.47	360 x 1050 x 365	8; 9	155	8.40	0.2
90	97	88	132	115	107	**6SE7031–0HG60–1AA1** [4]	1.93	508 x 1450 x 465	8; 9	155	12.45	0.2
110	118	107	161	140	130	**6SE7031–2HG60–1AA1** [4]	2.33	508 x 1450 x 465	8; 9	155	14.75	0.2
132	145	132	198	173	160	**6SE7031–5HG60–1AA1** [4]	2.83	508 x 1450 x 465	8; 9	180	16.70	0.2
160	171	156	233	204	188	**6SE7031–7HG60–1AA1** [4]	3.50	508 x 1450 x 465	8; 9	180	19.25	0.2
200	208	189	284	248	229	**6SE7032–1HG60–1AA1** [4]	4.30	508 x 1450 x 465	8; 9	250	22.35	0.2
250	297	270	404	353	327	**6SE7033–0HK60–1AA0**	6.40	800 x 1750 x 565	12	400	21	0.06
315	354	322	481	421	389	**6SE7033–5HK60–1AA0**	7.20	800 x 1750 x 565	12	400	24	0.08
400	452	411	515	538	497	**6SE7034–5HK60–1AA0**	8.80	800 x 1750 x 565	12	400	30	0.13

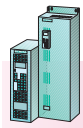
1) Short-time current = **1.6 x I_{UN}** is possible for **30 s to 160 kW** at 3 AC 500 V to 600 V, see Section 6.

2) The indicated cooling water requirement applies to the nominal power rating of the converter and 100 % utilization of the additional cooling capacity with a feed/return water temperature rise ΔT = 5 K.

3) $^1/_2$"-adapter set for frame sizes A to F:
Order No.: **6SX7010–0AD00**.
The adapter set consists of 2 x 3 m cooling-water pipes, clamps, outlet end unions (straight) with union nuts and seals.

4) $^3/_4$"-adapter set for frame size G:
Order No.: **6SX7010–0AD01**.
The adapter set consists of 2 x 3 m cooling-water pipes, clamps, outlet end unions (straight) with union nuts and seals.

5) When installing the 2.2 to 30 kW compact units, a side clearance of about 65 mm must be allowed in addition to the value given in the table.



Maximum permissible operating pressure	Maximum additional cooling capacity[1]	Sound pressure level with standard protection degree IP20/IP00[2] L_{pA} (1 m)	Power connections – Terminals for sizes A to D – Lugs for sizes E to K – Location: at top for AC/DC, at bottom for motor			Auxiliary current requirement	
			Finely stranded	Single- and multi-stranded	Retaining bolt	24 V DC Standard version max. at 20 V[3]	24 V DC Max. version max. at 20 V[3]
		50 Hz					
bar	kW	dB	mm^2	mm^2		A	A
1.0	0.1	60	2.5 to 10	2.5 to 16		1.5	2.5
1.0	0.1	60	2.5 to 10	2.5 to 16		1.5	2.5
1.0	0.1	60	2.5 to 10	2.5 to 16		1.5	2.5
1.0	0.1	60	2.5 to 10	2.5 to 16		1.5	2.5
1.0	0.1	60	2.5 to 10	2.5 to 16		1.5	2.5
1.0	0.2	60	2.5 to 16	10 to 25		1.5	2.5
1.0	0.5	65	2.5 to 35	10 to 50		1.5	2.5
1.0	0.5	65	2.5 to 35	10 to 50		1.5	2.5
1.0	0.5	65	2.5 to 35	10 to 50		1.5	2.5
1.0	0.7	69		max. 2 x 70	M 10	1.7	2.7
1.0	0.7	69		max. 2 x 70	M 10	1.7	2.7
1.0	0.7	69		max. 2 x 70	M 10	2.1	3.2
1.0	1.5	80		max. 2 x 70	M 10	2.1	3.2
1.0	1.5	80		max. 2 x 150	M 12	2.3	3.5
1.0	1.5	80		max. 2 x 150	M 12	2.3	3.5
1.0	1.5	82		max. 2 x 150	M 12	2.3	3.5
1.0	1.5	82		max. 2 x 150	M 12	2.3	3.5
2.5	–	76		max. 2 x 300	M 12/M 16	3.1	4.3
2.5	–	76		max. 2 x 300	M 12/M 16	3.1	4.3
2.5	–	76		max. 2 x 300	M 12/M 16	3.1	4.3
1.0	0.7	69		max. 2 x 70	M 10	2.1	3.2
1.0	0.7	69		max. 2 x 70	M 10	2.1	3.2
1.0	1.5	80		max. 2 x 150	M 12	2.3	3.5
1.0	1.5	80		max. 2 x 150	M 12	2.3	3.5
1.0	1.5	82		max. 2 x 150	M 12	2.3	3.5
1.0	1.5	82		max. 2 x 150	M 12	2.3	3.5
1.0	1.5	82		max. 2 x 150	M 12	2.3	3.5
2.5	–	76		max. 2 x 300	M 12/M 16	3.1	4.3
2.5	–	76		max. 2 x 300	M 12/M 16	3.1	4.3
2.5	–	76		max. 2 x 300	M 12/M 16	3.1	4.3

1) Additional cooling of the control cabinet during operation under rated conditions depends on constructional conditions and especially on the difference between the cooling-water temperature and the ambient temperature of the cabinet. The additional cooling capacity as quoted is the maximum possible value which applies at a cooling-water temperature of +30 °C and a cabinet temperature of +40 °C.

2) Sound pressure level is reduced by about 3 to 5 dB according to the degree of protection IP54/IP65 and sealing of the cabinets.

3) See Engineering Information, page 6/45.

Technical characteristics

The design of the power section of AFE inverters is identical to that of the standard inverters of the SIMOVERT MASTER-DRIVES series. It is therefore not necessary to keep special spare parts for AFE inverters.

The CUSA control board makes a standard inverter into an AFE inverter.

The power range is 6.8 kW to 1200 kW with supply voltages of 3 AC 400 V, 500 V and 690 V. For power outputs of > 250 kW, only cabinet units can be supplied (see Section 4).

For power outputs > 60 kW, i.e. all chassis units, a special sine filter called the Clean Power Filter is necessary.

N.B.!

AFE inverters are aligned inversely to the supply and cannot function autonomously. In order to function, they need at least the following system components:

- VSB voltage sensing board
- Precharger
- Main contactor
- AFE reactor.

Compact units

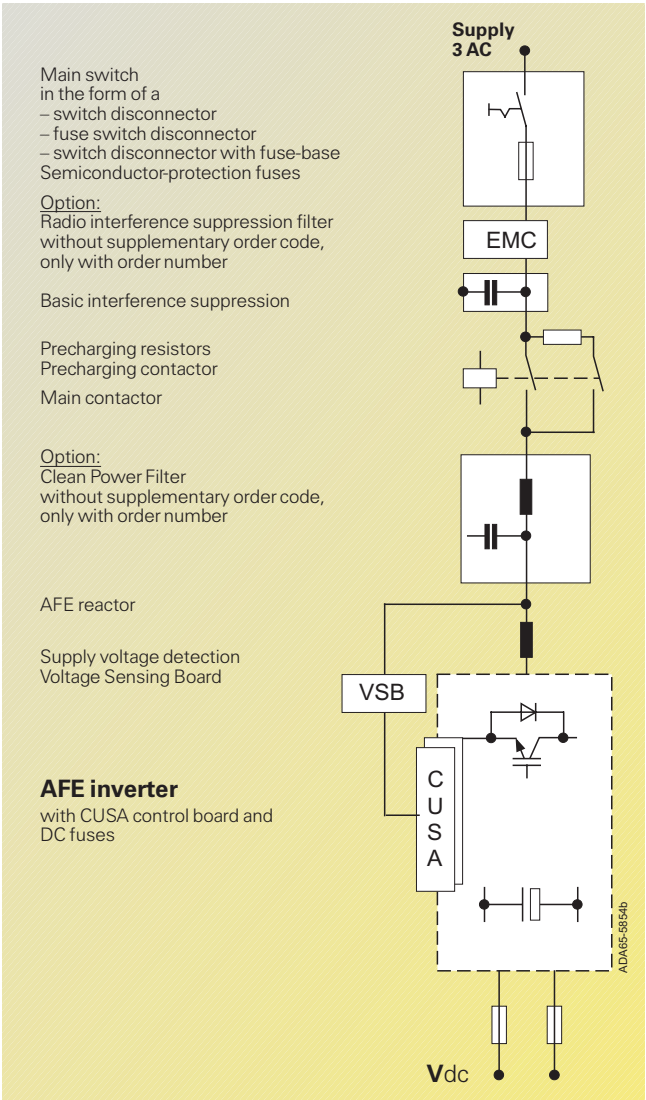


Fig. 3/8
AFE compact units

Chassis units

In order to facilitate handling when chassis units are used, all the necessary system components together with some supply components, including the Clean Power filter, are combined to form an **AFE supply connecting module**.

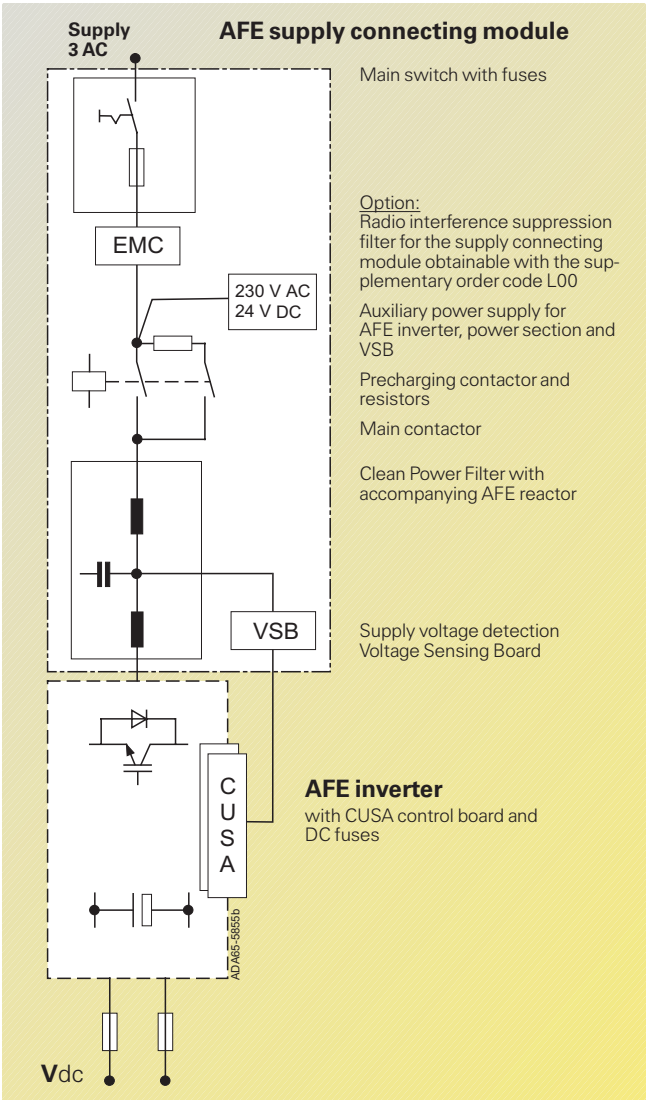


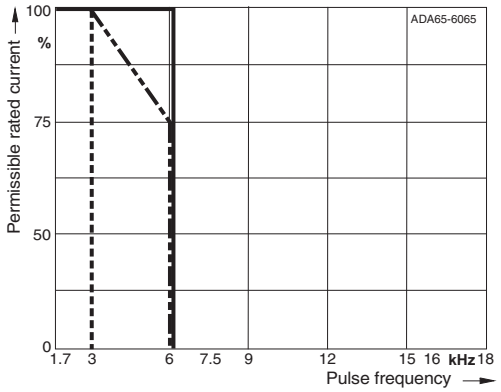
Fig. 3/9
AFE chassis units

Technical data

Rated voltage			
Supply voltage	3 AC 380 V – 20 % to 460 V + 5 %	3 AC 500 V – 20 % to 575 V + 5 %	3 AC 660 V – 20 % to 690 V + 5 %
Output voltage Operating range of control of DC link voltage	Factory setting 600 V DC for compact units 632 V DC for chassis and cabinet units Minimum 1.5x rms value of the supply voltage Maximum 740 V DC	Factory setting 790 V DC for chassis and cabinet units Minimum 1.5x rms value of the supply voltage Maximum 920 V DC	Factory setting 1042 V DC for chassis and cabinet units Minimum 1.5x rms value of the supply voltage Maximum 1100 V DC
Rated frequency			
Supply frequency	50/60 Hz (± 10 %)	50/60 Hz (± 10 %)	50/60 Hz (± 10 %)
Load class II to EN 60 146-1-1	see also Engineering Information, Section 6		
Base load current	0.91 x rated output current		
Short-time-current	1.36 x rated output current during 60 s or 1.60 x rated output current during 30 s for units up to size G and supply voltage max. 600 V		
Cycle time	300 s		
Supply power factor • fundamental • overall	1 (Factory setting) > 0.99		
Efficiency	> 0.98		

Reduction curves

For reduction factors due to different installation conditions (installation altitude, ambient temperature), see Section 6.



Max. adjustable pulse frequency depending on output and type of construction:

6 kHz — for type A, B, C and D
for 45 kW; 55 kW; 380 V to 480 V
for 37 kW; 45 kW; 500 V to 600 V
for 75 kW; 90 kW; 380 V to 480 V
for 55 kW; 500 V to 600 V
for 110 kW; 132 kW; 380 V to 480 V
for 75 kW; 90 kW; 500 V to 600 V
for 55 kW to 110 kW; 660 V to 690 V

6 kHz — for 160 kW to 250 kW; 380 V to 480 V
for 110 kW to 160 kW; 500 V to 600 V
for 132 kW to 200 kW; 660 V to 690 V

3 kHz — for 315 kW to 400 kW; 380 V to 480 V
for 200 kW to 315 kW; 500 V to 600 V
for 250 kW to 400 kW; 660 V to 690 V

Options for AFE inverters

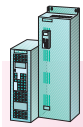
AFE inverters cannot be ordered with options.

For the ordering of optional electronic boards, see Section 6.

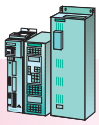
For Engineering Information on self-commutated, pulsed rectifier/regenerative units AFE, see Section 6.

Selection and ordering data

Rated rectifier/ regenerative output at cos φ = 1 and 400 V supply voltage	Short-time rectifier/ regenerative output at cos φ = 1 and 400 V supply voltage	Rated input current 3 AC from/to line	Base load input current 3 AC from/to line	Short-time input current 3 AC from/to line	**AFE inverter** with CUSA control unit 6SE7090–0XX84–0BJ0	Power loss	Spare parts as for VC inverter with nominal power rating	Dimensions Unit measurements W x H x D	Dimension drawing, see Section 7	Weight approx.
P_n	$P_{max.}$	I_{UN}	I_G	$I_{max.}$		P_v	P_{type}			
kW	kW	A	A	A	Order No.	kW	kW	mm	No.	kg
Supply voltage 3-ph. 380 V AC –20 % to 460 V +5 %										
400 V										
6.8	11	10.2	9.2	16.3	**6SE7021–0EA81**	0.14	4	90 x 425 x 350	6	8
9	14	13.2	11.9	21.1	**6SE7021–3EB81**	0.18	5.5	135 x 425 x 350	6	12
12	19	17.5	15.8	28.0	**6SE7021–8EB81**	0.24	7.5	135 x 425 x 350	6	12
17	27	25.5	23.0	40.8	**6SE7022–6EC81**	0.34	11	180 x 600 x 350	6	24
23	37	34	31	54	**6SE7023–4EC81**	0.46	15	180 x 600 x 350	6	24
32	51	47	42	75	**6SE7024–7ED81**	0.63	22	270 x 600 x 350	6	35
40	63	59	53	94	**6SE7026–0ED81**	0.79	30	270 x 600 x 350	6	35
49	78	72	65	115	**6SE7027–2ED81**	0.98	37	270 x 600 x 350	6	35
63	100	92	83	147	**6SE7031–0EE80**	1.06	45	270 x 1050 x 365	8	55
85	135	124	112	198	**6SE7031–2EF80**	1.44	55	360 x 1050 x 365	8	65
100	159	146	131	234	**6SE7031–5EF80**	1.69	75	360 x 1050 x 365	8	65
125	200	186	167	298	**6SE7031–8EF80**	2.00	90	360 x 1050 x 365	8	65
143	228	210	189	336	**6SE7032–1EG80**	2.42	110	508 x 1450 x 465	8	155
177	282	260	234	416	**6SE7032–6EG80**	3.00	132	508 x 1450 x 465	8	155
214	342	315	284	504	**6SE7033–2EG80**	3.64	160	508 x 1450 x 465	8	155
250	400	370	333	592	**6SE7033–7EG80**	4.25	200	508 x 1450 x 465	8	155
Supply voltage 3-ph. 500 V AC –20 % to 575 V +5 %										
500 V										
51	81	61	55	98	**6SE7026–1FE80**	0.86	37	270 x 1050 x 365	8	55
56	90	66	59	106	**6SE7026–6FE80**	0.95	45	270 x 1050 x 365	8	55
67	107	79	71	126	**6SE7028–0FF80**	1.14	55	360 x 1050 x 365	8	65
92	147	108	97	173	**6SE7031–1FF80**	1.47	75	360 x 1050 x 365	8	65
109	174	128	115	205	**6SE7031–3FG80**	1.85	90	508 x 1450 x 465	8	155
132	212	156	140	250	**6SE7031–6FG80**	2.25	110	508 x 1450 x 465	8	155
164	262	192	173	307	**6SE7032–0FG80**	2.78	132	508 x 1450 x 465	8	155
192	307	225	203	360	**6SE7032–3FG80**	3.26	160	508 x 1450 x 465	8	155
Supply voltage 3-ph. 660 V AC –20 % to 690 V +5 %										
690 V										
70	96	60	54	82	**6SE7026–0HF80**	1.19	55	360 x 1050 x 365	8	65
96	131	82	74	112	**6SE7028–2HF80**	1.63	75	360 x 1050 x 365	8	65
114	155	97	87	132	**6SE7031–0HG80**	1.83	90	508 x 1450 x 465	8	155
138	188	118	106	160	**6SE7031–2HG80**	2.35	110	508 x 1450 x 465	8	155
170	231	145	131	197	**6SE7031–5HG80**	2.89	132	508 x 1450 x 465	8	155
200	272	171	154	233	**6SE7031–7HG80**	3.40	160	508 x 1450 x 465	8	155
245	333	208	187	283	**6SE7032–1HG80**	4.16	200	508 x 1450 x 465	8	155



Cooling air requirement	Sound pressure level with standard protection degree IP20/IP00 L_{pA} (1 m)	Power connections – Terminals for sizes A to D – Lugs for sizes E to G – Location: at bottom for AFE reactor, at top for DC link connection			Auxiliary current requirement			
		Finely stranded	Single- and multi-stranded	Retaining bolt	24 V DC Standard version	24 V DC Max. version	1-ph. 230 V fan for AFE inverter units	
	50 Hz						50 Hz	60 Hz
m^3/s	dB	mm^2	mm^2		A	A	A	A
0.009	60	2.5 to 10	2.5 to 16		2	3	none	none
0.022	60	2.5 to 10	2.5 to 16		2	3	none	none
0.022	60	2.5 to 10	2.5 to 16		2	3	none	none
0.028	60	2.5 to 16	10 to 25		2	3	none	none
0.028	60	2.5 to 16	10 to 25		2	3	none	none
0.054	65	2.5 to 35	10 to 50		2	3	0.35	0.44
0.054	65	2.5 to 35	10 to 50		2	3	0.35	0.44
0.054	65	2.5 to 35	10 to 50		2	3	0.35	0.44
0.11	69		max. 2 x 70	M 10	The AFE chassis units are offered with the line connecting module (see system components) as standard. The auxiliary power supply 24 V DC and 230 V AC and the fusing are incorporated in the matching line connecting module.			
0.15	70		max. 2 x 70	M 10				
0.15	70		max. 2 x 70	M 10				
0.15	70		max. 2 x 70	M 10				
0.33	81		max. 2 x 150	M 12				
0.33	81		max. 2 x 150	M 12				
0.44	83		max. 2 x 150	M 12				
0.44	83		max. 2 x 150	M 12				
0.11	70		max. 2 x 70	M 10	The AFE chassis units are offered with the line connecting module (see system components) as standard. The auxiliary power supply 24 V DC and 230 V AC and the fusing are incorporated in the matching line connecting module.			
0.11	70		max. 2 x 70	M 10				
0.15	70		max. 2 x 70	M 10				
0.15	81		max. 2 x 70	M 10				
0.33	81		max. 2 x 150	M 12				
0.33	81		max. 2 x 150	M 12				
0.44	83		max. 2 x 150	M 12				
0.44	83		max. 2 x 150	M 12				
0.15	70		max. 2 x 70	M 10	The AFE chassis units are offered with the line connecting module (see system components) as standard. The auxiliary power supply 24 V DC and 230 V AC and the fusing are incorporated in the matching line connecting module.			
0.15	70		max. 2 x 70	M 10				
0.32	81		max. 2 x 150	M 12				
0.32	81		max. 2 x 150	M 12				
0.44	81		max. 2 x 150	M 12				
0.44	83		max. 2 x 150	M 12				
0.44	83		max. 2 x 150	M 12				



Technical characteristics

Rectifier units supply the DC bus for inverters with motoring energy and enable operation of a multi-motor system.

The Compact PLUS rectifier units have an integrated braking chopper. For regenerative mode, these rectifier units require only an external braking resistor.

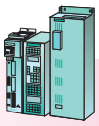
Rectifier/regenerative units supply the DC bus for inverters with motoring energy from a three-phase system and return regenerative energy from the DC bus to the power system. This is achieved using two independent thyristor bridges. The regenerating bridge is connected via an autotransformer.

The advantages of using an autotransformer are as follows:

- maximum motor torque, even during regenerative mode
- improved availability with weak supply systems or during voltage dips.

Rectifier and rectifier/regenerative units are suitable as standard for operation with IT supply systems.

In order to increase the output current, up to 2 "parallel units" of the rectifier/regenerative unit type K ("base unit") with the same rated current may be connected in parallel (see Engineering Information, page 6/17).



Technical data

Rated voltage			
Supply voltage, motoring	3 AC 380 V – 15 % to 480 V +10 %	3 AC 500 V – 15 % to 600 V +10 %	3 AC 660 V – 15 % to 690 V +15 %
Supply voltage, generating	3 AC 455 V – 15 % to 576 V +10 %	3 AC 600 V – 15 % to 720 V +10 %	3 AC 790 V – 15 % to 830 V +15 %
Output voltage DC link voltage	510 V DC –15 % to 650 V DC +10 %	675 V DC –15 % to 810 V DC +10 %	890 V DC –15 % to 930 V DC +15 %
Rated frequency			
Supply frequency	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)
Load class II to EN 60 146-1-1			
Base load current	0.91 x rated DC link current		
Short-time current	1.36 x rated DC link current during 60 s; additionally for Compact PLUS units: 1.6 x rated DC link current during 30 s		
Cycle time	300 s		
Overload duration	60 s (20 % of the cycle time)		
Power factor, motoring • supply fundamental • overall	 ≥ 0.98 0.93 to 0.96		
Efficiency	0.99 to 0.995		

For reduction factors due to different installation conditions (installation altitude, ambient temperature), see Section 6.

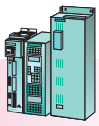
Options for rectifier units and rectifier/regenerative units

Rectifier units and rectifier/regenerative units can be supplied ex works with the following options in the table.
For a description of options, see page 3/93. For the ordering of units with optional electronic boards, see Section 6.
Rectifier and rectifier/regenerative units are suitable as standard for operation with IT supply systems.

Supplementary order code	Description of option	Rectifier unit Size				Rectifier/regenerative unit Size		
		Compact PLUS	B, C	E	H, K	C	E	H, K
K91	DC link current detector	–	●	●	■	■	■	■
M20	IP20 panels	–	■	●	–	■	●	–

■ Standard
● Option possible
– not possible

3



Selection and ordering data

Nominal power rating[1]	Rated DC link current	DC link base load current	DC link short-time current	Supply current[2]	Rectifier unit	Max. power loss	Braking power with integrated braking chopper: Smallest permissible value of external braking resistor R_{min}	Braking power with integrated braking chopper: Rated braking power P_{20} with R_{min}	Braking power with integrated braking chopper: Short-time braking power P_3 with R_{min}
kW	A	A	A	A	Order No.	kW	Ω	kW	kW
Compact PLUS units									
Supply voltage 3-ph. 380 V AC –15 % to 480 V AC +10 % 50/60 Hz									
15	41	–	66[4]	36	**6SE7024–1EP85–0AA0**	0.13	19	20	30
50	120	–	192[4]	108	**6SE7031–2EP85–0AA0**	0.27	6.5	60	90
100	230	–	368[4]	207	**6SE7032–3EP85–0AA0**	0.60	3.4	116	174
Compact and chassis units									
Supply voltage 3-ph. 380 V to 480 V AC									
15	41	37	56	36	**6SE7024–1EB85–0AA0**	0.12	–	–	–
37	86	78	117	75	**6SE7028–6EC85–0AA0**	0.26	–	–	–
75	173	157	235	149	**6SE7031–7EE85–0AA0**	0.62	–	–	–
110	270	246	367	233	**6SE7032–7EE85–0AA0**	0.86	–	–	–
160	375	341	510	326	**6SE7033–8EE85–0AA0**	1.07	–	–	–
200	463	421	630	403	**6SE7034–6EE85–0AA0**	1.32	–	–	–
250	605	551	823	526	**6SE7036–1EE85–0AA0**	1.67	–	–	–
400	821	747	1117	710	**6SE7038–2EH85–0AA0**[3]	3.29	–	–	–
500	1023	931	1391	888	**6SE7041–0EH85–0AA0**[3]	3.70	–	–	–
630	1333	1213	1813	1156	**6SE7041–3EK85–0AA0**[3]	4.85	–	–	–
800	1780	1620	2421	1542	**6SE7041–8EK85–0AA0**[3]	6.24	–	–	–
Supply voltage 3-ph. 500 V to 600 V AC									
22	41	37	56	36	**6SE7024–1FB85–0AA0**	0.21	–	–	–
37	72	66	98	63	**6SE7027–2FC85–0AA0**	0.22	–	–	–
55	94	86	128	81	**6SE7028–8FC85–0AA0**	0.28	–	–	–
75	142	129	193	123	**6SE7031–4FE85–0AA0**	0.65	–	–	–
132	235	214	320	203	**6SE7032–4FE85–0AA0**	0.97	–	–	–
200	354	322	481	307	**6SE7033–5FE85–0AA0**	1.25	–	–	–
250	420	382	571	366	**6SE7034–2FE85–0AA0**	1.27	–	–	–
315	536	488	729	465	**6SE7035–4FE85–0AA0**	1.74	–	–	–
400	774	704	1053	671	**6SE7037–7FH85–0AA0**[3]	3.30	–	–	–
630	1023	931	1391	888	**6SE7041–0FH85–0AA0**[3]	4.03	–	–	–
800	1285	1169	1748	1119	**6SE7041–3FK85–0AA0**[3]	5.40	–	–	–
900	1464	1332	1991	1269	**6SE7041–5FK85–0AA0**[3]	5.87	–	–	–
1100	1880	1711	2557	1633	**6SE7041–8FK85–0AA0**[3]	6.65	–	–	–
Supply voltage 3-ph. 660 V to 690 V AC									
160	222	202	302	194	**6SE7032–2HE85–0AA0**	1.08	–	–	–
250	354	322	481	308	**6SE7033–5HE85–0AA0**	1.33	–	–	–
315	420	382	571	366	**6SE7034–2HE85–0AA0**	1.58	–	–	–
400	536	488	729	465	**6SE7035–4HE85–0AA0**	2.02	–	–	–
630	774	704	1053	671	**6SE7037–7HH85–0AA0**[3]	3.70	–	–	–
800	1023	931	1391	888	**6SE7041–0HH85–0AA0**[3]	4.15	–	–	–
1000	1285	1169	1748	1119	**6SE7041–3HK85–0AA0**[3]	5.54	–	–	–
1100	1464	1332	1991	1269	**6SE7041–5HK85–0AA0**[3]	6.00	–	–	–
1500	1880	1711	2557	1633	**6SE7041–8HK85–0AA0**[3]	7.62	–	–	–

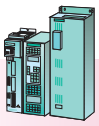
1) Nominal power ratings are quoted for ease of assigning components only. The drive outputs are dependent on the inverters connected and are to be dimensioned accordingly.

2) The current data refer to a line supply inductance of 3 % referred to the rectifier unit impedance *Z*, i.e. the ratio of the system fault level to the converter output is 33:1 or 100:1 if an additional 2 % line reactor is used.

Rectifier unit impedance: $Z = \frac{V_{supply}}{\sqrt{3} \cdot I_{V_{supply}}}$

3) An interface adapter **6SE7090–0XX85–1TA0** is required if these rectifier units are used for 12-pulse system.

4) Short-time current:
1.6 x I_N for **30 s**
1.36 x I_N for **60 s**



Dimensions W x H x D	Dimension drawing, see Section 7	Weight approx.	Cooling air requirement	Sound pressure level with standard protection degree IP20/IP00 L_{pA} (1 m)	Power connections – Terminals for sizes B, C and P – Lugs for sizes E, H and K – Location: at bottom for AC, at top for DC			Auxiliary current requirement			
					Finely stranded	Single- and multi-stranded	Retaining bolt	24 V DC Standard version max. at 20 V[1]	24 V DC Max. version max. at 20 V[1]	1-ph. or 2-ph. 230 V fan	
				50 Hz						50 Hz	60 Hz
mm	No.	kg	m³/s	dB	mm²	mm²		A	A	A	A
90 x 360 x 260	5	13.3	0.018	60	10	10	–	–	0.5	–	–
135 x 360 x 260	5	6.0	0.041	68	50	50	–	–	0.7	–	–
180 x 360 x 260	5	2.7	0.053	65	95	95	–	–	0.7	–	–
135 x 425 x 350	6	12	0.022	60	2.5 to 10	2.5 to 16		0.5	–	none	none
180 x 600 x 350	6	18	0.028	60	2.5 to 35	10 to 50		0.5	–	none	none
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 12	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 12	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 12	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 12	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 16	0.3	–	0.6	0.75
508 x 1050 x 565	15	130	0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
508 x 1050 x 565	15	130	0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
800 x 1400 x 565	17	260	1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
800 x 1400 x 565	17	300	1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
135 x 425 x 350	6	12	0.022	60	2.5 to 10	2.5 to 16		0.5	–	none	none
180 x 600 x 350	6	18	0.028	60	2.5 to 35	10 to 50		0.5	–	none	none
180 x 600 x 350	6	18	0.028	60	2.5 to 35	10 to 50		0.5	–	none	none
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 12	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 12	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 12	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 16	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 16	0.3	–	0.6	0.75
508 x 1050 x 565	15	130	0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
508 x 1050 x 565	15	130	0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
800 x 1400 x 565	17	260	1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
800 x 1400 x 565	17	300	1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
800 x 1400 x 565	17	300	1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 12	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 12	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 16	0.3	–	0.6	0.75
270 x 1050 x 365	14	45	0.2	75		2 x 300	M 16	0.3	–	0.6	0.75
508 x 1050 x 565	15	130	0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
508 x 1050 x 565	15	130	0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
800 x 1400 x 565	17	260	1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
800 x 1400 x 565	17	300	1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
800 x 1400 x 565	17	300	1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0

1) See Engineering Information, page 6/45.

Selection and ordering data

Nominal power rating[1]	Rated DC link output current[4]	Base load DC link current[4]	Short-time DC link current[4]	Input current[2]	Rectifier/ regenerative unit[3]	Max. power loss	Dimensions W x H x D	Dimension drawing, see Section 7	Weight approx.
kW	A	A	A	A	Order No.	kW	mm	No.	kg
Supply voltage 3-ph. 380 V to 480 V AC Can also be connected to 3-ph. 200 V to 230 V AC									
7.5	21	19	29	18	**6SE7022–1EC85–1AA0**	0.15	180 x 600 x 350	6	23
15	41	37	56	35	**6SE7024–1EC85–1AA0**	0.20	180 x 600 x 350	6	23
37	86	78	117	74	**6SE7028–6EC85–1AA0**	0.31	180 x 600 x 350	6	23
75	173	157	235	149	**6SE7031–7EE85–1AA0**	0.69	270 x 1050 x 365	14	45
90	222	202	302	192	**6SE7032–2EE85–1AA0**	0.97	270 x 1050 x 365	14	45
132	310	282	422	269	**6SE7033–1EE85–1AA0**	1.07	270 x 1050 x 365	14	45
160	375	341	510	326	**6SE7033–8EE85–1AA0**	1.16	270 x 1050 x 365	14	52
200	463	421	630	403	**6SE7034–6EE85–1AA0**	1.43	270 x 1050 x 365	14	52
250	605	551	823	526	**6SE7036–1EE85–1AA0**	1.77	270 x 1050 x 365	14	65
400	821	747	1117	710	**6SE7038–2EH85–1AA0**	3.29	508 x 1400 x 565	16	175
500	1023	931	1391	888	**6SE7041–0EH85–1AA0**	3.70	508 x 1400 x 565	16	175
630	1333	1213	1813	1156	**6SE7041–3EK85–1AA0**	4.85	800 x 1725 x 565	18	450
800	1780	1620	2421	1542	**6SE7041–8EK85–1AA0**	6.24	800 x 1725 x 565	18	470
Supply voltage 3-ph. 500 V to 600 V AC									
11	27	25	37	23	**6SE7022–7FC85–1AA0**	0.19	180 x 600 x 350	6	23
22	41	37	56	35	**6SE7024–1FC85–1AA0**	0.21	180 x 600 x 350	6	23
37	72	66	98	62	**6SE7027–2FC85–1AA0**	0.30	180 x 600 x 350	6	23
55	94	86	128	81	**6SE7028–8FC85–1AA0**	0.35	180 x 600 x 350	6	23
90	151	137	205	130	**6SE7031–5FE85–1AA0**	0.76	270 x 1050 x 365	14	45
132	235	214	320	202	**6SE7032–4FE85–1AA0**	1.14	270 x 1050 x 365	14	45
160	270	246	367	232	**6SE7032–7FE85–1AA0**	1.11	270 x 1050 x 365	14	45
200	354	322	481	307	**6SE7033–5FE85–1AA0**	1.36	270 x 1050 x 365	14	55
250	420	382	571	366	**6SE7034–2FE85–1AA0**	1.38	270 x 1050 x 365	14	55
315	536	488	729	465	**6SE7035–4FE85–1AA0**	2.00	270 x 1050 x 365	14	68
450	774	704	1053	671	**6SE7037–7FH85–1AA0**	3.30	508 x 1400 x 565	16	175
630	1023	931	1391	888	**6SE7041–0FH85–1AA0**	4.03	508 x 1400 x 565	16	175
800	1285	1169	1748	1119	**6SE7041–3FK85–1AA0**	5.40	800 x 1725 x 565	18	450
900	1464	1332	1991	1269	**6SE7041–5FK85–1AA0**	5.87	800 x 1725 x 565	18	450
1100	1880	1711	2557	1633	**6SE7041–8FK85–1AA0**	7.65	800 x 1725 x 565	18	470
Supply voltage 3-ph. 660 V to 690 V AC									
110	140	127	190	120	**6SE7031–4HE85–1AA0**	0.82	270 x 1050 x 365	14	65
160	222	202	302	191	**6SE7032–2HE85–1AA0**	1.26	270 x 1050 x 365	14	65
200	270	246	367	232	**6SE7032–7HE85–1AA0**	1.15	270 x 1050 x 365	14	55
315	420	382	571	366	**6SE7034–2HE85–1AA0**	1.68	270 x 1050 x 365	14	55
400	536	488	729	465	**6SE7035–3HE85–1AA0**	1.81	270 x 1050 x 365	14	70
630	774	704	1053	671	**6SE7037–7HH85–1AA0**	3.70	508 x 1400 x 565	16	175
800	1023	931	1391	888	**6SE7041–0HH85–1AA0**	4.15	508 x 1400 x 565	16	175
1000	1285	1169	1748	1119	**6SE7041–3HK85–1AA0**	5.54	800 x 1725 x 565	18	450
1100	1464	1332	1991	1269	**6SE7041–5HK85–1AA0**	6.00	800 x 1725 x 565	18	450
1500	1880	1711	2557	1633	**6SE7041–8HK85–1AA0**	7.62	800 x 1725 x 565	18	470

1) Nominal power ratings are quoted for ease of assigning components only. The drive outputs are dependent on the inverters connected and are to be dimensioned accordingly.
When rectifier/regenerative units 3-ph. 380 V to 480 V AC are used on a 3-ph. 200 V to 230 V AC supply, the rated currents remain the same and the nominal power rating is reduced to about 50 %.

2) The current data refer to a line supply inductance of 5 % referred to the rectifier unit impedance Z, i. e. the ratio of the system fault level to the converter output is 20:1 or 100:1 if an additional 4 % line reactor is used.

Rectifier unit impedance: $Z = \frac{V_{supply}}{\sqrt{3} \cdot I_{V\,supply}}$

3) An interface adapter **6SE7090–0XX85–1TA0** is required if these rectifier units are used for 12-pulse system.

4) Engineering Information:
In generating mode only 92 % of the indicated current value is permissible.

Cooling air requirement	Sound pressure level with standard protection degree IP20/IP00 L_{pA} (1 m)	Power connections – Terminals for size C – Lugs for sizes E, H, K – Location: – AC motoring at top for sizes C, H, K; at bottom for size E – DC at top for sizes C, E, H, K – AC generating at bottom for sizes C, E, H, K			Auxiliary current requirement			
		Finely stranded	Single- and multi-stranded	Retaining bolt	24 V DC Standard version max. at 20 V[1]	24 V DC Max. version max. at 20 V[1]	1-ph. or 2-ph. 230 V	
	50 Hz						50 Hz	60 Hz
m^3/s	dB	mm^2	mm^2		A	A	A	A
0.028	60	2.5 to 35	10 to 50		0.9	2.0	none	none
0.028	60	2.5 to 35	10 to 50		0.9	2.0	none	none
0.028	60	2.5 to 35	10 to 50		0.9	2.0	none	none
0.2	75		2 x 300	M 12	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 12	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 12	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 12	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 12	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 16	0.7	2.0	0.60	0.75
0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
0.028	60	2.5 to 35	10 to 50		0.7	2.0	none	none
0.028	60	2.5 to 35	10 to 50		0.7	2.0	none	none
0.028	60	2.5 to 35	10 to 50		0.7	2.0	none	none
0.028	60	2.5 to 35	10 to 50		0.7	2.0	none	none
0.2	75		2 x 300	M 12	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 12	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 12	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 12	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 16	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 16	0.7	2.0	0.60	0.75
0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
0.2	75		2 x 300	M 12	0.7	2.0	0.60	0.75
0.2	75		2 x 300		0.7	2.0	0.60	0.75
0.2	75		2 x 300		0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 16	0.7	2.0	0.60	0.75
0.2	75		2 x 300	M 16	0.7	2.0	0.60	0.75
0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
0.70	80		4 x 300	M 12	1.0	2.3	2.8	3.5
1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
1.00	86		4 x 300	M 12	1.0	2.3	5.6	7.0
1.00	86							

1) See Engineering Information, page 6/45.

Selection and ordering data

Nominal power rating[1]	Rated DC link output current[2][3]	Base load DC link current[3]	Short-time DC link current[3]	Input current	Rectifier unit	Rectifier/ regenerative unit	Max. power loss	Dimensions W x H x D	Dimension drawing, see Section 7	Weight approx.
kW	A	A	A	A	Order No.	Order No.	kW	mm	No.	kg
Supply voltage 3-ph. 380 V to 480 V AC										
630	1333	1213	1813	1146	**6SE7041–3EK85–0AD0**	**–**	4.85	800 x 1400 x 565	17	260
630	1333	1213	1813	1146	**–**	**6SE7041–3EK85–1AD0**	4.85	800 x 1725 x 565	18	450
800	1780	1620	2421	1531	**6SE7041–8EK85–0AD0**	**–**	6.24	800 x 1400 x 565	17	300
800	1780	1620	2421	1531	**–**	**6SE7041–8EK85–1AD0**	6.24	800 x 1725 x 565	18	470
Supply voltage 3-ph. 500 V to 600 V AC										
800	1285	1169	1748	1105	**6SE7041–3FK85–0AD0**	**–**	5.40	800 x 1400 x 565	17	260
800	1285	1169	1748	1105	**–**	**6SE7041–3FK85–1AD0**	5.40	800 x 1725 x 565	18	450
900	1464	1332	1991	1259	**6SE7041–5FK85–0AD0**	**–**	5.87	800 x 1400 x 565	17	300
900	1464	1332	1991	1259	**–**	**6SE7041–5FK85–1AD0**	5.87	800 x 1725 x 565	18	450
1100	1880	1711	2557	1617	**6SE7041–8FK85–0AD0**	**–**	6.65	800 x 1400 x 565	17	300
1100	1880	1711	2557	1617	**–**	**6SE7041–8FK85–1AD0**	6.65	800 x 1725 x 565	18	470
Supply voltage 3-ph. 660 V to 690 V AC										
1000	1285	1169	1748	1105	**6SE7041–3HK85–0AD0**	**–**	5.54	800 x 1400 x 565	17	260
1000	1285	1169	1748	1105	**–**	**6SE7041–3HK85–1AD0**	5.54	800 x 1725 x 565	18	450
1100	1464	1332	1991	1259	**6SE7041–5HK85–0AD0**	**–**	6.00	800 x 1400 x 565	17	300
1100	1464	1332	1991	1259	**–**	**6SE7041–5HK85–1AD0**	6.00	800 x 1725 x 565	18	450
1500	1880	1711	2557	1617	**6SE7041–8HK85–0AD0**	**–**	7.62	800 x 1400 x 565	17	300
1500	1880	1711	2557	1617	**–**	**6SE7041–8HK85–1AD0**	7.62	800 x 1725 x 565	18	470

See Engineering Information, page 6/17.

1) Nominal power ratings are quoted for ease of assigning components only. The drive outputs are dependent on the inverters connected and are to be dimensioned accordingly.

2) The rated output current when rectifier units are connected in parallel via a 2 % line commutating reactor is calculated according to the following formula:
$\sum I = 0.9 \times n \times$ rated output current
n = Number of parallel units $1 \leq n \leq 3$.

3) Engineering Information:
In generating mode only 92 % of the indicated current value is permissible .

Cooling air require-ment	Sound pressure level with standard protection degree IP20/IP00 L_{pA} (1 m)	Power connections – Lugs for size K – Location: Rectifier units: at bottom for AC, at top for DC; Regenerative unit: at top for AC motoring, at bottom for AC generating, at top for DC Cable cross-section	 Retaining bolt	Auxiliary current requirement 24 V DC Standard version max. at 20 V1)	 24 V DC Max. version max. at 20 V1)	 1-ph. or 2-ph. 230 V fan	
	50 Hz					50 Hz	60 Hz
m³/s	dB	mm²		A	A	A	A
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0
1.0	86	4 x 300	M 12	0.5	–	5.6	7.0

1) See Engineering Information, page 6/45.

Technical characteristics

The OCP (overcurrent protector unit) is an autonomous module of the SIMOVERT MASTERDRIVES series. It can also be easily retrofitted to already existing equipment that includes rectifier/regenerative units from the SIMOVERT MASTERDRIVES range.

It is connected as a supplementary device in the divided positive cable of the DC link between the rectifier/regenerative unit and the associated inverters.

The OCP is available as a chassis unit with 2 rated currents for DC links with the following supply voltages:

- 3-ph. 380 V to 480 V AC + 10% (DC link voltage 510 V DC to 650 V DC + 10%)
- 3-ph. 660 V to 690 V AC + 15% (DC link voltage 675 V DC to 930 V DC + 15%)

OCPs for DC links with a supply voltage of 3-ph. 500 V to 600 V AC + 10% can be implemented with units for 3-ph. 690 V AC.

Using an OCP has the following benefits and advantages:

- Component and servicing costs are substantially reduced due to avoidance of fuse tripping and destruction of thyristors in the rectifier/regenerative unit.
- Availability is increased, minimizing expensive plant downtime and production stoppage times.
- The OCP can be bypassed in the event of a fault so that the rectifier/regenerative unit continues to be operational without the OCP.

Using an OCP is cost-effective and is therefore especially recommended for retrofitting in existing plant that uses SIMOVERT MASTERDRIVES. For new projects, the use of an AFE (fully pulsed with filter) may be more appropriate as this solution offers additional advantages and benefits.

An AFE

- prevents or eliminates inverter stalling (the OCP minimizes the negative effects of switch-off)
- produces considerably less network perturbations
- enables setting of the power factor up to the level of power factor compensation
- enables highly dynamic closed-loop control of the DC link voltage.

For the assignment of OCPs to rectifier/regenerative units, see page 3/37, "Selection and Ordering Data".

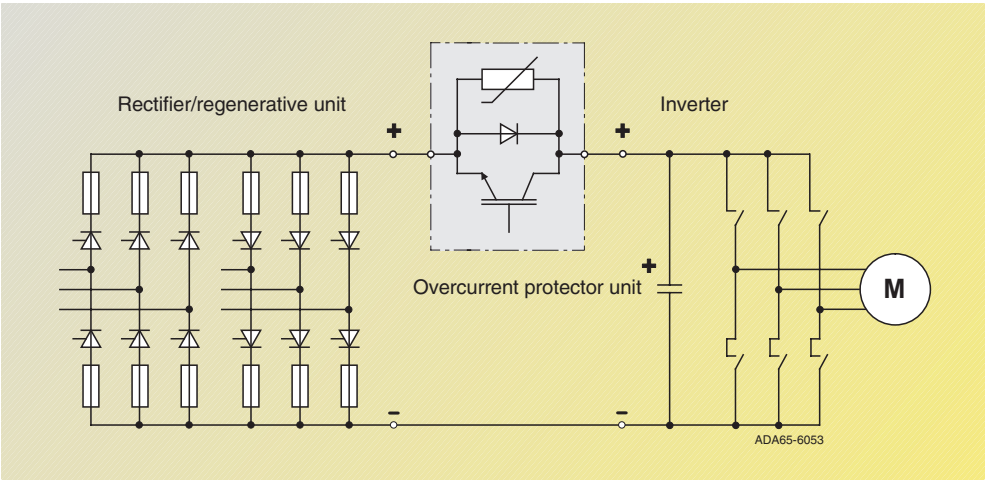


Fig. 3/10

Technical data

Cooling-medium temperature	0 °C to +40 °C
Permissible ambient temperature during storage and transport	–25 °C to +70 °C
Cooling air requirement	0.55 m^3/s
Climatic category	3K3 to DIN IEC 721-3-3/04.90
Pollution degree	Pollution degree 2 to DIN VDE 0110 Part 1/01.89, Moisture condensation not permissible
Overvoltage category (power section)	Category III to DIN VDE 0110 Part 2/01.89
Overvoltage strength (with connected inverter)	Class 1 to DIN VDE 0160/04.91
Degree of protection	IP00 to EN 60 529 (DIN VDE 0470 Part 1/11.92)
Immunity	IEC 801-2, IEC 801-4
Mechanical specifications	To DIN IEC 60 068-2-6/06.90
Sound pressure level L_{pA} (1 m) 50 Hz 60 Hz	 80 dB 83 dB

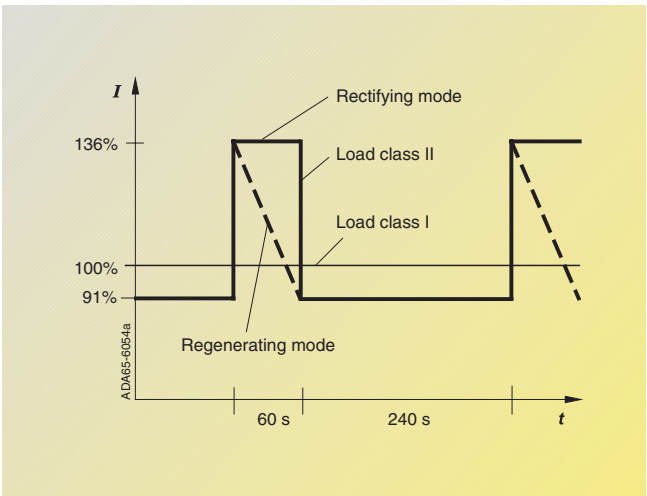


Fig. 3/11
Base load and overload to load class II to EN 60 146-1-1

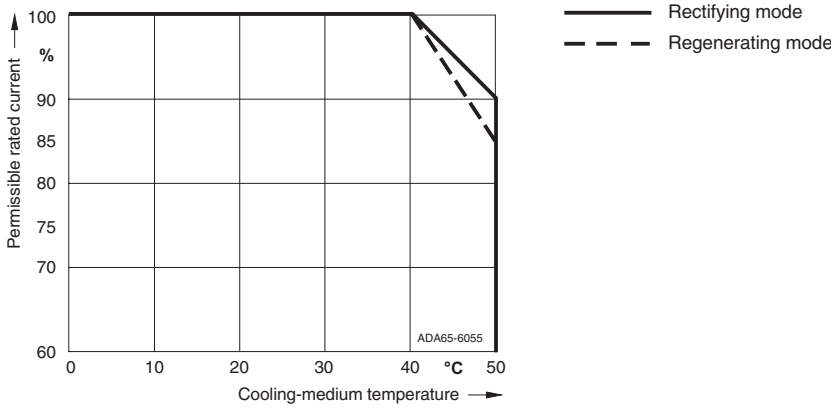
Selection and ordering data

Rated DC link current		Rated DC link base load current		Base load duration	DC link short-time current		Short-time current duration	Max. power loss at		Overcurrent protector unit (OCP)	Dimensions W x H x D	Dimension drawing, see Section 7	Weight approx.
Infeed current	Regenerative current	Infeed current	Regenerative current		Infeed current	Regenerative current	see Fig.	Infeed	Regeneration				
A	A	A	A	s	A	A	No.	kW	kW	Order No.	mm	No.	kg
Rated DC link voltage 510 V to 650 V DC +10%													
1023	945	930	860	240	1390	1280	3/11	1.1	2.3	**6SE7041–0TS85–5JA0**	587 x 750 x 470	19	75
1780	1640	1620	1500	240	2430	2030	3/11	1.6	4	**6SE7041–8TS85–5JA0**	587 x 750 x 470	19	75
Rated DC link voltage 675 V to 930 V DC +15%													
1023	945	930	860	240	1390	1280	3/11	1.1	2.4	**6SE7041–0WS85–5JA0**	587 x 750 x 470	19	75
1880	1730	1711	1580	240	2566	2350	3/11	1.7	4.6	**6SE7042–0WS85–5JA0**	587 x 750 x 470	19	75

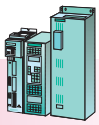
Assignment of overcurrent protector units (OCP) to rectifier/regenerative units

Overcurrent protector unit	Rectifier/regenerative unit					
Order No.	Type	Type	Type	Type	Type	Type
Supply voltage 3-ph. 380 V to 480 V +10%						
6SE7041–0TS85–5JA0	6SE7038–2EH85–1AA0	6SE7041–0EH85–1AA0				
6SE7041–8TS85–5JA0	6SE7041–3EK85–1AA0[1)]	6SE7041–8EK85–1AA0[1)]				
Supply voltage 3-ph. 500 V to 690 V +15%						
6SE7041–0WS85–5JA0	6SE7037–7FH85–1AA0	6SE7041–0FH85–1AA0		6SE7037–7HH85–1AA0	6SE7041–0HH85–1AA0	
6SE7042–0WS85–5JA0	6SE7041–3FK85–1AA0[1)]	6SE7041–5FK85–1AA0[1)]	6SE7041–8FK85–1AA0[1)]	6SE7041–3HK85–1AA0[1)]	6SE7041–5HK85–1AA0[1)]	6SE7041–8HK85–1AA0[1)]

Reduction curves



1) The assignment for type K units also applies to parallel units (–1AD0)



Technical characteristics

Braking units 5 kW to 20 kW Degree of protection IP20

The braking units in the output range P_{20} = 5 kW to 20 kW consist of a chopper power section and an **internal** load resistor.

Braking resistor Degree of protection IP20

An external load resistor can be connected to increase the braking time or to increase the braking power.

The Compact PLUS converters and rectifier units have an integral chopper power section. For regenerative mode, these units only require a braking resistor.

Applications in which braking energy occurs only occasionally, e.g. emergency stop, can be implemented with compact braking resistors that are specially matched to Compact PLUS units. These compactly dimensioned braking resistors can absorb high levels of braking power for a short time.

Braking units 50 kW to 200 kW Degree of protection IP20

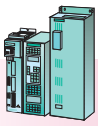
Braking units of 50 kW to 200 kW require an **external** load resistor which has to be connected to the braking unit.

More information

regarding dimensioning of the braking units and braking resistors can be found in section 6, Engineering Information.

Fig. 3/12
Braking unit and braking resistor for compact and chassis units

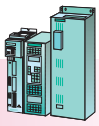
Fig. 3/13
Braking resistor for Compact PLUS units



Technical data

Rated voltage			
DC link voltage	510 V DC –15 % to 650 V DC +10 %	675 V DC –15 % to 810 V DC +10 %	890 V DC –15 % to 930 V DC +15 %
Thresholds			
Upper threshold 1	774 V	967 V	1158 V
Lower threshold 2	673 V	841 V	1070 V
Load class II to EN 60 146-1-1			
Rated power P_{20}	P_{20} power at the upper threshold: The duration is a function of the internal or external resistor		
Continuous power P_{DB}	Continuous power at the upper threshold: The value is dependent on the internal and external resistor		
Short-time power P_3	1.5 x P_{20} power at the upper threshold: The duration is a function of the internal and external resistor		
Cycle time	90 s		
Overload duration	20 s (22 % of the cycle time)		

Braking units cannot be ordered with options.



Selection and ordering data

Braking resistors for Compact PLUS units

Braking power[1]					Braking resistor			
						Dimensions	Dimension drawing, see Section 7	Weight
P_{20}	P_3	P_{DB}	Resistance	Cycle time T		W x H x D		
kW	kW	kW	Ω	s	Order No.	mm	No.	kg
2[3]	3	0.15	200	3200	**6SE7013–2ES87–2DC0**	44 x 250 x 120	21	1.4
4[3]	6	0.3[4]	100	6400	**6SE7016–3ES87–2DC0**	44 x 250 x 120	21	1.9
5	7.5	1.25	80	90	**6SE7018–0ES87–2DC0**	145 x 180 x 540	22	6
10	15	2.5	40	90	**6SE7021–6ES87–2DC0**	145 x 360 x 540	22	12
12[3]	18	0.9[5]	33.3	6400	**6SE7022–0ES87–2DC0**	134 x 350 x 203	23	6.8
20	30	5	20	90	**6SE7023–2ES87–2DC0**	450 x 305 x 485	24	17
50	75	12.5	8	90	**6SE7028–0ES87–2DC0**	745 x 305 x 485	24	27
100	150	25	4	90	**6SE7031–6ES87–2DC0**	745 x 605 x 485	25	47

Braking units and braking resistors for compact and chassis units

Braking power[1]				Braking unit			Braking resistor, external				
					Dimensions	Weight		Resistance[2]	Dimensions	Dimension drawing, see Section 7	Weight
P_{20}	P_3	P_{DB} external	P_{DB} internal		W x H x D				B x H x T		
kW	kW	kW	kW	Order No.	mm	kg	Order No.	Ω	mm	No.	kg
DC link voltage 510 V to 650 V DC[2]											
5	7.5	1.25	0.16	**6SE7018–0ES87–2DA0**	45 x 425 x 350	6	**6SE7018–0ES87–2DC0**	80	145 x 180 x 540	20; 22	6
10	15	2.5	0.32	**6SE7021–6ES87–2DA0**	45 x 425 x 350	6	**6SE7021–6ES87–2DC0**	40	145 x 360 x 540	20; 22	11.5
20	30	5	0.63	**6SE7023–2EA87–2DA0**	90 x 425 x 350	11	**6SE7023–2ES87–2DC0**	20	430 x 305 x 485	20; 24	17
50	75	12.5	–	**6SE7028–0EA87–2DA0**	90 x 425 x 350	11	**6SE7028–0ES87–2DC0**	8	740 x 305 x 485	20; 24	27
100	150	25	–	**6SE7031–6EB87–2DA0**	135 x 425 x 350	18	**6SE7031–6ES87–2DC0**	4	740 x 605 x 485	20; 25	47
170	255	42.5	–	**6SE7032–7EB87–2DA0**	135 x 425 x 350	18	**6SE7032–7ES87–2DC0**	2.35	740 x 1325 x 485	20; 26	103
DC link voltage 675 V to 810 V DC[2]											
5	7.5	1.25	0.16	**6SE7016–4FS87–2DA0**	45 x 425 x 350	6	**6SE7016–4FS87–2DC0**	124	145 x 180 x 540	20; 22	6
10	15	2.5	0.32	**6SE7021–3FS87–2DA0**	45 x 425 x 350	6	**6SE7021–3FS87–2DC0**	62	145 x 360 x 540	20; 22	11.5
50	75	12.5	–	**6SE7026–4FA87–2DA0**	90 x 425 x 350	11	**6SE7026–4FS87–2DC0**	12.4	740 x 305 x 485	20; 24	27
100	150	25	–	**6SE7031–3FB87–2DA0**	135 x 425 x 350	18	**6SE7031–3FS87–2DC0**	6.2	740 x 605 x 485	20; 25	43
200	300	50	–	**6SE7032–5FB87–2DA0**	135 x 425 x 350	18	**6SE7032–5FS87–2DC0**	3.1	740 x 1325 x 485	20; 26	95
DC link voltage 890 V to 930 V DC[2]											
50	75	12.5	–	**6SE7025–3HA87–2DA0**	90 x 425 x 350	11	**6SE7025–3HS87–2DC0**	17.8	740 x 305 x 485	20; 24	28
200	300	50	–	**6SE7032–1HB87–2DA0**	135 x 425 x 350	18	**6SE7032–1HS87–2DC0**	4.45	740 x 1325 x 485	20; 26	101

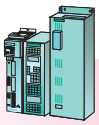
1) For power definition, see Section 6.

2) Permits the braking power for
Switch-on application threshold = 774 V
(≙ Supply voltage 3 AC 460 V)
Switch-on application threshold = 967 V
(≙ Supply voltage 3 AC 575 V)
Switch-on application threshold = 1158 V
(≙ Supply voltage 3 AC 690 V)

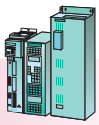
3) Braking resistor in type Compact PLUS for occasionally incurring braking energy, e. g. emergency stop.

4) CSA rating 240 W.

5) CSA rating 720 W.



recommended for connection to converter		recommended for connection to rectifier unit	
6SE7011–5EP60; 6SE7013–0EP60; 6SE7015–0EP60			
6SE7018–0EP60; 6SE7021–0EP60			
6SE7011–5EP60; 6SE7013–0EP60; 6SE7015–0EP60			
6SE7018–0EP60; 6SE7021–0EP60			
6SE7021–4EP60; 6SE7022–1EP60			
6SE7021–4EP60; 6SE7022–1EP60; 6SE7022–7EP60; 6SE7023–4EP60		6SE7024–1EP85–0AA0	
		6SE7031–2EP85–0AA0	
		6SE7032–3EP85–0AA0	
Power connections: Terminals		Power connections: Lugs	
DC voltage: Top External resistor: Bottom		DC voltage: Top External resistor: Bottom	
Connectable cable cross-section		Cable cross-section	Retaining bolt
Finely stranded	Single- and multi-stranded		
mm^2	mm^2	mm^2	
1.5 to 4	1.5 to 4	–	–
1.5 to 4	1.5 to 4	–	–
2.5 to 10	2.5 to 16	–	–
2.5 to 10	2.5 to 16	–	–
–	–	max. 1 x 95	M 8
–	–	max. 1 x 95	M 8
1.5 to 4	1.5 to 4	–	–
1.5 to 4	1.5 to 4	–	–
2.5 to 10	2.5 to 16	–	–
–	–	max. 1 x 95	M 8
–	–	max. 1 x 95	M 8
2.5 to 10	2.5 to 16	–	–
–	–	max. 1 x 95	M 8



Technical characteristics of line-side components

Line fuses

The 3NE1 SITOR® fuse protects both cables and semiconductors in one fuse. This results in considerable cost savings and shorter installation times.

For Order No. and equipment assignments, see page 3/46 onwards.

Line commutating reactor

The line commutating reactor reduces the harmonic currents and the commutating dips of the converters, rectifier units and rectifier/regenerative units. The effect of the reactor depends on the ratio of the system fault power to the drive's power.

Recommendation for the ratio of system fault power to drive's power > 33 : 1:

- A 2 % line commutating reactor should be used for converters and rectifier units.
- A 4 % line commutating reactor is recommended for rectifier/regenerative units.

For Order No. and equipment assignments, see page 3/46 onwards.

A line commutating reactor also limits current peaks caused by potential dips of the supply voltage (e.g. due to compensation equipment or ground faults).

For technical data, see Catalog PD 30, Order No.: E86060–K2803–A101–A1 (available only in German).

Autotransformer for the rectifier/regenerative units

In regenerating mode, rectifier/regenerative units need a 20 % higher supply voltage at the antiparallel inverter bridge. The voltage can be stepped-up using an autotransformer. There are two types of autotransformer available; one with 25 % and one with 100 % power-on duration. They comply with the necessary technical requirements and cannot be replaced by any other type.

The autotransformers are fitted with a thermal switch (terminals 1 and 2) as standard for temperature monitoring.

For Order No. and equipment assignments, see page 3/73 onwards.

For dimensions, see Section 7.

Radio-interference suppression filters (line filters)

For power ratings of up to 37 kW, the line filters reduce the interference voltages produced by converter, rectifier and rectifier/regenerative units to the limits permissible for residential supply systems according to EN 55 011, Class B1. These filters also comply to the limit values for Class A1.

For units with larger output ratings, the line filters reduce the radio-interference voltages of the converters, rectifier units and rectifier/regenerative units to the limits applicable to industrial supply systems.

For Order No. and equipment assignments, see page 3/46 onwards.

For dimensions, see Section 7.

The radio-interference suppression filters with Order No. 6SE70 can be used for a maximum supply voltage of 3-ph. 480 V AC and with TT and TN power systems (earthed systems) only.

The radio-interference suppression filters with Order No. B84143 are available for a supply voltage of up to 3-ph. 690 V AC. Their use in TT, TN or IT systems (insulated systems) must be indicated by the order number supplement.

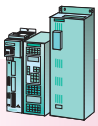
For IT systems, these filters can also be used in the 3-ph. 380 V to 480 V AC as well as in the 3-ph. 500 V to 600 V AC voltage range.

Notes regarding use of filters

- The limit values in the case of converters, rectifier units and rectifier/regenerative units are complied with only in conjunction with a line commutating reactor of 2 % v_K (also valid for line commutating reactors of 4 % v_K). The line commutating reactors are to be mounted in a metal cabinet.
- Line filters for earthed and non-earthed systems are available.
  The concept of a non-earthed system is violated by use of a radio-interference suppression filter. For more information, see the EMC product standard, EN 61 800-3.
  The use of a radio-interference suppression filter in a non-earthed system is therefore only a compromise between radio-interference suppression and interference-free operation when an earth fault occurs.
- In the case of units of sizes A to D, a connecting adapter for cable shields is to be used, see page 3/79.
- For the use of power cable for motor connection, see page 3/84.
- The cabinet design, the equipment layout and the wiring are to be carried out in accordance with EMC guidelines.

Information

For installation of SIMOVERT MASTERDRIVES according to EMC guidelines, see page 6/46.



Technical characteristics of DC link components

Components for connecting inverters and braking units

The inverters and braking units can be connected to the DC bus in three ways:

1. Direct connection

   As standard, the necessary fuses are integrated in the inverters, except for inverters sizes E to G (integrated fuses for these units available with option code L30), see page 3/93.

2. Electromechanical connection

   The electromechanical connection consists of a fuse switch disconnector, with fuses or disconnector lugs.

   Note:
   This connection must not be activated with a live system.

3. Electrical connection

   The electrical connection basically consists of fuse switch disconnectors, precharging resistors, a precharging contactor and a connecting contactor.

With Compact PLUS units, the DC links are connected by means of a special connecting system. There are no further components required except for the 3 x 10 mm buses (Cu tinned to DIN 46 433).

For Engineering Information, see Section 6.

For selection and ordering data of the components, see page 3/56 onwards.

Free-wheeling diode

The free-wheeling diode prevents consequential damage to braking units and lower output rating inverters when the DC fuses on a higher power rating inverter blow or when, with a rectifier/regenerative unit, the fuses blow in the event of commutation failure.

For Engineering Information, see Section 6.

Technical characteristics of load-side components and cables

Output reactors

Output reactors compensate capacitive charging/discharging currents when long motor cables are connected and limit the d*v*/d*t* at the motor terminals.

For the maximum cable lengths which can be connected with and without reactors, see page 6/50.

Voltage limitation filters (output dv/dt filters)

Voltage limitation filters are to be used together with motors where the dielectric strength of the insulating system is unknown or insufficient.

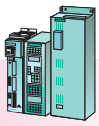
Sine filters

The use of sine filters ensures that the motors are supplied with a practically sinusoidal voltage and current waveform. The distortion factor for a motor voltage frequency of 50 Hz with a sine filter is approximately 5 %. The stress on the motors which are supplied via sine filters is below the level according to DIN VDE 0530.

Engineering Information

On the load-side components, see Section 6.

For selection and ordering data, see page 3/46 and onwards.



Technical characteristics of the 6FX MOTION CONNECT power and signal cables

Motor cables

The 6FX5 and 6FX8 cables are suitable for use with the most varied of production and processing machines.

The cables can be used universally. They are:

- mechanically and chemically robust,
- CFC and silicone free,
- EMC-tested,
- with UL certification.

They meet demanding requirements and are characterized by:

- high bending cycles together with small bending radii,
- resistance to aggressive substances,
- environment-friendliness (CFC, silicone and halogen free),
- and their large contribution to electromagnetic compatibility.

Encoder cables

With the prefabricated 6FX5 and 6FX7 cables, connection of an incremental encoder to the CUVC control board (or T300 technology board or the SBP option board) is significantly simplified. The connector for the incremental encoder is already attached. This saves time and avoids wiring errors.

The 6FX. cables, prefabricated and sold by the meter, are described in detail in Catalog NC Z.

3

Technical Data MOTION CONNECT 500 and MOTION CONNECT 800

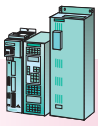
	MOTION CONNECT 500 Type 6FX5008–. . . . .–. . . .	MOTION CONNECT 800 Type 6FX8008–. . . . .–. . . .
Certifications		
Power/signal cables		
• VDE[1])	yes	yes
• c/UL or UL/CSA	758/C22.2N.210.2–M9C	758/C22.2N.210.2–M9C
• UL/CSA File No.[2])	yes	yes
Electrical data acc. to DIN VDE 0472		
Rated voltage		
• power cable V_0/V		
– supply cores	600/1000 V	600/1000 V
– signal cores	24 V (VDE) 1000 V (UL)	24 V (VDE) 1000 V (UL/CSA)
• signal cable	30 V	30 V
Test voltage		
• power cable		
– supply cores	4 kV_{rms}	4 kV_{rms}
– signal cores	2 kV_{rms}	2 kV_{rms}
• signal cable	500 V_{rms}	500 V_{rms}
Operating temperature		
on the surface		
rated voltage		
• fixed cable	–20 °C to +80 °C	–50 °C to +80 °C
• moving cable	0 °C to +60 °C	–20 °C to +60 °C
Mechanical data		
Max. tensile stress per conductor cross-section		
• fixed cable	50 N/mm²	50 N/mm²
• moving cable	–	20 N/mm²
Smallest permissible bending radius		
• fixed cable (power cable)	5 x D_{max}	6 x D_{max}
fixed cable (signal cable)	see catalog NC Z	see catalog NC Z
• moving cable (power cable)	see catalog NC Z	see catalog NC Z
moving cable (signal cable)	see catalog NC Z	see catalog NC Z
Torsional stress	30 °/m absolute	30 °/m absolute
Power cable bends		
• 1.5 to 6 mm² + signal	100 x 10^3	10 x 10^6
• 10 to 50 mm²	100 x 10^3	3 x 10^6
Signal cable bends	2 x 10^6	10 x 10^6
Traverse rate (power cables)		
• 1.5 to 6 mm² + signal	30 m/min.	180 m/min.
• 10 to 50 mm²	30 m/min.	100 m/min.
Traverse rate (signal cables)	180 m/min. (5 m); 100 m/min. (15 m)	180 m/min.
Acceleration (power cables)	2 m/s²	5 m/s² (5 m); 10 m/s² (2.5 m)
Acceleration (signal cables)	5 m/s²	5 m/s² (5 m); 10 m/s² (2.5 m)
Chemical data		
Insulation material	CFC free	Halogen, silicone and CFC free, DIN 47 2815/IEC 60 754-1
Oil resistance	DIN VDE 0472, part 803, type of test B hydraulic oil only	VDE 0472, part 803, type of test B
Outer sheath		
• power cable	PVC, color DESINA: orange RAL 2003	PUR DIN VDE 0282, part 10, color DESINA: orange RAL 2003
• signal cable	PVC, color DESINA: green RAL 6018	PUR DIN VDE 0282, part 10, color DESINA: green RAL 6018
Flame resistant[3])	IEC 60 332.3	IEC 60 332.3

The cables are not suitable for outdoor use.
The technical data of these cables only apply to simple bends with horizontal travel of up to five meters.
Degree of protection for the customized power and signal cables and their extension cables **when plugged and closed: IP67**

1) The corresponding registration numbers are printed on the cable sheath.

2) The File No. of the respective manufacturers are printed on the cable sheath.

3) For UL/CSA VW1 is printed on the cable sheath. Not for c/UL.



Technical characteristics of PROTOFLEX control cables and PROTODUR motor connecting cable

Technical data PROTOFLEX-EMV-CY, PROTOFLEX-EMV-3PLUS and 4-PLUS-UV

Control cables for power wiring, e.g. for compliance with EN 55 011, Class B

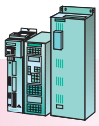
Rated voltage	V_0/V: 600 V/1000 V, max. 1700 V to DIN VDE 0250, Part 1		
Cables	Copper, finely-stranded, to DIN VDE 0295, Class 5 or better		
Insulating covering	Insulating compound made of PE, 2YI2, to DIN VDE 0207, Part 2		
Core identification	Green-yellow, black, brown, blue to DIN VDE 0293		
Outer sheath	PVC compound YM 2 to DIN VDE 0207, Part 5, Color: see page 3/82		
Shield	Total shield under the outer sheath Braid made of tin-plated copper wires Max. transfer impedance: 250 Ω/km at 30 MHz to DIN VDE 0250, Part 405		
Bending radius	Outer diameter d ≤ 12 mm	12 < d ≤ 20 mm	> 20 mm
– Free moving	5 d	7.5 d	10 d
– Fixed	10 d	15 d	20 d
Tensile load			
– Flexible applications	≤ 20 N/mm² to DIN VDE 0298, Part 3		
– Fixed	≤ 50 N/mm² to DIN VDE 0298, Part 3		
Temperature limits			
– Operation	max. +70 °C		
– Short-circuit ≤ 5 s	+160 °C		
– Storage and transport	–40 °C to +70 °C		

Technical data PROTODUR power cable

Motor connecting cable with concentric CEANDER conductors, e.g. for compliance with EN 55 011, Class A

NYCWY-0.6/1 kV to DIN VDE 0271, IEC 502

Rated voltage	V_0/V: 600 V/1000 V
Cables	Copper to DIN VDE 0295
– RE	Round cables, single-wire
– RM	Round cables, stranded
– SM	Sector cables, stranded
Insulating covering	Thermoplastic insulating compound made of PVC, YI 4, to DIN VDE 0207, Part 4
Core identification	black, brown, blue to DIN VDE 0293
Outer sheath	PVC compound YM 3 to DIN VDE 0207, Part 5
Shield	Concentric CEANDER conductor
Bending radius	≥ 12 x cable diameter
Tensile load	
– Fixed	≤ 50 N/mm²
Temperature limits	
– Operation	max. +70 °C
– Short-circuit ≤ 5 s	+160 °C
– Storage and transport	–40 °C to +70 °C



Selection and ordering data

Nominal power rating	Converter	Switch disconnector[2]		Switch disconnector with fuse holders[2]			Fuse switch disconnectors[1][2]			Circuit-breakers for system and motor protection to IEC 947-4[3][4]	
			Rated current		Rated current	Max. fuse size		Rated current	Max. fuse size		Rated current range
kW	Order No.	Order No.	A	Order No.	A		Order No.	A		Order No.	A
Compact PLUS units [5]											
Supply voltage 3-ph. 380 V to 480 V AC											
400 V											
0.55	**6SE7011–5EP60**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1CA10	1.8– 2.5
1.1	**6SE7013–0EP60**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1FA10	3.5– 5.0
1.5	**6SE7015–0EP60**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1HA10	5.5– 8.0
3	**6SE7018–0EP60**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1KA10	9.0– 12.5
4	**6SE7021–0EP60**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1KA10	9.0– 12.5
5.5	**6SE7021–4EP60**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–4AA10	11 – 16
7.5	**6SE7022–1EP60**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–4BA10	14 – 20
11	**6SE7022–7EP60**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1031–4EA10	22 – 32
15	**6SE7023–4EP60**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1031–4FA10	28 – 40
Compact and chassis units											
Supply voltage 3-ph. 380 V to 480 V AC											
400 V											
2.2	**6SE7016–1EA61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1HA10	5.5– 8
3	**6SE7018–0EA61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1KA10	9 – 12.5
4	**6SE7021–0EA61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1KA10	9 – 12.5
5.5	**6SE7021–3EB61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–4AA10	11 – 16
7.5	**6SE7021–8EB61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–4BA10	14 – 20
11	**6SE7022–6EC61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1031–4EA10	22 – 32
15	**6SE7023–4EC61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1031–4FA10	28 – 40
18.5	**6SE7023–8ED61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1031–4HA10	40 – 50
22	**6SE7024–7ED61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1041–4JA10	45 – 63
30	**6SE7026–0ED61**	3KA51 30–1EE01	80	3KL52 30–1EB01	125	00	3NP40 10–0CH01	100	000	3RV1041–4KA10	57 – 75
37	**6SE7027–2ED61**	3KA51 30–1EE01	80	3KL52 30–1EB01	125	00	3NP40 10–0CH01	100	000	3RV1041–4LA10	70 – 90
45	**6SE7031–0EE60**	3KA53 30–1EE01	160	3KL52 30–1EB01	125	00	3NP40 70–0CA01	160	00	3VF3211–1BU41–0AA0	100 – 125
55	**6SE7031–2EF60**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF3311–1BX41–0AA0	160 – 200
75	**6SE7031–5EF60**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF3311–1BX41–0AA0	160 – 200
90	**6SE7031–8EF60**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF4211–1BM41–0AA0	200 – 250
110	**6SE7032–1EG60**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF5211–1BK41–0AA0	250 – 315
132	**6SE7032–6EG60**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP43 70–0CA01	400	1; 2	3VF5211–1BK41–0AA0	250 – 315
160	**6SE7033–2EG60**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP43 70–0CA01	400	1; 2	3VF5211–1BM41–0AA0	315 – 400
200	**6SE7033–7EG60**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP43 70–0CA01	400	1; 2	3VF6211–1BK44–0AA0	400 – 500
250	**6SE7035–1EK60**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	3	3NP44 70–0CA01	630	2; 3	3VF6211–1BM44–0AA0	500 – 600
315	**6SE7036–0EK60**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	3	3NP44 70–0CA01	630	2; 3	3VF7111–1BK60–0AA0	630
400	**6SE7037–0EK60**	3KE45	1000	–			–			3VF7111–1BK60–0AA0	800

1) Fuse switch disconnectors:
Please observe the size of the cable-protection fuses and semiconductor-protection fuses!

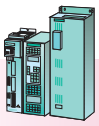
2) Can be optionally used depending on requirements. For further information, see catalog "Low-voltage switchgear".

3) See catalog "Low-voltage switchgear".
Used for drive converters with a line supply inductance of ≥ 3 % referred to the drive converter impedance, i.e. so that the ratio of the system fault level to the converter output is 33 : 1 or 100 : 1 and an additional 2 % line reactor is used. For the 100 kA system fault level, it may be necessary to use a fuse, as listed in the catalog "Low-voltage switchgear".

Unit impedance: $Z = \frac{V_{supply}}{\sqrt{3} \cdot I_{V\,supply}}$

4) Caution:
Observe rated short-circuit breaking capacity I_{CN} and, if necessary, use the specified fuses.

5) The recommended system components are for a converter that acts as a single drive. If the converter supplies a multi-motor system, the supply current is larger than the current for a single drive by a factor of up to 1.6 (rated supply current = 1.76 x rated output current I_R).
In this case, system components with a corresponding current-carrying capacity are to be selected.



Cable-protection fuses Duty class gL[1][3]			Semiconductor-protection fuses Duty class gR[3] incl. cable protection			Radio-interference suppression filter		Main contactor/ AC contactor[4]		Commutating reactor v_D = 2 %		
	Rated current	Size		Rated current	Size		Class[2] P_v type	AC 1 duty at 40°C	Rated current		P_v 50/60 Hz	Rated current
Order No.	A		Order No.	A		Order No.	W	Order No.	A	Order No.	W	A
										400/480 V, 50/60 Hz		
3NA3 803	10	00	3NE1 813–0	16	000	6SE7012–0EP87–0FB1[6]	B1 5	3RT10 15	18	4EP3200–4US00	8/ 10	1.5
3NA3 803	10	00	3NE1 813–0	16	000	6SE7016–0EP87–0FB1[6]	B1 13	3RT10 15	18	4EP3200–5US00	12/ 18	3.0
3NA3 803	10	00	3NE1 813–0	16	000	6SE7016–0EP87–0FB1[6]	B1 13	3RT10 15	18	4EP3200–2US00	23/ 35	5.0
3NA3 805	16	00	3NE1 813–0	16	000	6SE7021–2EP87–0FB1[6]	B1 23	3RT10 15	18	4EP3400–2US00	35/ 38	9.1
3NA3 805	16	00	3NE1 813–0	16	000	6SE7021–2EP87–0FB1[6]	B1 23	3RT10 15	18	4EP3400–1US00	35/ 38	11.2
3NA3 810	25	00	3NE1 814–0	20	000	6SE7021–8EP87–0FB1[6]	B1 26	3RT10 16	22	4EP3500–0US00	45/ 48	16
3NA3 810	25	00	3NE1 815–0	25	000	6SE7023–4ES87–0FB1 6SE7023–8EP87–0FB1[7]	B1 30	3RT10 16	22	4EP3600–4US00	52/ 57	18
3NA3 814	35	00	3NE1 803–0	35	000	6SE7023–4ES87–0FB1 6SE7023–8EP87–0FB1[7]	B1 30	3RT10 25	40	4EP3600–5US00	52/ 57	28
3NA3 817	40	00	3NE1 802–0	40	000	6SE7023–4ES87–0FB1 6SE7023–8EP87–0FB1[7]	B1 30	3RT10 34	50	4EP3700–2US00	57/ 60	35.5
										400/480 V, 50/60 Hz		
3NA3 803	10	00	–			6SE7021–0ES87–0FB1[5]	B1 15	3RT1015	18	4EP3200–1US00	23/ 35	6.3
3NA3 805	16	00	3NE1 813–0	16	000	6SE7021–0ES87–0FB1[5]	B1 15	3RT1015	18	4EP3400–2US00	35/ 38	9.1
3NA3 805	16	00	3NE1 813–0	16	000	6SE7021–0ES87–0FB1[5]	B1 15	3RT1015	18	4EP3400–1US00	35/ 38	11.2
3NA3 810	25	00	3NE1 814–0	20	000	6SE7021–8ES87–0FB1[5]	B1 20	3RT1016	22	4EP3500–0US00	45/ 48	16
3NA3 810	25	00	3NE1 815–0	25	000	6SE7021–8ES87–0FB1[5]	B1 20	3RT1016	22	4EP3600–4US00	52/ 57	18
3NA3 814	35	00	3NE1 803–0	35	000	6SE7023–4ES87–0FB1[5]	B1 30	3RT1025	40	4EP3600–5US00	52/ 57	28
3NA3 817	40	00	3NE1 802–0	40	000	6SE7023–4ES87–0FB1[5]	B1 30	3RT1034	50	4EP3700–2US00	57/ 60	35.5
3NA3 820	50	00	3NE1 817–0	50	000	6SE7027–2ES87–0FB1[5]	B1 40	3RT1034	50	4EP3700–5US00	57/ 60	40
3NA3 822	63	00	3NE1 818–0	63	000	6SE7027–2ES87–0FB1[5]	B1 40	3RT1035	60	4EP3800–2US00	67/ 71	50
3NA3 824	80	00	3NE1 820–0	80	000	6SE7027–2ES87–0FB1[5]	B1 40	3RT1044	100	4EP3800–7US00	67/ 71	63
3NA3 830	100	00	3NE1 021–0	100	00	6SE7027–2ES87–0FB1[5]	B1 40	3RT1044	100	4EP3900–2US00	82/ 87	80
3NA3 032	125	0	3NE1 021–0	100	00	6SE7031–2ES87–0FA1[5]	A1 50	3RT1045	120	4EP4000–2US00	96/103	100
3NA3 036	160	0	3NE1 224–0	160	1	6SE7031–8ES87–0FA1[5]	A1 70	3RT1446	140	4EP4000–6US00	96/103	125
3NA3 140	200	1	3NE1 225–0	200	1	6SE7031–8ES87–0FA1[5]	A1 70	3RT1055	185	4EU2452–2UA00–0AA0	154/163	160
3NA3 144	250	1	3NE1 227–0	250	1	6SE7031–8ES87–0FA1[5]	A1 70	3RT1056	215	4EU2552–4UA00–0AA0	187/201	200
3NA3 144	250	1	3NE1 227–0	250	1	6SE7033–2ES87–0FA1[5]	A1 100	3RT1456	275	4EU2552–8UA00–0AA0	187/201	224
3NA3 252	315	2	3NE1 230–0	315	1	6SE7033–2ES87–0FA1[5]	A1 100	3RT1065	330	4EU2752–0UB00–0AA0	253/275	280
3NA3 260	400	2	3NE1 332–0	400	2	6SE7033–2ES87–0FA1[5]	A1 100	3RT1065	330	4EU2752–7UA00–0AA0	253/275	315
3NA3 365	500	3	3NE1 333–0	450	2	6SE7036–0ES87–0FA1[5]	A1 120	3RT1075	430	4EU2752–8UA00–0AA0	253/275	400
3NA3 372	630	3	3NE1 435–0	560	3	6SE7036–0ES87–0FA1[5]	A1 120	3RT1076	610	4EU3052–5UA00–0AA0	334/367	560
3NA3 475	800	4	3NE1 436–0	630	3	6SE7036–0ES87–0FA1[5]	A1 120	2 x 3RT1075	774	4EU3052–6UA00–1BA0	334/367	630
3NA3 475	800	4	3NE1 438–1	800	3	6SE7041–0ES87–0FA1[5]	A1 200	3 x 3RT1075	774	4EU3652–8UA00–1BA0	450/495	720

1) Does not provide 100 % protection for the input rectifier of the unit.

2) Compliance with limit-value class according to EN 55 011 can only be ensured if a line commutating reactor with V_D = 2 % is used (line commutating reactor with V_D = 4 % also possible).

3) The cable cross-sections must be dimensioned according to DIN VDE 0100, VDE 0298 Part 4 and as a function of the rated fuse currents.

4) See catalog "Low-voltage switchgear".

5) Can only be used with TT and TN systems (earthed system).

6) Filter with integrated commutating reactor u_D = 2 % with UL certification.

7) Filter with integrated commutating reactor V_D = 2 % and UL certification. Available fall 2003.

Selection and ordering data

Nominal power rating	Converter	Switch disconnector[2]		Switch disconnector with fuse holders[2]			Fuse switch disconnectors[1][2]			Circuit-breakers for system and motor protection to IEC 947-4-3[3][4]	
			Rated current		Rated current	Max. fuse size		Rated current	Max. fuse size		Rated current range
kW	Order No.	Order No.	A	Order No.	A		Order No.	A		Order No.	A
Supply voltage 3-ph. 500 V to 600 V AC											
500 V											
2.2	**6SE7014–5FB61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1GA10	4.5– 6.3
3	**6SE7016–2FB61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1HA10	5.5– 8
4	**6SE7017–8FB61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1JA10	7 – 10
5.5	**6SE7021–1FB61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–1KA10	9 – 12.5
7.5	**6SE7021–5FB61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1021–4BA10	14 – 20
11	**6SE7022–2FC61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1031–4EA10	22 – 32
18.5	**6SE7023–0FD61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1031–4FA10	28 – 40
22	**6SE7023–4FD61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1031–4FA10	28 – 40
30	**6SE7024–7FD61**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000	3RV1041–4JA10	45 – 63
37	**6SE7026–1FE60**	3KA51 30–1EE01	80	3KL52 30–1EB01	125	00	3NP40 10–0CH01	100	000	3VF3111–1BN41–0AA0	50 – 63
45	**6SE7026–6FE60**	3KA51 30–1EE01	80	3KL52 30–1EB01	125	00	3NP40 10–0CH01	100	000	3VF3111–1BQ41–0AA0	63 – 80
55	**6SE7028–0FF60**	3KA52 30–1EE01	125	3KL52 30–1EB01	125	00	3NP40 70–0CA01	160	00	3VF3211–1BU41–0AA0	100 –125
75	**6SE7031–1FF60**	3KA53 30–1EE01	160	3KL52 30–1EB01	125	00	3NP40 70–0CA01	160	00	3VF3311–1BX41–0AA0	160 –200
90	**6SE7031–3FG60**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF3311–1BX41–0AA0	160 –200
110	**6SE7031–6FG60**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF3311–1BX41–0AA0	160 –200
132	**6SE7032–0FG60**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF4211–1BM41–0AA0	200 –250
160	**6SE7032–3FG60**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF5211–1BK41–0AA0	250 –315
200	**6SE7033–0FK60**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP43 70–0CA01	400	1; 2	3VF5211–1BM41–0AA0	315 –400
250	**6SE7033–5FK60**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP43 70–0CA01	400	1; 2	3VF6211–1BK44–0AA0	400 –500
315	**6SE7034–5FK60**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	3	3NP44 70–0CA01	630	2; 3	3VF6211–1BM44–0AA0	500 –630
Supply voltage 3-ph. 660 V to 690 V AC											
690 V											
55	**6SE7026–0HF60**	3KA51 30–1EE01	80	3KL52 30–1EB01	125	00	3NP40 10–0CH01	100	000	3VF3111–1BQ41–0AA0	63 – 80
75	**6SE7028–2HF60**	3KA51 30–1EE01	80	3KL52 30–1EB01	125	00	3NP40 10–0CH01	100	000	3VF3211–1BU41–0AA0	100 –125
90	**6SE7031–0HG60**	3KA53 30–1EE01	160	3KL52 30–1EB01	125	00	3NP40 70–0CA01	160	00	3VF3211–1BW41–0AA0	125 –160
110	**6SE7031–2HG60**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF3211–1BW41–0AA0	125 –160
132	**6SE7031–5HG60**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF3311–1BX41–0AA0	160 –200
160	**6SE7031–7HG60**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF4211–1BM41–0AA0	200 –250
200	**6SE7032–1HG60**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1	3VF5211–1BK41–0AA0	250 –315
250	**6SE7033–0HK60**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP43 70–0CA01	400	1; 2	3VF5211–1BM41–0AA0	315 –400
315	**6SE7033–5HK60**	3KA57 30–1EE01	400	3KL61 30–1AB0	630	3	3NP44 70–0CA01	630	2; 3	3VF6211–1BK44–0AA0	400 –500
400	**6SE7034–5HK60**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	3	3NP44 70–0CA01	630	2; 3	3VF6211–1BM4–0AA0	500 –630

1) Fuse switch disconnectors:
Please observe the size of the cable-protection fuses and semiconductor-protection fuses!

2) Can be optionally used depending on requirements. For further information, see catalog "Low-voltage switchgear".

3) See catalog "Low-voltage switchgear".
Used for drive converters with a line supply inductance of ≥ 3 % referred to the drive converter impedance, i.e. so that the ratio of the system fault level to the converter output is 33 : 1 or 100 : 1 if additional 2 % line reactor is used. For the 100 kA system fault level, it may be necessary to use a fuse, as listed in the catalog "Low-voltage switchgear".

Unit impedance: $Z = \frac{V_{supply}}{\sqrt{3} \cdot I_{V\,supply}}$

4) Caution:
Observe rated short-circuit breaking capacity I_{CN} and, if necessary, use the specified fuses.

Cable-protection fuses Duty class gL[1][3]				Semiconductor-protection fuses Duty class gR[3] incl. cable protection			Radio-interference suppression filter[2]		Main contactor/ AC contactor[4]		Commutating reactor v_D = 2 %		
		Rated current	Size		Rated current	Size		P_v type	AC 1 duty at 40 °C	Rated current		P_v 50/60 Hz	Rated current
Order No.		A		Order No.	A		Order No.	W	Order No.	A	Order No.	W	A
to 500 V	**to 600 V**										**500 V, 50 Hz**		
3NA3 803	3NA3 803–6	10	000	3NE1 813–0	16	000	B84143–A25–R21[5]	25	3RT10 15	18	4EP3200–2US00	23	5
3NA3 803	3NA3 803–6	10	000	3NE1 813–0	16	000	B84143–A25–R21[5]	25	3RT10 15	18	4EP3300–0US00	31	6.3
3NA3 807	3NA3 807–6	20	000	3NE1 814–0	20	000	B84143–A25–R21[5]	25	3RT10 15	18	4EP3400–3US00	35	8
3NA3 807	3NA3 807–6	20	000	3NE1 814–0	20	000	B84143–A25–R21[5]	25	3RT10 15	18	4EP3600–8US00	52	12.5
3NA3 807	3NA3 807–6	20	000	3NE1 814–0	20	000	B84143–A25–R21[5]	25	3RT10 16	22	4EP3600–2US00	52	16
3NA3 814	3NA3 814–6	35	000	3NE1 803–0	35	000	B84143–A25–R21[5]	25	3RT10 25	40	4EP3600–3US00	52	22.4
3NA3 817	3NA3 817–6	40	000/00	3NE1 802–0	40	000	B84143–A36–R21[5]	30	3RT10 25	40	4EP3700–6US00	57	31.5
3NA3 820	3NA3 820–6	50	000/00	3NE1 802–0	40	000	B84143–A36–R21[5]	30	3RT10 25	40	4EP3700–1US00	57	35.5
3NA3 822	3NA3 822–6	63	000/00	3NE1 818–0	63	000	B84143–A50–R21[5]	35	3RT10 35	60	4EP3800–1US00	67	50
3NA3 824	3NA3 824–6	80	000/00	3NE1 818–0	63	000	B84143–A80–R21[5]	40	3RT10 44	100	4EP3900–1US00	82	63
3NA3 824	3NA3 824–6	80	000/00	3NE1 820–0	80	000	B84143–A80–R21[5]	40	3RT10 44	100	4EP4000–7US00	96	71
3NA3 830	3NA3 830–6	100	000/00	3NE1 021–0	100	00	B84143–A80–R21[5]	40	3RT10 44	100	4EP4000–1US00	96	80
3NA3 136	3NA3 136–6	160	1	3NE1 022–0	125	00	B84143–A120–R21[5]	50	3RT10 45	120	4EP4000–8US00	96	112
3NA3 136	3NA3 136–6	160	1	3NE1 224–0	160	1	B84143–A150–R21[5]	60	3RT10 54	160	4EU2452–1UA00–0AA0	154	140
3NA3 140	3NA3 140–6	200	1	3NE1 225–0	200	1	B84143–A180–R21[5]	70	3RT10 55	185	4EU2552–2UA00–0AA0	187	160
3NA3 244	3NA3 244–6	250	2	3NE1 227–0	250	1	B84143–B250–S□□	90	3RT10 56	215	4EU2552–6UA00–0AA0	187	200
3NA3 252	3NA3 252–6	315	2	3NE1 227–0	250	1	B84143–B250–S□□	90	3RT14 56	275	4EU2752–2UA00–0AA0	253	250
3NA3 260	3NA3 260–6	400	2	3NE1 331–0	350	2	B84143–B320–S□□	100	3RT10 65	330	4EU2752–3UA00–0AA0	253	315
3NA3 365	3NA3 365–6	500	3	3NE1 332–0	400	2	B84143–B600–S□□	120	3RT10 75	430	4EU2752–4UA00–0AA0	253	400
3NA3 365	3NA3 365–6	500	3	3NE1 334–0	500	2	B84143–B600–S□□	120	3RT10 75	610	4EU3052–2UA00–0AA0	334	450
											690 V, 50 Hz		
3NA3 824–6		80	00	3NE1 818–0	63	000	B84143–A80–R21[5]	40	3RT10 44	100	4EP4000–3US00	96	63
3NA3 830–6		100	00	3NE1 021–0	100	00	B84143–A120–R21[5]	50	3RT10 44	100	4EU2452–3UA00–0AA0	154	91
3NA3 136–6		160	1	3NE1 022–0	125	00	B84143–A120–R21[5]	50	3RT10 45	120	4EU2552–7UA00–0AA0	187	100
3NA3 136–6		160	1	3NE1 224–0	160	1	B84143–A120–R21[5]	50	3RT14 46	140	4EU2552–3UA00–0AA0	187	125
3NA3 136–6		160	1	3NE1 224–0	160	1	B84143–A150–R21[5]	60	3RT10 54	160	4EU2552–0UB00–0AA0	187	160
3NA3 140–6		200	1	3NE1 225–0	200	1	B84143–A180–R21[5]	70	3RT10 56	215	4EU2752–5UA00–0AA0	253	180
3NA3 244–6		250	2	3NE1 227–0	250	1	B84143–B250–S□□	90	3RT14 56	275	4EU2752–6UA00–0AA0	253	224
3NA3 360–6		400	3	3NE1 332–0	400	2	B84143–B320–S□□	100	3RT10 65	330	4EU3052–3UA00–0AA0	334	315
3NA3 360–6		400	3	3NE1 332–0	400	2	B84143–B600–S□□	120	3RT14 66	400	4EU3052–4UA00–0AA0	334	400
3NA3 365–6		500	3	3NE1 334–0	500	2	B84143–B600–S□□	120	3RT10 76	610	4EU3652–5UA00–0AA0	334	500

B84143–B . . . –S□□

For 500 V TT and TN systems (earthed system)	2 0
For 690 V TT and TN systems (earthed system)	2 1
For 380 V to 690 V IT systems (non-earthed system)	2 4

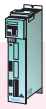
1) Does not provide 100 % protection for the input rectifier of the unit.

2) Available from EPCOS (www.epcos.com). Further information on the filters can be found at www4.ad.siemens.de. Please enter the following number under "Entry ID": 65 67 129.

3) The cable cross-sections must be dimensioned according to DIN VDE 0100, VDE 0298 Part 4 and as a function of the rated fuse currents.

4) See catalog "Low-voltage switchgear".

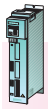
5) Can only be used with TT and TN systems (earthed system).



Selection and ordering data

Nominal power rating	Converter	Inverter	Output sinusoidal filter[1]	$f_{max.}$	P_v max.	Output reactor[1] Iron-core reactor $f_{max.}$ = 300 Hz	P_v max.
kW	Order No.	Order No.	Order No.	Hz	W	Order No.	W
Supply voltage 3-ph. 380 V to 480 V AC							
400 V			f_{pulse} = 6 kHz			$f_{pulse} \leq$ 3 kHz	
0.55	**6SE7011–5EP60**	–	–			6SE7013–0ES87–1FE0	50
1.1	**6SE7013–0EP60**	–	–			6SE7013–0ES87–1FE0	50
1.5	**6SE7015–0EP60**	–	6SE7016–1EA87–1FC0	400	150	6SE7015–0ES87–1FE0	60
3	**6SE7018–0EP60**	–	6SE7021–0EB87–1FC0	400	200	6SE7021–0ES87–1FE0	80
4	**6SE7021–0EP60**	–	6SE7021–0EB87–1FC0	400	200	6SE7021–0ES87–1FE0	80
5.5	**6SE7021–4EP60**	–	6SE7021–8EB87–1FC0	400	250	6SE7021–8ES87–1FE0	95
7.5	**6SE7022–1EP60**	–	6SE7022–6EC87–1FC0	400	300	6SE7022–6ES87–1FE0	110
11	**6SE7022–7EP60**	–	6SE7022–6EC87–1FC0	400	300	6SE7022–6ES87–1FE0	110
15	**6SE7023–4EP60**	–	6SE7023–4EC87–1FC0	400	400	6SE7023–4ES87–1FE0	130
Supply voltage 510 V to 650 V DC							
400 V			f_{pulse} = 6 kHz			$f_{pulse} \leq$ 3 kHz	
0.75	–	**6SE7012–0TP60**	–			6SE7013–0ES87–1FE0	50
1.5	–	**6SE7014–0TP60**	–			6SE7015–0ES87–1FE0	60
2.2	–	**6SE7016–0TP60**	6SE7016–1EA87–1FC0	400	150	6SE7016–1ES87–1FE0	80
4	–	**6SE7021–0TP60**	6SE7021–0EB87–1FC0	400	200	6SE7021–0ES87–1FE0	80
5.5	–	**6SE7021–3TP60**	6SE7021–8EB87–1FC0	400	250	6SE7021–8ES87–1FE0	95
7.5	–	**6SE7021–8TP60**	6SE7021–8EB87–1FC0	400	250	6SE7021–8ES87–1FE0	95
11	–	**6SE7022–6TP60**	6SE7022–6EC87–1FC0	400	300	6SE7022–6ES87–1FE0	110
15	–	**6SE7023–4TP60**	6SE7023–4EC87–1FC0	400	400	6SE7023–4ES87–1FE0	130
18.5	–	**6SE7023–8TP60**	6SE7024–7ED87–1FC0	400	500	6SE7024–7ES87–1FE0	190

1) See Engineering Information, Section 6.



Output filter reactor[1]) Ferrite-core reactor	$f_{max.}$	P_v max.	Output dv/dt filter[1]) $f_{max.}$ = 300 Hz	P_v max.
Order No.	Hz	W	Order No.	W
f_{pulse} ≤ 6 kHz			f_{pulse} ≤ 3 kHz	
–			–	
–			–	
6SE7016–1ES87–1FF1	600	96	6SE7016–2FB87–1FD0	100
6SE7021–0ES87–1FF1	600	96	6SE7021–5FB87–1FD0	150
6SE7021–0ES87–1FF1	600	96	6SE7021–5FB87–1FD0	150
6SE7021–8ES87–1FF1	600	96	6SE7021–5FB87–1FD0	150
6SE7022–6ES87–1FF0	600	100	6SE7022–2FC87–1FD0	170
6SE7022–6ES87–1FF0	600	100	6SE7022–2FC87–1FD0	170
6SE7023–4ES87–1FF0	600	115	6SE7023–4FC87–1FD0	170
f_{pulse} ≤ 6 kHz			f_{pulse} ≤ 3 kHz	
–			–	
–			–	
6SE7016–1ES87–1FF1	600	96	6SE7016–2FB87–1FD0	100
6SE7021–0ES87–1FF1	600	96	6SE7021–5FB87–1FD0	150
6SE7021–8ES87–1FF1	600	96	6SE7021–5FB87–1FD0	150
6SE7021–8ES87–1FF1	600	96	6SE7021–5FB87–1FD0	150
6SE7022–6ES87–1FF0	600	100	6SE7022–2FC87–1FD0	170
6SE7023–4ES87–1FF0	600	115	6SE7023–4FC87–1FD0	170
6SE7024–7ES87–1FF0	600	170	6SE7024–7FC87–1FD0	200

Selection and ordering data

Nominal power rating	Converter	Inverter	Output sinusoidal filter[1]			Output reactor[1]	
				$f_{max.}$	P_v max.	Iron-core reactor $f_{max.}$ = 300 Hz	P_v max.
kW	Order No.	Order No.	Order No.	Hz	W	Order No.	W
Supply voltage 3-ph. 380 V to 480 V and DC voltage 510 V to 650 V DC							
400 V			f_{pulse} = 6 kHz			$f_{pulse} \leq$ 3 kHz	
2.2	**6SE7016–1EA61**	**6SE7016–1TA61**	6SE7016–1EA87–1FC0	400	150	6SE7016–1ES87–1FE0	80
3	**6SE7018–0EA61**	**6SE7018–0TA61**	6SE7021–0EB87–1FC0	400	200	6SE7021–0ES87–1FE0	80
4	**6SE7021–0EA61**	**6SE7021–0TA61**	6SE7021–0EB87–1FC0	400	200	6SE7021–0ES87–1FE0	80
5.5	**6SE7021–3EB61**	**6SE7021–3TB61**	6SE7021–8EB87–1FC0	400	250	6SE7021–8ES87–1FE0	95
7.5	**6SE7021–8EB61**	**6SE7021–8TB61**	6SE7021–8EB87–1FC0	400	250	6SE7021–8ES87–1FE0	95
11	**6SE7022–6EC61**	**6SE7022–6TC61**	6SE7022–6EC87–1FC0	400	300	6SE7022–6ES87–1FE0	110
15	**6SE7023–4EC61**	**6SE7023–4TC61**	6SE7023–4EC87–1FC0	400	400	6SE7023–4ES87–1FE0	130
18.5	**6SE7023–8ED61**	**6SE7023–8TD61**	6SE7024–7ED87–1FC0	400	500	6SE7024–7ES87–1FE0	190
22	**6SE7024–7ED61**	**6SE7024–7TD61**	6SE7024–7ED87–1FC0	400	500	6SE7024–7ES87–1FE0	190
30	**6SE7026–0ED61**	**6SE7026–0TD61**	6SE7027–2ED87–1FC0	400	600	6SE7027–2ES87–1FE0	130
37	**6SE7027–2ED61**	**6SE7027–2TD61**	6SE7027–2ED87–1FC0	400	600	6SE7027–2ES87–1FE0	130
45	**6SE7031–0EE60**	**6SE7031–0TE60**	6SE7031–0EE87–1FH0	200	450	6SE7031–0ES87–1FE0	190
55	**6SE7031–2EF60**	**6SE7031–2TF60**	6SE7031–5EF87–1FH0	200	600	6SE7031–5ES87–1FE0	220
75	**6SE7031–5EF60**	**6SE7031–5TF60**	(6SE7031–5EF87–1FH0[8]))	200	600	6SE7031–5ES87–1FE0	220
90	**6SE7031–8EF60**	**6SE7031–8TF60**	6SE7031–5EF87–1FH0[2])	200	600	6SE7031–8ES87–1FE0	300
110	**6SE7032–1EG60**	**6SE7032–1TG60**	6SE7031–8EF87–1FH0[3])	200	750	6SE7032–6ES87–1FE0	300
132	**6SE7032–6EG60**	**6SE7032–6TG60**	6SE7031–8EF87–1FH0[4])	200	750	6SE7032–6ES87–1FE0	300
160	**6SE7033–2EG60**	**6SE7033–2TG60**	6SE7032–6EG87–1FH0[5])	200	900	6SE7033–2ES87–1FE0	370
200	**6SE7033–7EG60**	**6SE7033–7TG60**	6SE7032–6EG87–1FH0[6])	200	900	6SE7033–7ES87–1FE0	380
250	**6SE7035–1EK60**	**6SE7035–1TJ60**	–			6SE7035–1ES87–1FE0	460
315	**6SE7036–0EK60**	**6SE7036–0TJ60**	–			6SE7037–0ES87–1FE0	620
400	**6SE7037–0EK60**	**6SE7037–0TJ60**	–			6SE7037–0ES87–1FE0	620
500	**–**	**6SE7038–6TK60**	–			6SE7038–6ES87–1FE0	740
630	**–**	**6SE7041–1TK60**	–			6SE7041–1ES87–1FE0	860
710	**–**	**6SE7041–3TL60**	–			[7])	
900	**–**	without interphase transformer chassis **6SE7041–6TQ60**	–			6SE7038–6ES87–1FE0 (2x)	740 (2x)
900	**–**	with interphase transformer chassis **6SE7041–6TM60**	–			6SE7038–6ES87–1FE0 (2x)	740 (2x)
1300	**–**	without interphase transformer chassis **6SE7042–5TN60**	–			[7])	

Attention!
Please observe foot notes 2 to 6.

1) See Engineering Information, Section 6, also observe foot notes 2 to 6.
2) Rated current of the units with sinusoidal filter due to derating at a pulse frequency of 6 kHz, I_S = 140 A.
3) Rated current of the units with sinusoidal filter due to derating at a pulse frequency of 6 kHz, I_S = 158 A.
4) Rated current of the units with sinusoidal filter due to derating at a pulse frequency of 6 kHz, I_S = 195 A.
5) Rated current of the units with sinusoidal filter due to derating at a pulse frequency of 6 kHz, I_S = 236 A.
6) Rated current of the units with sinusoidal filter due to derating at a pulse frequency of 6 kHz, I_S = 278 A.
7) No reactor required. Maximum cable length 800 m shielded, 1200 m unshielded.
8) Rated current of the units with sinusoidal filter due to derating at a pulse frequency of 6 kHz, I_S = 110 A and therefore lower than for the units with 55 kW (no derating at 6 kHz).

Output filter reactor[1]) Ferrite-core reactor	$f_{max.}$	P_v max.	Output dv/dt filter[1]) $f_{max.}$ = 300 Hz	P_v max.
Order No.	Hz	W	Order No.	W
$f_{pulse} \leq 6$ kHz			$f_{pulse} \leq 3$ kHz	
6SE7016–1ES87–1FF1	600	96	6SE7016–2FB87–1FD0	100
6SE7021–0ES87–1FF1	600	96	6SE7021–5FB87–1FD0	150
6SE7021–0ES87–1FF1	600	96	6SE7021–5FB87–1FD0	150
6SE7021–8ES87–1FF1	600	96	6SE7021–5FB87–1FD0	150
6SE7021–8ES87–1FF1	600	96	6SE7021–5FB87–1FD0	150
6SE7022–6ES87–1FF0	600	100	6SE7022–2FC87–1FD0	170
6SE7023–4ES87–1FF0	600	115	6SE7023–4FC87–1FD0	170
6SE7024–7ES87–1FF0	600	170	6SE7024–7FC87–1FD0	200
6SE7024–7ES87–1FF0	600	170	6SE7024–7FC87–1FD0	200
6SE7027–2ES87–1FF0	600	135	6SE7026–0HE87–1FD0	230
6SE7027–2ES87–1FF0	600	135	6SE7028–2HE87–1FD0	300
6SE7031–0ES87–1FF0	500	170	6SE7031–2HS87–1FD0	390
6SE7031–5ES87–1FF0	500	300	6SE7031–7HS87–1FD0	480
6SE7031–5ES87–1FF0	500	300	6SE7031–7HS87–1FD0	480
6SE7031–8ES87–1FF0	500	300	6SE7032–3HS87–1FD0	500
6SE7032–6ES87–1FF0	500	350	6SE7033–0HS87–1FD0	700
6SE7032–6ES87–1FF0	500	350	6SE7033–0HS87–1FD0	700
6SE7033–2ES87–1FF0	500	350	6SE7033–5HS87–1FD0	800
6SE7033–7ES87–1FF0	500	350	6SE7034–5HS87–1FD0	950
6SE7035–1ES87–1FF0	500	400	6SE7035–7HS87–1FD0	1300
6SE7037–0ES87–1FF0	500	480	6SE7036–5HS87–1FD0	1500
6SE7037–0ES87–1FF0	500	480	6SE7038–6HS87–1FD0	1800
6SE7038–6ES87–1FF0	500	530	6SE7038–6HS87–1FD0	1800
–			–	
–			–	
–			6SE7038–6HS87–1FD0 (2x)	1800 (2x)
–			–	
–			–	

1) See Engineering Information, Section 6.

Selection and ordering data

Nominal power rating	Converter	Inverter	Output sinusoidal filter[1]	$f_{max.}$	P_v max.	Output reactor[1] Iron-core reactor $f_{max.}$ = 300 Hz	P_v max.	Output dv/dt filter[1] $f_{max.}$ = 300 Hz	P_v max.
kW	Order No.	Order No.	Order No.	Hz	W	Order No.	W	Order No.	W
Supply voltage 3-ph. 500 V to 600 V AC and DC voltage 675 V to 810 V DC									
500 V			$f_{pulse} \leq 3$ kHz			$f_{pulse} \leq 3$ kHz		$f_{pulse} \leq 3$ kHz	
2.2	**6SE7014–5FB61**	**6SE7014–5UB61**	6SE7016–2FB87–1FH0	200	200	6SE7016–2FS87–1FE0	130	6SE7016–2FB87–1FD0	100
3	**6SE7016–2FB61**	**6SE7016–2UB61**	6SE7016–2FB87–1FH0	200	200	6SE7016–2FS87–1FE0	130	6SE7016–2FB87–1FD0	100
4	**6SE7017–8FB61**	**6SE7017–8UB61**	6SE7021–5FC87–1FH0	200	300	6SE7021–5FS87–1FE0	190	6SE7021–5FB87–1FD0	150
5.5	**6SE7021–1FB61**	**6SE7021–1UB61**	6SE7021–5FC87–1FH0	200	300	6SE7021–5FS87–1FE0	190	6SE7021–5FB87–1FD0	150
7.5	**6SE7021–5FB61**	**6SE7021–5UB61**	6SE7021–5FC87–1FH0	200	300	6SE7021–5FS87–1FE0	190	6SE7021–5FB87–1FD0	150
11	**6SE7022–2FC61**	**6SE7022–2UC61**	6SE7022–2FD87–1FH0	200	400	6SE7022–2FS87–1FE0	220	6SE7022–2FC87–1FD0	170
18.5	**6SE7023–0FD61**	**6SE7023–0UD61**	6SE7023–4FD87–1FH0	200	500	6SE7023–4FS87–1FE0	190	6SE7023–4FC87–1FD0	170
22	**6SE7023–4FD61**	**6SE7023–4UD61**	6SE7023–4FD87–1FH0	200	500	6SE7023–4FS87–1FE0	190	6SE7023–4FC87–1FD0	170
30	**6SE7024–7FD61**	**6SE7024–7UD61**	6SE7024–7FE87–1FH0	200	600	6SE7024–7FS87–1FE0	220	6SE7024–7FC87–1FD0	200
37	**6SE7026–1FE60**	**6SE7026–1UE60**	6SE7026–1FF87–1FH0	100	450	6SE7026–0HS87–1FE0	300	6SE7026–0HE87–1FD0	230
45	**6SE7026–6FE60**	**6SE7026–6UE60**	6SE7028–0FF87–1FH0	100	600	6SE7028–2HS87–1FE0	370	6SE7028–2HE87–1FD0	300
55	**6SE7028–0FF60**	**6SE7028–0UF60**	6SE7028–0FF87–1FH0	100	600	6SE7028–2HS87–1FE0	370	6SE7028–2HE87–1FD0	300
75	**6SE7031–1FF60**	**6SE7031–1UF60**	6SE7031–3FG87–1FH0	100	750	6SE7031–2HS87–1FE0	500	6SE7031–2HS87–1FD0	390
90	**6SE7031–3FG60**	**6SE7031–3UG60**	6SE7031–3FG87–1FH0	100	750	6SE7031–2HS87–1FE0	500	6SE7031–2HS87–1FD0	390
110	**6SE7031–6FG60**	**6SE7031–6UG60**	6SE7031–6FG87–1FH0	100	900	6SE7031–7HS87–1FE0	620	6SE7031–7HS87–1FD0	480
132	**6SE7032–0FG60**	**6SE7032–0UG60**	–			6SE7032–3HS87–1FE0	620	6SE7032–3HS87–1FD0	500
160	**6SE7032–3FG60**	**6SE7032–3UG60**	–			6SE7032–3HS87–1FE0	620	6SE7032–3HS87–1FD0	500
200	**6SE7033–0FK60**	**6SE7033–0UJ60**	–			6SE7033–0GS87–1FE0	870	6SE7033–0HS87–1FD0	700
250	**6SE7033–5FK60**	**6SE7033–5UJ60**	–			6SE7033–5GS87–1FE0	1050	6SE7033–5HS87–1FD0	800
315	**6SE7034–5FK60**	**6SE7034–5UJ60**	–			6SE7034–5GS87–1FE0	1270	6SE7034–5HS87–1FD0	950
400	**–**	**6SE7035–7UK60**	–			6SE7035–7GS87–1FE0	1840	6SE7035–7HS87–1FD0	1300
450	**–**	**6SE7036–5UK60**	–			6SE7036–5GS87–1FE0	1980	6SE7036–5HS87–1FD0	1500
630	**–**	**6SE7038–6UK60**	–			6SE7038–6GS87–1FE0	2350	6SE7038–6HS87–1FD0	1800
800	**–**	**6SE7041–1UL60**	–			6SE7041–2GS87–1FE0		on request[2]	
900	**–**	**6SE7041–2UL60**	–			6SE7041–2GS87–1FE0		on request[2]	
1000	**–**	without interphase transformer chassis **6SE7041–4UQ60**	–			6SE7038–6GS87–1FE0 (2x)	2350 (2x)	6SE7038–6HS87–1FD0 (2x)	1800 (2x)
1100	**–**	**6SE7041–6UQ60**	–			6SE7038–6GS87–1FE0 (2x)	2350 (2x)	6SE7038–6HS87–1FD0 (2x)	1800 (2x)
1000	**–**	with interphase transformer chassis **6SE7041–4UM60**	–			–			
1100	**–**	**6SE7041–6UM60**	–			–			
1500	**–**	without interphase transformer chassis **6SE7042–1UN60**	–			6SE7041–2GS87–1FE0 (2x)	2350 (2x)	on request	
1700	**–**	without interphase transformer chassis **6SE7042–3UN60**	–			6SE7041–2GS87–1FE0 (2x)	2350 (2x)	on request	

1) See Engineering Information, Section 6.

2) The following cable lengths are permissible in combination with the TG 31024-05 limiting network and output filter reactor:
30 m shielded/50 m unshielded; with 1 supplementary reactor (i.e. 2 output filter reactors) 100 m shielded/150 m unshielded.

Nominal power rating	Converter	Inverter	Output reactor[1]) Iron-core reactor $f_{max.}$ = 300 Hz	P_v max.	Output dv/dt filter[1]) $f_{max.}$ = 300 Hz	P_v max.
kW	Order No.	Order No.	Order No.	W	Order No.	W
Supply voltage 3-ph. 660 V to 690 V AC and DC voltage 890 V to 930 V DC						
690 V			$f_{pulse} \leq$ 3 kHz		$f_{pulse} \leq$ 3 kHz	
55	**6SE7026–0HF60**	**6SE7026–0WF60**	6SE7026–0HS87–1FE0	300	6SE7026–0HE87–1FD0	230
75	**6SE7028–2HF60**	**6SE7028–2WF60**	6SE7028–2HS87–1FE0	370	6SE7028–2HE87–1FD0	300
90	**6SE7031–0HG60**	**6SE7031–0WG60**	6SE7031–2HS87–1FE0	500	6SE7031–2HS87–1FD0	390
110	**6SE7031–2HG60**	**6SE7031–2WG60**	6SE7031–2HS87–1FE0	500	6SE7031–2HS87–1FD0	390
132	**6SE7031–5HG60**	**6SE7031–5WG60**	6SE7031–7HS87–1FE0	620	6SE7031–7HS87–1FD0	480
160	**6SE7031–7HG60**	**6SE7031–7WG60**	6SE7031–7HS87–1FE0	620	6SE7031–7HS87–1FD0	480
200	**6SE7032–1HG60**	**6SE7032–1WG60**	6SE7032–3HS87–1FE0	620	6SE7032–3HS87–1FD0	500
250	**6SE7033–0HK60**	**6SE7033–0WJ60**	6SE7033–0GS87–1FE0	870	6SE7033–0HS87–1FD0	700
315	**6SE7033–5HK60**	**6SE7033–5WJ60**	6SE7033–5GS87–1FE0	1050	6SE7033–5HS87–1FD0	800
400	**6SE7034–5HK60**	**6SE7034–5WJ60**	6SE7034–5GS87–1FE0	1270	6SE7034–5HS87–1FD0	950
500	**–**	**6SE7035–7WK60**	6SE7035–7GS87–1FE0	1840	6SE7035–7HS87–1FD0	1300
630	**–**	**6SE7036–5WK60**	6SE7036–5GS87–1FE0	1980	6SE7036–5HS87–1FD0	1500
800	**–**	**6SE7038–6WK60**	6SE7038–6GS87–1FE0	2350	6SE7038–6HS87–1FD0	1800
1000	**–**	**6SE7041–1WL60**	6SE7041–2GS87–1FE0		on request[2])	
1200	**–**	**6SE7041–2WL60**	6SE7041–2GS87–1FE0		on request[2])	
		without interphase transformer chassis				
1300	**–**	**6SE7041–4WQ60**	6SE7038–6GS87–1FE0 (2x)	2350 (2x)	6SE7038–6HS87–1FD0 (2x)	1800 (2x)
1500	**–**	**6SE7041–6WQ60**	6SE7038–6GS87–1FE0 (2x)	2350 (2x)	6SE7038–6HS87–1FD0 (2x)	1800 (2x)
		with interphase transformer chassis				
1300	**–**	**6SE7041–4WM60**	–	–	–	–
1500	**–**	**6SE7041–6WM60**	–	–	–	–
		without interphase transformer chassis				
1900	**–**	**6SE7042–1WN60**	6SE7041–2GS87–1FE0 (2x)	–	–	–
		without interphase transformer chassis				
2300	**–**	**6SE7042–3WN60**	6SE7041–2GS87–1FE0 (2x)	–	–	–

1) See Engineering Information, Section 6.

2) The following cable lengths are permissible in combination with the TG 31024-05 limiting network and output filter reactor:
30 m shielded/50 m unshielded; with 1 supplementary reactor (i.e. 2 output filter reactors) 100 m shielded/150 m unshielded.

Selection and ordering data

Nominal power rating	Inverter	Fuse switch disconnector for DC coupling[1)2)]			Inverter fuse Duty class gR [2)]			Inverter fuse Duty class aR [2)]		
			I_S	Max. fuse size		I_S	Size		I_S	Size
kW	Order No.	Order No.	A		Order No.	A		Order No.	A	
DC voltage 510 V to 650 V										
400 V										
2.2	**6SE7016–1TA61**[3)]	3NP40 10–0CH01	100	000	2 x 3NE1 814–0[4)]	20	000	2 x 3NE8 015[4)]	25	00
3	**6SE7018–0TA61**[3)]	3NP40 10–0CH01	100	000	2 x 3NE1 815–0[4)]	25	000	2 x 3NE8 015[4)]	25	00
4	**6SE7021–0TA61**[3)]	3NP40 10–0CH01	100	000	2 x 3NE1 815–0[4)]	25	000	2 x 3NE8 015[4)]	25	00
5.5	**6SE7021–3TB61**[3)]	3NP40 10–0CH01	100	000	2 x 3NE1 803–0[4)]	35	000	2 x 3NE8 017[4)]	50	00
7.5	**6SE7021–8TB61**[3)]	3NP40 10–0CH01	100	000	2 x 3NE1 817–0[4)]	50	000	2 x 3NE8 017[4)]	50	00
11	**6SE7022–6TC61**[3)]	3NP40 10–0CH01	100	000	2 x 3NE1 818–0[4)]	63	000	2 x 3NE8 020[4)]	80	00
15	**6SE7023–4TC61**[3)]	3NP40 10–0CH01	100	000	2 x 3NE1 820–0[4)]	80	000	2 x 3NE8 020[4)]	80	00
18.5	**6SE7023–8TD61**[3)]	3NP40 70–0CA01	160	00	2 x 3NE1 021–0[4)]	100	00	2 x 3NE8 022[4)]	125	00
22	**6SE7024–7TD61**[3)]	3NP40 70–0CA01	160	00	2 x 3NE1 022–0[4)]	125	00	2 x 3NE8 022[4)]	125	00
30	**6SE7026–0TD61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE1 224–0[4)]	160	0	2 x 3NE8 024[4)]	160	00
37	**6SE7027–2TD61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE1 224–0[4)]	160	0	2 x 3NE8 024[4)]	160	00
45	**6SE7031–0TE60**	3NP42 70–0CA01	250	0; 1	–			2 x 3NE3 224	160	1
55	**6SE7031–2TF60**	3NP42 70–0CA01	250	0; 1	–			2 x 3NE3 227	250	1
75	**6SE7031–5TF60**	3NP42 70–0CA01	250	0; 1	–			2 x 3NE3 227	250	1
90	**6SE7031–8TF60**	3NP43 70–0CA01	400	1; 2	–			2 x 3NE3 230–0B	315	1
110	**6SE7032–1TG60**	3NP44 70–0CA01	630	2; 3	–			2 x 3NE3 233	450	1
132	**6SE7032–6TG60**	3NP44 70–0CA01	630	2; 3	–			2 x 3NE3 233	450	1
160	**6SE7033–2TG60**	3NP44 70–0CA01	630	2; 3	–			2 x 3NE3 334–0B	500	2
200	**6SE7033–7TG60**	3NP44 70–0CA01	630	2; 3	–			2 x 3NE3 336	630	2
250	**6SE7035–1TJ60**	2 x 3NP43 70–0CA01	400	1; 2	–			2 x 2 x 3NE3 233[3)]	450	1
315	**6SE7036–0TJ60**	2 x 3NP44 70–0CA01	630	2; 3	–			2 x 2 x 3NE3 335[3)]	560	2
400	**6SE7037–0TJ60**	2 x 3NP44 70–0CA01	630	2; 3	–			2 x 2 x 3NE3 335[3)]	560	2
500	**6SE7038–6TK60**	2 x 3NP44 70–0CA01	630	2; 3	–			2 x 2 x 3NE3 337–8[3)]	710	2
630	**6SE7041–1TK60**	2 x 2 x 3NH3 330	700	2; 3	–			2 x 2 x 3NE3 338–8[3)]	800	2
710	**6SE7041–3TL60**							2 x 2 x 3NE3 340-8[3)]	900	2
900	without interphase transformer chassis **6SE7041–6TQ60**	4 x 3NP44 70–0CA01	630	2; 3	–			4 x 2 x 3NE3 337–8[3)]	710	2
900	with interphase transformer chassis **6SE7041–6TM60**	4 x 3NP44 70–0CA01	630	2; 3	–			4 x 2 x 3NE3 337–8[3)]	710	2
1300	without interphase transformer chassis **6SE7042–5TN60**	–	–	–	–			4 x 2 x 3NE3 340–8[3)]	900	2

1) See catalog "Low-voltage switchgear". Rated insulation voltage for pollution degree 3 to DIN VDE 0110, Part 1, but conditions of use to pollution degree 2. The rated insulation voltage is therefore ≥ 1000 V.

2) Note fuse sizes when selecting fuse switch disconnectors.

3) DC fuses are integral components of the inverter unit.

4) For the fusing of inverters without integrated DC link fuse (inverter with option L33).

Contactor for isolating the inverter from the DC bus[1]		Precharging resistors				Free-wheeling diode on the DC bus	
	I_S		Dimension drawing, see Section 7	Quantity per inverter	R_S	Diode	Clamp-on cover
Order No.	A	Order No.	No.		Ω	Order No.	Order No.
3RT13 25	1 x 30	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2]	
3RT13 25	1 x 30	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2]	
3RT13 25	1 x 30	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2]	
3RT13 25	1 x 30	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2]	
3RT13 25	2 x 27	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2]	
3RT13 25	2 x 27	6SX7010–0AC06	46	2	27	SKR 60 F 12[2]	
3RT13 25	2 x 27	6SX7010–0AC06	46	2	27	SKR 60 F 12[2]	
3RT13 25	2 x 27	6SX7010–0AC06	46	2	27	SKR 60 F 12[2]	
3RT13 36	2 x 50	6SX7010–0AC06	46	2	27	SKR 60 F 12[2]	
3RT13 44	2 x 81	6SX7010–0AC07	46	2	27	SKR 141 F 15[2]	
3RT13 44	2 x 81	6SX7010–0AC07	46	2	27	SKR 141 F 15[2]	
3RT13 44	2 x 81	6SX7010–0AC08	46	2	15	SKR 141 F 15[2]	
3RT13 46	2 x 108	6SX7010–0AC08	46	2	15	SKR 141 F 15[2]	
3TK10	2 x 162	6SX7010–0AC08	46	2	15	SKR 141 F 15[2]	
3TK10	2 x 162	6SX7010–0AC10	46	2	10	SKR 141 F 15[2]	
3TK10	2 x 162	6SX7010–0AC10	46	2	10	2 x SKR 141 F 15[2]	
3TK11	2 x 207	6SX7010–0AC10	46	2	10	2 x SKR 141 F 15[2]	
3TK12	2 x 243	6SX7010–0AC10	46	2	10	2 x SKR 141 F 15[2]	
3TK13	2 x 279	6SX7010–0AC10	46	2	10	2 x SKR 141 F 15[2]	
3TK14	2 x 423	6SX7010–0AC10	46	2	10	D348S16[3]	V50–14.45M[3]
3TK14	2 x 423	6SX7010–0AC11	46	2	5.6	D689S20[3]	V72–26.120M[3]
3TK15	2 x 585	6SX7010–0AC11	46	2	5.6	D689S20[3]	V72–26.120M[3]
3TK17	2 x 765	6SX7010–0AC13	47	2	2.7	D689S20[3]	V72–26.120M[3]
2 x 3TK15	4 x 488	6SX7010–0AC11	46	4	5.6	2 x D689S20[3]	2 x V72–26.120M[3]
2 x 3TK15	4 x 488	6SX7010–0AC13	47	4	2.7	2 x D689S20[3]	2 x V72–26.120M[3]
2 x 3TK17	4 x 638	6SX7010–0AC13	47	4	2.7	2 x D689S20[3]	2 x V72–26.120M[3]
2 x 3TK17	4 x 638	6SX7010–0AC13	47	4	2.7	2 x D689S20[3]	2 x V72–26.120M[3]
4 x 3TK15	4 x 488	6SX7010–0AC13	47	8	2.7	4 x D689S20[3]	4 x V72–26.120M[3]

1) See catalog "Low-voltage switchgear". Rated insulation voltage for pollution degree 2 to DIN VDE 0110 Part 1: 1000 V.

2) See Engineering Information, Section 6. The diodes indicated are available from SEMIKRON GmbH u. Co. KG, Sigmundstraße 200, D-90431 Nuremberg, Germany (www.semikron.com).

3) See Engineering Information, Section 6. Disc-type diode with a clamp-on cap for mounting on a copper plate or rail. The diodes indicated are available from EUPEC GmbH u. Co. KG, Max-Planck-Str. 5, D-59581 Warstein, Germany (www.eupec.com).

Selection and ordering data

Nominal power rating	Inverter	Fuse switch disconnector for DC coupling[1)2)]	I_S	Max. fuse size	Inverter fuse Duty class aR	I_S	Size
kW	Order No.	Order No.	A		Order No.	A	
DC voltage 675 V to 810 V DC							
500 V							
2.2	**6SE7014–5UB61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE4 101[4)]	32	0
3	**6SE7016–2UB61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE4 101[4)]	32	0
4	**6SE7017–8UB61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE4 101[4)]	32	0
5.5	**6SE7021–1UB61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE4 101[4)]	32	0
7.5	**6SE7021–5UB61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE4 101[4)]	32	0
11	**6SE7022–2UC61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE4 117[4)]	50	0
18.5	**6SE7023–0UD61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE4 120[4)]	80	0
22	**6SE7023–4UD61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE4 120[4)]	80	0
30	**6SE7024–7UD61**[3)]	3NP42 70–0CA01	250	0; 1	2 x 3NE4 121[4)]	100	0
37	**6SE7026–1UE60**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 222	125	1
45	**6SE7026–6UE60**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 224	160	1
55	**6SE7028–0UF60**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 224	160	1
75	**6SE7031–1UF60**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 225	200	1
90	**6SE7031–3UG60**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 225	200	1
110	**6SE7031–6UG60**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 227	250	1
132	**6SE7032–0UG60**	3NP43 70–0CA01	400	1; 2	2 x 3NE3 232–0B	400	1
160	**6SE7032–3UG60**	3NP43 70–0CA01	400	1; 2	2 x 3NE3 232–0B	400	1
200	**6SE7033–0UJ60**	3NP43 70–0CA01	400	1; 2	2 x 3NE3 334–0B[3)]	500	2
250	**6SE7033–5UJ60**	3NP44 70–0CA01	630	2; 3	2 x 3NE3 336[3)]	630	2
315	**6SE7034–5UJ60**	3NP44 70–0CA01	630	2; 3	2 x 3NE3 337–8[3)]	710	2
400	**6SE7035–7UK60**	2 x 3NP44 70–0CA01	630	2; 3	2 x 2 x 3NE3 333[3)]	450	2
450	**6SE7036–5UK60**	2 x 3NP44 70–0CA01	630	2; 3	2 x 2 x 3NE3 334–0B[3)]	500	2
630	**6SE7038–6UK60**	2 x 3NP44 70–0CA01	630	2; 3	2 x 2 x 3NE3 336[3)]	630	2
800	**6SE7041–1UL60**	2 x 3NP44 70–0CA01	630	2; 3	2 x 2 x 3NE3 338–8[3)]	800	2
900	**6SE7041–2UL60**				2 x 2 x 3NE3 340–8[3)]	900	2
	without interphase transformer chassis						
1000	**6SE7041–4UQ60**	4 x 3NP44 70–0CA01	630	2; 3	4 x 2 x 3NE3 336[3)]	630	2
1100	**6SE7041–6UQ60**	4 x 3NP44 70–0CA01	630	2; 3	4 x 2 x 3NE3 336[3)]	630	2
	with interphase transformer chassis						
1000	**6SE7041–4UM60**	4 x 3NP44 70–0CA01	630	2; 3	4 x 2 x 3NE3 336[3)]	630	2
1100	**6SE7041–6UM60**	4 x 3NP44 70–0CA01	630	2; 3	4 x 2 x 3NE3 336[3)]	630	2
	without interphase transformer chassis						
1500	**6SE7042–1UN60**	4 x 3NP44 70–0CA01	630	2; 3	4 x 2 x 3NE3 338–8[3)]	800	2
	without interphase transformer chassis						
1700	**6SE7042–3UN60**	–	–	–	4 x 2 x 3NE3 340–8[3)]	900	2

1) See catalog "Low-voltage switchgear". Rated insulation voltage for pollution degree 3 to DIN VDE 0110, Part 1, but conditions of use to pollution degree 2. The rated insulation voltage is therefore ≥ 1000 V.

2) Note fuse sizes when selecting fuse switch disconnectors.

3) DC fuses are integral components of the inverter unit.

4) For the fusing of inverters without integrated DC link fuse (inverter with option L33).

Contactor for isolating the inverter from the DC bus[1])		Precharging resistors				Free-wheeling diode on the DC bus	
	I_S		Dimension drawing, see Section 7	Quantity per inverter	R_S	Diode	Clamp-on cover
Order No.	A	Order No.	No.		Ω	Order No.	Order No.
3RT13 25	1 x 30	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2])	
3RT13 25	1 x 30	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2])	
3RT13 25	1 x 30	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2])	
3RT13 25	1 x 30	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2])	
3RT13 25	1 x 30	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2])	
3RT13 25	2 x 27	6SX7010–0AC06	46	2	27	SKR 3 F 20/12[2])	
3RT13 25	2 x 27	6SX7010–0AC06	46	2	27	SKR 60 F 12[2])	
3RT13 25	2 x 27	6SX7010–0AC06	46	2	27	SKR 60 F 12[2])	
3RT13 36	2 x 50	6SX7010–0AC07	46	2	27	SKR 60 F 12[2])	
3RT13 44	2 x 81	6SX7010–0AC07	46	2	27	SKR 60 F 12[2])	
3RT13 44	2 x 81	6SX7010–0AC08	46	2	15	SKR 60 F 12[2])	
3RT13 44	2 x 81	6SX7010–0AC08	46	2	15	SKR 60 F 12[2])	
3RT13 44	2 x 81	6SX7010–0AC08	46	2	15	SKR 141 F 15[2])	
3RT13 46	2 x 108	6SX7010–0AC08	46	2	15	SKR 141 F 15[2])	
3TK10	2 x 162	6SX7010–0AC10	46	2	10	SKR 141 F 15v	
3TK10	2 x 162	6SX7010–0AC10	46	2	10	2 x SKR 141 F 15[2])	
3TK10	2 x 162	6SX7010–0AC10	46	2	10	2 x SKR 141 F 15[2])	
3TK11	2 x 207	6SX7010–0AC11	46	2	5.6	D348S16[3])	V50–14.45M[3])
3TK13	2 x 279	6SX7010–0AC11	46	2	5.6	D348S16[3])	V50–14.45M[3])
3TK14	2 x 423	6SX7010–0AC13	47	2	2.7	D689S20[3])	V72–26.120M[3])
3TK14	2 x 423	6SX7010–0AC13	47	2	2.7	D689S20[3])	V72–26.120M[3])
3TK15	2 x 585	6SX7010–0AC13	47	2	2.7	D689S20[3])	V72–26.120M[3])
3TK17	2 x 765	6SX7010–0AC13	47	2	2.7	D689S20[3])	V72–26.120M[3])
2 x 3TK15	4 x 488	6SX7010–0AC13	47	4	2.7	2 x D689S20[3])	2 x V72–26.120M[3])
2 x 3TK15	4 x 488	6SX7010–0AC13	47	4	2.7	2 x D689S20[3])	2 x V72–26.120M[3])
2 x 3TK15	4 x 488	6SX7010–0AC13	47	4	2.7	2 x D689S20[3])	2 x V72–26.120M[3])
2 x 3TK17	4 x 638	6SX7010–0AC13	47	4	2.7	2 x D689S20[3])	2 x V72–26.120M[3])
2 x 3TK15	4 x 488	6SX7010–0AC13	47	4	2.7	2 x D689S20[3])	2 x V72–26.120M[3])
2 x 3TK17	4 x 638	6SX7010–0AC13	47	4	2.7	2 x D689S20[3])	2 x V72–26.120M[3])
4 x 3TK15	4 x 488	6SX7010–0AC13	47	8	2.7	4 x D689S20[3])	4 x V72–26.120M[3])
4 x 3TK15	4 x 488	6SX7010–0AC13	47	8	2.7	4 x D689S20[3])	4 x V72–26.120M[3])

1) See catalog "Low-voltage switchgear". Rated insulation voltage for pollution degree 2 to DIN VDE 0110 Part 1: 1000 V.

2) See Engineering Information, Section 6. The diodes indicated are available from SEMIKRON GmbH u. Co. KG, Sigmundstraße 200, D-90431 Nuremberg, Germany (www.semikron.com).

3) See Engineering Information, Section 6. Disc-type diode with a clamp-on cap for mounting on a copper plate or rail. The diodes indicated are available from EUPEC GmbH u. Co. KG, Max-Planck-Str. 5, D-59581 Warstein, Germany (www.eupec.com).

Selection and ordering data

Nominal power rating	Inverter	Fuse switch disconnector for DC coupling[1)2)]	I_S	Max. fuse size	Inverter fuse Duty class aR	I_S	Size
kW	Order No.	Order No.	A		Order No.	A	
DC voltage 890 V to 930 V DC							
690 V							
55	**6SE7026–0WF60**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 222	125	1
75	**6SE7028–2WF60**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 224	160	1
90	**6SE7031–0WG60**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 225	200	1
110	**6SE7031–2WG60**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 225	200	1
132	**6SE7031–5WG60**	3NP43 70–0CA01	400	1; 2	2 x 3NE3 230–0B	315	1
160	**6SE7031–7WG60**	3NP43 70–0CA01	400	1; 2	2 x 3NE3 230–0B	315	1
200	**6SE7032–1WG60**	3NP43 70–0CA01	400	1; 2	2 x 3NE3 232–0B	400	1
250	**6SE7033–0WJ60**	3NP43 70–0CA01	400	1; 2	2 x 3NE3 234–0B[3)]	500	1
315	**6SE7033–5WJ60**	3NP44 70–0CA01	630	2; 3	2 x 3NE3 336[3)]	630	2
400	**6SE7034–5WJ60**	3NP44 70–0CA01	630	2; 3	2 x 3NE3 337–8[3)]	710	2
500	**6SE7035–7WK60**	2 x 3NP44 70–0CA01	630	2; 3	2 x 2 x 3NE3 333[3)]	450	2
630	**6SE7036–5WK60**	2 x 3NP44 70–0CA01	630	2; 3	2 x 2 x 3NE3 334–0B[3)]	500	2
800	**6SE7038–6WK60**	2 x 3NP44 70–0CA01	630	2; 3	2 x 2 x 3NE3 336[3)]	630	2
1000	**6SE7041–1WL60**	2 x 3NP44 70–0CA01	630	2; 3	2 x 2 x 3NE3 338–8[3)]	800	2
1200	**6SE7041–2WL60**				2 x 2 x 3NE3 340–8[3)]	900	2
	without interphase transformer chassis						
1300	**6SE7041–4WQ60**	4 x 3NP44 70–0CA01	630	2; 3	4 x 2 x 3NE3 336[3)]	630	2
1500	**6SE7041–6WQ60**	4 x 3NP44 70–0CA01	630	2; 3	4 x 2 x 3NE3 336[3)]	630	2
	with interphase transformer chassis						
1300	**6SE7041–4WM60**	4 x 3NP44 70–0CA01	630	2; 3	4 x 2 x 3NE3 336[3)]	630	2
1500	**6SE7041–6WM60**	4 x 3NP44 70–0CA01	630	2; 3	4 x 2 x 3NE3 336[3)]	630	2
	without interphase transformer chassis						
1900	**6SE7042–1WN60**	4 x 3NP44 70–0CA01	630	2; 3	4 x 2 x 3NE3 338–8[3)]	800	2
	without interphase transformer chassis						
2300	**6SE7042–3WN60**	–	–	–	4 x 2 x 3NE3 340–8[3)]	900	2

1) See catalog "Low-voltage switchgear". Rated insulation voltage for pollution degree 3 to DIN VDE 0110, Part 1, but conditions of use to pollution degree 2. The rated insulation voltage is therefore ≥ 1000 V.

2) Note fuse sizes when selecting fuse switch disconnectors.

3) DC fuses are integral components of the inverter unit.

Contactor for isolating the inverter from the DC bus[1]		Precharging resistors				Free-wheeling diode on the DC bus	
	I_S		Dimension drawing, see Section 7	Quantity per inverter	R_S	Diode	Clamp-on cover
Order No.	A	Order No.	No.		Ω	Order No.	Order No.
2 x 3RT13 25	4 x 22	6SX7010–0AC07	46	2	27	SKR 141 F 15[2]	
2 x 3RT13 36	4 x 41	6SX7010–0AC08	46	2	15	SKR 141 F 15[2]	
2 x 3RT13 36	4 x 41	6SX7010–0AC08	46	2	15	SKR 141 F 15[2]	
2 x 3RT13 36	4 x 71	6SX7010–0AC08	46	2	15	SKR 141 F 15[2]	
2 x 3RT13 44	4 x 73	6SX7010–0AC10	46	2	10	SKR 141 F 15[2]	
2 x 3RT13 44	4 x 73	6SX7010–0AC10	46	2	10	SKR 141 F 15[2]	
2 x 3RT13 44	4 x 73	6SX7010–0AC10	46	2	10	2 x SKR 141 F 15[2]	
2 x 3TK10	3 x 162	6SX7010–0AC11	46	2	5.6	D348S16[3]	V50 – 14.45M[3]
2 x 3TK10	4 x 146	6SX7010–0AC11	46	2	5.6	D348S16[3]	V50 – 14.45M[3]
2 x 3TK11	4 x 183	6SX7010–0AC13	47	2	2.7	D689S20[3]	V72–26.120M[3]
2 x 3TK12	4 x 219	6SX7010–0AC13	47	2	2.7	D689S20[3]	V72–26.120M[3]
2 x 3TK12	4 x 219	6SX7010–0AC13	47	2	2.7	D689S20[3]	V72–26.120M[3]
2 x 3TK14	4 x 402	6SX7010–0AC13	47	2	2.7	D689S20[3]	V72–26.120M[3]
2 x 3TK15	4 x 488	6SX7010–0AC13	47	4	2.7	2 x D689S20[3]	2 x V72–26.120M[3]
2 x 3TK15	4 x 488	6SX7010–0AC13	47	4	2.7	2 x D689S20[3]	2 x V72–26.120M[3]
2 x 3TK15	4 x 488	6SX7010–0AC13	47	4	2.7	2 x D689S20[3]	2 x V72–26.120M[3]
2 x 3TK17	4 x 638	6SX7010–0AC13	47	4	2.7	2 x D689S20[3]	2 x V72–26.120M[3]
2 x 3TK15	4 x 488	6SX7010–0AC13	47	4	2.7	2 x D689S20[3]	2 x V72–26.120M[3]
2 x 3TK17	4 x 638	6SX7010–0AC13	47	4	2.7	2 x D689S20[3]	2 x V72–26.120M[3]
4 x 3TK15	4 x 488	6SX7010–0AC13	47	8	2.7	4 x D689S20[3]	4 x V72–26.120M[3]
4 x 3TK15	4 x 488	6SX7010–0AC13	47	8	2.7	4 x D689S20[3]	4 x V72–26.120M[3]

1) See catalog "Low-voltage switchgear". Rated insulation voltage for pollution degree 2 to DIN VDE 0110 Part 1: 1000 V.

2) See Engineering Information, Section 6. The diodes indicated are available from SEMIKRON GmbH u. Co. KG, Sigmundstraße 200, D-90431 Nuremberg, Germany (www.semikron.com).

3) See Engineering Information, Section 6. Disc-type diode with a clamp-on cap for mounting on a copper plate or rail. The diodes indicated are available from EUPEC GmbH u. Co. KG, Max-Planck-Str. 5, D-59581 Warstein, Germany (www.eupec.com).

Selection and ordering data

Rated rectifier/ regenerative output	AFE inverter with CUSA control board 6SE7090–0XX84–0BJ0	AFE supply connecting module with VSB voltage sensing board 6SE7090–0XX84–1GA1 and AFE reactor					
at cos φ = 1 and 400 V supply voltage		**for compact units AFE reactor only**	Rated current	Power loss	Weight approx.	Dimensions line connecting module	Dimensions AFE reactor is supplied loose
P_n				P_v		W x H x D	W x H x D
kW	Order No.	Order No.	A	W	kg	mm	mm
Supply voltage 3-ph. 380 V AC –20 % to 460 V AC +5 %							
400 V							
6.8	**6SE7021–0EA81**	6SE70 21–3ES87–1FG0	13	17	8	–	270 x 250 x 196
9	**6SE7021–3EB81**	6SE70 21–3ES87–1FG0	13	23	8	–	270 x 250 x 196
12	**6SE7021–8EB81**	6SE70 22–6ES87–1FG0	26	30	12	–	300 x 250 x 185
17	**6SE7022–6EC81**	6SE70 22–6ES87–1FG0	26	43	12	–	300 x 250 x 185
23	**6SE7023–4EC81**	6SE70 24–7ES87–1FG0	47	58	20	–	360 x 300 x 185
32	**6SE7024–7ED81**	6SE70 24–7ES87–1FG0	47	80	20	–	360 x 300 x 185
40	**6SE7026–0ED81**	6SE70 27–2ES87–1FG0	72	100	32	–	380 x 300 x 196
49	**6SE7027–2ED81**	6SE70 27–2ES87–1FG0	72	123	32	–	380 x 300 x 196
63	**6SE7031–0EE80**	6SE71 31–0EE83–2NA0	92	500	110	274 x 1310 x 408	300 x 267 x 212
85	**6SE7031–2EF80**	6SE71 31–2EF83–2NA0	124	630	160	440 x 1310 x 470	355 x 340 x 212
100	**6SE7031–5EF80**	6SE71 31–5EF83–2NA0	146	710	165	440 x 1310 x 470	355 x 340 x 272
125	**6SE7031–8EF80**	6SE71 31–8EF83–2NA0	186	860	170	440 x 1310 x 470	355 x 340 x 278
143	**6SE7032–1EG80**	6SE71 32–1EG83–2NA0	210	1100	235	580 x 1339 x 459	420 x 389 x 312
177	**6SE7032–6EG80**	6SE71 32–6EG83–2NA0	260	1300	240	580 x 1339 x 459	420 x 389 x 312
214	**6SE7033–2EG80**	6SE71 33–2EG83–2NA0	315	1500	295	580 x 1339 x 459	480 x 380 x 376
250	**6SE7033–7EG80**	6SE71 33–7EG83–2NA0	370	1820	305	580 x 1339 x 459	480 x 380 x 376
Supply voltage 3-ph. 500 V AC –20 % to 575 V AC +5 %							
500 V							
51	**6SE7026–1FE80**	6SE71 26–1FE83–2NA0	61	410	100	274 x 1310 x 408	300 x 267 x 212
56	**6SE7026–6FE80**	6SE71 26–6FE83–2NA0	66	440	115	274 x 1310 x 408	300 x 267 x 212
67	**6SE7028–0FF80**	6SE71 28–0FF83–2NA0	79	560	150	440 x 1310 x 470	355 x 335 x 220
92	**6SE7031–1FF80**	6SE71 31–1FF83–2NA0	108	710	170	440 x 1310 x 470	355 x 340 x 282
109	**6SE7031–3FG80**	6SE71 31–3FG83–2NA0	128	830	208	580 x 1339 x 459	355 x 340 x 288
132	**6SE7031–6FG80**	6SE71 31–6FG83–2NA0	156	930	235	580 x 1339 x 459	420 x 389 x 312
164	**6SE7032–0FG80**	6SE71 32–0FG83–2NA0	192	1390	245	580 x 1339 x 459	420 x 389 x 312
192	**6SE7032–3FG80**	6SE71 32–3FG83–2NA0	225	1570	290	580 x 1339 x 459	480 x 380 x 376
Supply voltage 3-ph. 660 V AC –20 % to 690 V AC +5 %							
690 V							
70	**6SE7026–0HF80**	6SE71 26–0HF83–2NA0	60	600	145	440 x 1310 x 470	355 x 335 x 220
96	**6SE7028–2HF80**	6SE71 28–2HF83–2NA0	82	710	170	440 x 1310 x 470	355 x 335 x 282
114	**6SE7031–0HG80**	6SE71 31–0HG83–2NA0	97	790	214	580 x 1339 x 459	355 x 340 x 288
138	**6SE7031–2HG80**	6SE71 31–2HG83–2NA0	118	1060	235	580 x 1339 x 459	420 x 390 x 312
170	**6SE7031–5HG80**	6SE71 31–5HG83–2NA0	145	1240	240	580 x 1339 x 459	420 x 390 x 312
200	**6SE7031–7HG80**	6SE71 31–7HG83–2NA0	171	1370	290	580 x 1339 x 459	480 x 380 x 376
245	**6SE7032–1HG80**	6SE71 32–1HG83–2NA0	208	1610	300	580 x 1339 x 459	480 x 380 x 376

Switch disconnector2)		Switch disconnector with fuse holders2)			Fuse switch disconnectors1)2)			Semiconductor-protection fuses Duty class gR2) incl. cable protection		
Rated current		Rated current max. fuse size			Rated current max. fuse size			Rated current max. fuse size		
Order No.	A	Order No.	A	Size	Order No.	A	Size	Order No.	A	Size
3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	00	3NE1 813–0	16	00
3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	00	3NE1 814–0	20	00
3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	00	3NE1 815–0	25	00
3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	00	3NE1 803–0	35	00
3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	00	3NE1 802–0	40	00
3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	00	3NE1 818–0	63	00
3KA51 30–1EE01	80	3KL52 30–1EB01	125	00	3NP40 10–0CH01	100	00	3NE1 820–0	80	00
3KA51 30–1EE01	80	3KL52 30–1EB01	125	00	3NP40 10–0CH01	100	00	3NE1 820–0	80	00
integrated in the supply connecting module					integrated in the supply connecting module					
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1) See catalog “Low-voltage switchgear”. Rated insulation voltage for pollution degree 3 to DIN VDE 0110, Part 1, but conditions of use to pollution degree 2. The rated insulation voltage is therefore ≥ 1000 V.

2) Note fuse sizes when selecting fuse switch disconnectors.

Selection and ordering data

Rated rectifier/ regenerative output at cos φ = 1 and 400 V supply voltage	**AFE inverter** with CUSA control board 6SE7090–0XX84–0BJ0	**AFE supply connecting module** with VSB voltage sensing board 6SE7090–0XX84–1GA1 and AFE reactor	Radio-interference suppression filter		Main contactor/ AC contactor 230 V		Precharging Precharging contactor 230 V (with compact AFE 24 V control voltage)	
P_n		**for compact units AFE reactor only**		Class	Rated current		Rated current	
kW	Order No.	Order No.	Order No.		Order No.	A	Order No.	A
Supply voltage 3-ph. 380 V AC –20 % to 460 V AC +5 %								
400 V								
6.8	**6SE7021–0EA81**	6SE70 21–3ES87–1FG0	6SE70 21–0ES87–0FB1	A1	3RT10 15	16	3RT10 16–. BB4 .	
9	**6SE7021–3EB81**	6SE70 21–3ES87–1FG0	6SE70 21–8ES87–0FB1	A1	3RT10 16	20	3RT10 16–. BB4 .	
12	**6SE7021–8EB81**	6SE70 22–6ES87–1FG0	6SE70 21–8ES87–0FB1	A1	3RT10 16	20	3RT10 16–. BB4 .	
17	**6SE7022–6EC81**	6SE70 22–6ES87–1FG0	6SE70 23–4ES87–0FB1	A1	3RT10 25	35	3RT10 16–. BB4 .	
23	**6SE7023–4EC81**	6SE70 24–7ES87–1FG0	6SE70 23–4ES87–0FB1	A1	3RT10 34	45	3RT10 16–. BB4 .	
32	**6SE7024–7ED81**	6SE70 24–7ES87–1FG0	6SE70 27–2ES87–0FB1	A1	3RT10 35	55	3RT10 16–. BB4 .	
40	**6SE7026–0ED81**	6SE70 27–2ES87–1FG0	6SE70 27–2ES87–0FB1	A1	3RT10 44	90	3RT10 16–. BB4 .	
49	**6SE7027–2ED81**	6SE70 27–2ES87–1FG0	6SE70 27–2ES87–0FB1	A1	3RT10 44	90	3RT10 16–. BB4 .	
63	**6SE7031–0EE80**	6SE71 31–0EE83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
85	**6SE7031–2EF80**	6SE71 31–2EF83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
100	**6SE7031–5EF80**	6SE71 31–5EF83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
125	**6SE7031–8EF80**	6SE71 31–8EF83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
143	**6SE7032–1EG80**	6SE71 32–1EG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
177	**6SE7032–6EG80**	6SE71 32–6EG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
214	**6SE7033–2EG80**	6SE71 33–2EG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
250	**6SE7033–7EG80**	6SE71 33–7EG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
Supply voltage 3-ph. 500 V AC –20 % to 575 V AC +5 %								
500 V								
51	**6SE7026–1FE80**	6SE71 26–1FE83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
56	**6SE7026–6FE80**	6SE71 26–6FE83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
67	**6SE7028–0FF80**	6SE71 28–0FF83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
92	**6SE7031–1FF80**	6SE71 31–1FF83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
109	**6SE7031–3FG80**	6SE71 31–3FG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
132	**6SE7031–6FG80**	6SE71 31–6FG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
164	**6SE7032–0FG80**	6SE71 32–0FG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
192	**6SE7032–3FG80**	6SE71 32–3FG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
Supply voltage 3-ph. 660 V AC –20 % to 690 V AC +5 %								
690 V								
70	**6SE7026–0HF80**	6SE71 26–0HF83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
96	**6SE7028–2HF80**	6SE71 28–2HF83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
114	**6SE7031–0HG80**	6SE71 31–0HG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
138	**6SE7031–2HG80**	6SE71 31–2HG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
170	**6SE7031–5HG80**	6SE71 31–5HG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
200	**6SE7031–7HG80**	6SE71 31–7HG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			
245	**6SE7032–1HG80**	6SE71 32–1HG83–2NA0	option L00 for supply connecting module	A1	integrated in the supply connecting module			

Precharging Resistor Rated value		Clean power filter			Voltage sensing board VSB
1 unit required per phase			Power loss	Basic interference suppression	For DIN rail mounting with enclosure
Order No.	Ω	Order No.	W	Order No.	Order No.
6SX70 10–0AC81	22	6SE70 21–0EB87–1FC0	200	6SX70 10–0FB10	6SX70 10–0EJ00
6SX70 10–0AC81	22	6SE70 21–8EB87–1FC0	250	6SX70 10–0FB10	6SX70 10–0EJ00
6SX70 10–0AC81	22	6SE70 21–8EB87–1FC0	250	6SX70 10–0FB10	6SX70 10–0EJ00
6SX70 10–0AC80	10	6SE70 22–6EC87–1FC0	300	6SX70 10–0FB10	6SX70 10–0EJ00
6SX70 10–0AC80	10	6SE70 23–4EC87–1FC0	400	6SX70 10–0FB10	6SX70 10–0EJ00
6SX70 10–0AC80	10	6SE70 24–7ED87–1FC0	500	6SX70 10–0FB10	6SX70 10–0EJ00
6SX70 10–0AC80	10	6SE70 27–2ED87–1FC0	600	6SX70 10–0FB10	6SX70 10–0EJ00
6SX70 10–0AC80	10	6SE70 27–2ED87–1FC0	600	6SX70 10–0FB10	6SX70 10–0EJ00
		integrated in the supply connecting module			
		integrated in the supply connecting module			
		integrated in the supply connecting module			
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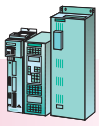


Selection and ordering data

Nominal power rating	Rectifier unit	Switch disconnector[2]		Switch disconnector with fuse holders[1][2]			Fuse switch disconnectors[1][2]		
			Rated current		Rated current	Max. fuse size		Rated current	Max. fuse size
kW	Order No.	Order No.	A	Order No.	A		Order No.	A	
Compact PLUS units									
Supply voltage 3-ph. 380 V to 480 V AC									
15	**6SE7024–1EP85–0AA0**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00; 000	3NP40 10–0CH01	100	000
50	**6SE7031–2EP85–0AA0**	3KA53 30–1EE01	160	3KL53 30–1EB01	160	00; 000	3NP42 70–0CA01	250	0; 1
100	**6SE7032–3EP85–0AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	1; 2	3NP42 70–0CA01	250	0; 1
Compact and chassis units									
Supply voltage 3-ph. 380 V to 480 V AC									
15	**6SE7024–1EB85–0AA0**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000
37	**6SE7028–6EC85–0AA0**	3KA51 30–1EE01	80	3KL52 30–1EB01	125	00	3NP40 10–0CH01	100	000
75	**6SE7031–7EE85–0AA0**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
110	**6SE7032–7EE85–0AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
160	**6SE7033–8EE85–0AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
200	**6SE7034–6EE85–0AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
250	**6SE7036–1EE85–0AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	3	3NP54 60–0CA00	630	2; 3
400	**6SE7038–2EH85–0AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
500	**6SE7041–0EH85–0AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
630	**6SE7041–3EK85–0A□0**	②	1250	–	–	–	–	–	–
800	**6SE7041–8EK85–0A□0**	②	1600	–	–	–	–	–	–
Supply voltage 3-ph. 500 V to 600 V AC									
22	**6SE7024–1FB85–0AA0**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000
37	**6SE7027–2FC85–0AA0**	3KA50 30–1EE01	63	3KL50 30–1EB01	63	00	3NP40 10–0CH01	100	000
55	**6SE7028–8FC85–0AA0**	3KA51 30–1EE01	80	3KL52 30–1EB01	125	00	3NP40 70–0CA01	160	00
75	**6SE7031–4FE85–0AA0**	3KA53 30–1EE01	160	3KL52 30–1EB01	125	00	3NP40 70–0CA01	160	00
132	**6SE7032–4FE85–0AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
200	**6SE7033–5FE85–0AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
250	**6SE7034–2FE85–0AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
315	**6SE7035–4FE85–0AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	3	3NP54 60–0CA00	630	2; 3
450	**6SE7037–7FH85–0AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
630	**6SE7041–0FH85–0AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
800	**6SE7041–3FK85–0A□0**	②	1250	–	–	–	–	–	–
900	**6SE7041–5FK85–0A□0**	②	1600	–	–	–	–	–	–
1100	**6SE7041–8FK85–0A□0**	②	2000	–	–	–	–	–	–
Supply voltage 3-ph. 660 V to 690 V AC									
160	**6SE7032–2HE85–0AA0**	3KA57 30–1EE01	400	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
250	**6SE7033–5HE85–0AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
315	**6SE7034–2HE85–0AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
400	**6SE7035–4HE85–0AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	3	3NP54 60–0CA00	630	2; 3
630	**6SE7037–7HH85–0AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
800	**6SE7041–0HH85–0AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
1000	**6SE7041–3HK85–0A□0**	②	1250	–	–	–	–	–	–
1100	**6SE7041–5HK85–0A□0**	②	1600	–	–	–	–	–	–
1500	**6SE7041–8HK85–0A□0**	②	2000	–	–	–	–	–	–

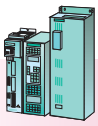
Rectifier unit	**A**
Rectifier unit with power section[3]	**D**

1) Switch disconnectors:
Note size of cable-protection and semiconductor-protection fuses!

2) Can be optionally used depending on requirements. For further information see catalog "Low-voltage switchgear".

3) For parallel connection.

② Not available from Siemens.



Compact PLUS units
Compact and chassis units

Recommended system components for rectifier units

Cable-protection fuses Duty class gL[1][2]			Semiconductor-protection fuses Duty class gR[2] (incl. cable protection)			Fuse bases to IEC/DIN[5]		Circuit-breaker[4]		Main contactor/ AC contactor[4]	
	Rated current	Size		Rated current	Size		Rated current/ size		Rated current	AC 1 duty 55 °C	Rated current
Order No.	A		Order No.	A		Order No.	A	Order No.	A	Order No.	A
3NA3 817	40	000	3NE1 802–0	40	000	–	–	–	–	3RT10 34	50
3NA3 032	125	0	3NE1 022–0	125	00	–	–	–	–	3RT10 54	160
3NA3 142	224	1	3NE1 227–0	250	1	–	–	–	–	3RT10 64	275
3NA3 820	50	00	3NE1 802–0	40	000	–	–	–	–	3RT10 34	45
3NA3 830	100	00	3NE1 820–0	80	000	–	–	–	–	3RT10 44	90
3NA3 140	200	1	3NE1 224–0	160	1	–	–	–	–	3TK50	190
3NA3 252	315	2	3NE1 227–0	250	1	–	–	–	–	3TK52	315
3NA3 260	400	2	3NE1 331–0	350	2	–	–	–	–	3TK54	380
3NA3 365	500	3	3NE1 332–0	400	2	–	–	–	–	3TK56	500
3NA3 372	630	3	3NE1 435–0	560	3	–	–	–	–	2 x 3TK52	567
3NA3 480[3][6]	1000	4	Semiconductor protection fuses aR (without cable protection) already integrated in the standard unit			3NH3 530	1000/4	3WN61	800	3 x 3TK52	788
3NA3 682[3][6]	1250	4a				3NH7 520	1250/4a	3WN62	1000	3 x 3TK54	950
2 x 3NA3 475[3][6]	800	4				3NH3 530	1000/4	3WN63	1250	3 x 3TK56	1250
2 x 3NA3 480[3][6]	1000	4				3NH3 530	1000/4	3WN65	2000	3 x 3TK15	1950
to 500 V	**to 600 V**										
3NA3 820	3NA3 820–6	50	00	3NE1 802–0	40	000	–	–	–	–	3RT10 34	45
3NA3 824	3NA3 824–6	80	00	3NE1 818–0	63	000	–	–	–	–	3RT10 44	90
3NA3 830	3NA3 830–6	100	00	3NE1 021–0	100	00	–	–	–	–	3RT10 44	90
3NA3 136	3NA3 136–6	160	1	3NE1 022–0	125	00	–	–	–	–	3RT14 46	135
3NA3 144	3NA3 144–6	250	2	3NE1 227–0	250	1	–	–	–	–	3TK52	315
3NA3 260	3NA3 260–6	400	2	3NE1 231–0	350	2	–	–	–	–	3TK52	315
3NA3 365	3NA3 365–6	500	3	3NE1 332–0	400	2	–	–	–	–	3TK54	380
3NA3 372		630	3	3NE1 334–0	500	2	–	–	–	–	3TK56	500
3NA3 480[3][6]		1000	4	Semiconductor protection fuses aR (without cable protection) already integrated in the standard unit			3NH3 530	1000/4	3WN61	800	2 x 3TK54	788
3NA3 682[3][6]		1250	4a				3NH7 520	1250/4a	3WN62	1000	3 x 3TK54	950
2 x 3NA3 475[3][6]		800	4				3NH3 530	1000/4	3WN63	1250	3 x 3TK56	1250
2 x 3NA3 475[3][6]		800	4				3NH3 530	1000/4	3WN64	1600	3 x 3TK14	1410
2 x 3NA3 480[3][6]		1000	4				3NH3 530	1000/4	3WN65	2000	3 x 3TK15	1950
3NA3 144–6		250	2	3NE1 225–0	200	1	–	–	–	–	3TK50	190
3NA3 260–6		400	2	3NE1 230–0	315	1	–	–	–	–	3TK52	315
3NA3 365–6		500	3	3NE1 225–0	400	2	–	–	–	–	3TK54	380
3NE1 436–0		630	3	3NE1 334–0	500	3	–	–	–	–	3TK56	500
			Semiconductor protection fuses aR (without cable protection) already integrated in the standard unit			–	–	3WN61	800	2 x 3TK54	788
						–	–	3WN62	1000	3 x 3TK54	950
						–	–	3WN63	1250	3 x 3TK56	1250
						–	–	3WN64	1600	3 x 3TK14	1410
						–	–	3WN65	2000	3 x 3TK15	1950

1) Does not provide 100 % protection for the input rectifier of the unit.

2) The cable cross-sections must be dimensioned according to DIN VDE 0100, VDE 0298 Part 4 as a function of the rated fuse currents.

3) See catalog "Low-voltage switchgear". Used for drive converters with a line supply inductance of ≥ 3 % referred to the drive converter impedance, i.e. so that the ratio of the system fault level to the converter output is 33 : 1 or 100 : 1 if an additional 2 % line reactor is used.

Impedance of unit:

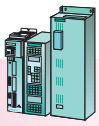
$$Z = \frac{V}{\sqrt{3} \cdot I_{UN}}$$

4) See catalog "Low-voltage switchgear".

5) Size and quantity dependent on the fuses used. For further information see catalog "Low-voltage switchgear".

6) Cables can also be protected with circuit-breakers with appropriate cable protection. See catalog "Low-voltage switchgear".

Caution:
Short-circuit capacity and loadability at ambient temperature must be taken into account.



Selection and ordering data

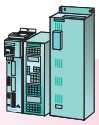
Nominal power rating	Rectifier unit	Radio-interference suppression filter	Commutating reactor[1] v_D = 2 %		
				P_v 50/60 Hz	Rated current
kW	Order No.	Order No.	Order No.	W	A
Compact PLUS units					
Supply voltage 3-ph. 380 V to 480 V AC					
			400/480 V, 50/60 Hz		
15	**6SE7024–1EP85–0AA0**	6SE7023–4ES87–0FB1[2]	4EP37 00–2US00	57/ 60	35.5
50	**6SE7031–2EP85–0AA0**	6SE7031–8ES87–0FA1[2]	4EU24 52–2UA00–0AA0	154/163	160
100	**6SE7032–3EP85–0AA0**	6SE7033–2ES87–0FA1[2]	4EU25 52–5UA00–0AA0	187/201	250
Compact and chassis units					
Supply voltage 3-ph. 380 V to 480 V AC					
			400/480 V, 50/60 Hz		
15	**6SE7024–1EB85–0AA0**	6SE7023–4ES87–0FB1[2]	4EP37 00–2US00	57/ 60	35.5
37	**6SE7028–6EC85–0AA0**	6SE7027–2ES87–0FB1[2]	4EP39 00–2US00	82/ 87	80
75	**6SE7031–7EE85–0AA0**	6SE7031–8ES87–0FA1[2]	4EU24 52–2UA00–0AA0	154/163	160
110	**6SE7032–7EE85–0AA0**	6SE7033–2ES87–0FA1[2]	4EU25 52–5UA00–0AA0	187/201	250
160	**6SE7033–8EE85–0AA0**	6SE7033–2ES87–0FA1[2]	4EU27 52–7UA00–0AA0	253/275	315
200	**6SE7034–6EE85–0AA0**	6SE7036–0ES87–0FA1[2]	4EU27 52–8UA00–0AA0	253/275	400
250	**6SE7036–1EE85–0AA0**	6SE7036–0ES87–0FA1[2]	4EU30 52–5UA00–0AA0	334/367	560
400	**6SE7038–2EH85–0AA0**	6SE7041–0ES87–0FA1[2]	4EU36 52–8UA00–1BA0	450/495	720
500	**6SE7041–0EH85–0AA0**	6SE7041–0ES87–0FA1[2]	4EU36 52–0UB00–1BA0	450/495	910
630	**6SE7041–3EK85–0A□0**	6SE7041–6ES87–0FA1[2]	4EU36 52–7UC00–1BA0	450/495	1120
800	**6SE7041–8EK85–0A□0**	6SE7041–6ES87–0FA1[2]	4EU39 51–0UC00–0A	570/627	1600
Supply voltage 3-ph. 500 V to 600 V AC					
			500 V, 50 Hz		
22	**6SE7024–1FB85–0AA0**	B84143–A50–R21[2][3]	4EP37 00–1US00	57	35.5
37	**6SE7027–2FC85–0AA0**	B84143–A80–R21[2][3]	4EP39 00–1US00	82	63
55	**6SE7028–8FC85–0AA0**	B84143–A80–R21[2][3]	4EP40 00–1US00	96	80
75	**6SE7031–4FE85–0AA0**	B84143–A120–R21[2][3]	4EU24 52–1UA00–0AA0	154	140
132	**6SE7032–4FE85–0AA0**	B84143–B 250–S□□3)	4EU25 52–6UA00–0AA0	187	200
200	**6SE7033–5FE85–0AA0**	B84143–B 320–S□□[3]	4EU27 52–3UA00–0AA0	253	315
250	**6SE7034–2FE85–0AA0**	B84143–B 600–S□□[3]	4EU27 52–4UA00–0AA0	253	400
315	**6SE7035–4FE85–0AA0**	B84143–B 600–S□□[3]	4EU30 52–2UA00–0AA0	334	450
450	**6SE7037–7FH85–0AA0**	B84143–B1000–S□□[3]	4EU36 52–3UA00–0AA0	450	710
630	**6SE7041–0FH85–0AA0**	B84143–B1000–S□□[3]	4EU36 52–4UA00–1BA0	450	910
800	**6SE7041–3FK85–0A□0**	B84143–B1600–S□□[3]	4EU39 51–5UB00–0A	570	1120
900	**6SE7041–5FK85–0A□0**	B84143–B1600–S□□[3]	4EU39 51–7UB00–0A	570	1250
1100	**6SE7041–8FK85–0A□0**	B84143–B1600–S□□[3]	4EU43 51–2UB00–0A	750	1600
Supply voltage 3-ph. 660 V to 690 V AC					
			690 V, 50 Hz		
160	**6SE7032–2HE85–0AA0**	B84143–B 250–S□□[3]	4EU27 52–6UA00–0AA0	253	224
250	**6SE7033–5HE85–0AA0**	B84143–B 320–S□□[3]	4EU30 52–3UA00–0AA0	334	315
315	**6SE7034–2HE85–0AA0**	B84143–B 600–S□□[3]	4EU30 52–4UA00–0AA0	334	400
400	**6SE7035–4HE85–0AA0**	B84143–B 600–S□□[3]	4EU36 52–5UA00–0AA0	450	500
630	**6SE7037–7HH85–0AA0**	B84143–B1000–S□□[3]	4EU36 52–7UA00–1BA0	450	710
800	**6SE7041–0HH85–0AA0**	B84143–B1000–S□□[3]	4EU39 51–0UA00–0A	570	910
1000	**6SE7041–3HK85–0A□0**	B84143–B1600–S□□[3]	4EU39 51–6UB00–0A	570	1120
1100	**6SE7041–5HK85–0A□0**	B84143–B1600–S□□[3]	4EU43 51–0UB00–0A	750	1250
1500	**6SE7041–8HK85–0A□0**	B84143–B1600–S□□[3]	4EU45 51–4UA00	840	1600

Rectifier unit	**A**
Rectifier unit for parallel connection	**D**
for 500 V TT and TN systems (earthed system)	**2 0**
for 690 V TT and TN systems (earthed system)	**2 1**
for 380 V to 690 V IT systems (non-earthed and insulated system)	**2 4**

1) For commutating reactors for converters and rectifier units, see catalog PD 30.

2) Can only be used with TT and TN systems (earthed system).

3) Further information on the filters can be obtained from EPCOS (www.epcos.com) at www4.ad.siemens.de. Please enter the following number under "Entry ID": 65 67 129.



Commutating reactor[1]) $v_D = 4\ \%$	P_v 50/60 Hz	Rated current
Order No.	W	A
400/480 V, 50/60 Hz		
4EP39 00–5US00	82/ 87	35.5
4EU27 52–1UB00–0AA0	253/275	160
4EU30 52–7UA00–0AA0	334/367	280
400/480 V, 50/60 Hz		
4EP39 00–5US00	82/ 87	35.5
4EU24 52–4UA00–0AA0	154/163	80
4EU27 52–1UB00–0AA0	253/275	160
4EU30 52–7UA00–0AA0	334/367	280
4EU30 52–8UA00–0AA0	334/367	355
4EU36 52–3UB00–0AA0	450/495	400
4EU36 52–4UB00–0AA0	450/495	560
4EU39 51–6UA00–0A	570/627	710
4EU39 51–1UB00–0A	570/627	910
4EU43 51–3UB00–0A	750/830	1120
4EU43 51–5UB00–0A	750/830	1600
500 V, 50 Hz		
4EP40 01–0US00	96	35.5
4EU24 52–5UA00–0AA0	154	63
4EU25 52–1UB00–0AA0	187	80
4EU27 52–3UB00–0AA0	253	140
4EU30 52–0UB00–0AA0	334	200
4EU36 52–5UB00–0AA0	450	315
4EU36 52–6UB00–0AA0	450	400
4EU36 52–7UB00–1BA0	450	500
4EU39 51–7UA00–0A	570	710
4EU43 51–5UA00–0A	570	910
4EU45 51–5UA00–0A	840	1120
4EU45 51–6UA00–0A	840	1250
4EU47 51–3UA00–0A	965	1600
690 V, 50 Hz		
4EU36 52–8UB00–0AA0	450	224
4EU36 52–0UC00–0AA0	450	315
4EU39 51–8UA00–0A	570	400
4EU39 51–0UB00–0A	570	500
4EU43 51–6UA00–0A	750	710
4EU45 51–3UA00	840	910
4EU47 51–2UA00	965	1120
4EU50 51–1UA00	1180	1250
4EU52 51–1UA00	1350	1600

1) Commutating reactors for converters and rectifier units, see catalog PD 30.

Recommended system components for rectifier/regenerative units, 25 % power-on duration in generating mode

Selection and ordering data

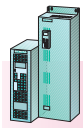
Nominal power rating	Rectifier/ regenerative unit	Switch disconnector[2]		Switch disconnector with fuse holders[1][2]			Fuse switch disconnectors[1][2]		
			Rated current		Rated current	Max. fuse size		Rated current	Max. fuse size
kW	Order No.	Order No.	A	Order No.	A		Order No.	A	
Supply voltage 3-ph. 380 V to 480 V AC									
7.5	**6SE7022–1EC85–1AA0**	3KA50 30–1EE01	63	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
15	**6SE7024–1EC85–1AA0**	3KA50 30–1EE01	63	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
37	**6SE7028–6EC85–1AA0**	3KA51 30–1EE01	80	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
75	**6SE7031–7EE85–1AA0**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
90	**6SE7032–2EE85–1AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
132	**6SE7033–1EE85–1AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
160	**6SE7033–8EE85–1AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
200	**6SE7034–6EE85–1AA0**	3KA57 30–1EE01	400	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
250	**6SE7036–1EE85–1AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
400	**6SE7038–2EH85–1AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
500	**6SE7041–0EH85–1AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
630	**6SE7041–3EK85–1A□0**	②	1250	–	–	–	–	–	–
800	**6SE7041–8EK85–1A□0**	②	1600	–	–	–	–	–	–
Supply voltage 3-ph. 500 V to 600 V AC									
11	**6SE7022–7FC85–1AA0**	3KA50 30–1EE01	63	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
22	**6SE7024–1FC85–1AA0**	3KA50 30–1EE01	63	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
37	**6SE7027–2FC85–1AA0**	3KA50 30–1EE01	63	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
55	**6SE7028–8FC85–1AA0**	3KA51 30–1EE01	80	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
90	**6SE7031–5FE85–1AA0**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
132	**6SE7032–4FE85–1AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
160	**6SE7032–7FE85–1AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
200	**6SE7033–5FE85–1AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
250	**6SE7034–2FE85–1AA0**	3KA57 30–1EE01	400	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
315	**6SE7035–4FE85–1AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
450	**6SE7037–7FH85–1AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
630	**6SE7041–0FH85–1AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
800	**6SE7041–3FK85–1A□0**	②	1250	–	–	–	–	–	–
900	**6SE7041–5FK85–1A□0**	②	1600	–	–	–	–	–	–
1100	**6SE7041–8FK85–1A□0**	②	2000	–	–	–	–	–	–
Supply voltage 3-ph. 660 V to 690 V AC									
110	**6SE7031–4HE85–1AA0**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
160	**6SE7032–2HE85–1AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP53 60–0CA00	400	1; 2
200	**6SE7032–7HE85–1AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP53 60–0CA00	400	1; 2
315	**6SE7034–2HE85–1AA0**	3KA57 30–1EE01	400	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
400	**6SE7035–3HE85–1AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
630	**6SE7037–7HH85–1AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
800	**6SE7041–0HH85–1AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
1000	**6SE7041–3HK85–1A□0**	②	1250	–	–	–	–	–	–
1100	**6SE7041–5HK85–1A□0**	②	1600	–	–	–	–	–	–
1500	**6SE7041–8HK85–1A□0**	②	2000	–	–	–	–	–	–

Rectifier/regenerative unit	**A**
Rectifier/regenerative unit for parallel connection	**D**

1) Switch disconnectors: Note size of cable-protection and semiconductor-protection fuses!

2) Can be optionally used depending on requirements. For further information see catalog "Low-voltage switchgear".

② Not available from Siemens.



Compact and chassis units

Recommended system components for rectifier/regenerative units, 25 % power-on duration in generating mode

Cable-protection fuses Duty class gL[1)2)]				Semiconductor-protection fuses Duty class aR[2)] (incl. cable protection)			Fuse bases to IEC/DIN[5)]		Circuit-breaker[4)]		Main contactor/ AC contactor[4)]	
		Rated current	Size		Rated current	Size		Rated current/ Size		Rated current	AC 1 duty 55 °C	Rated current
Order No.		A		Order No.	A		Order No.	A	Order No.	A	Order No.	A
3NA3 810		25	00	3NE4 101	32	0	–	–	–	–	3RT10 25	35
3NA3 820		50	00	3NE4 118	63	0	–	–	–	–	3RT10 34	45
3NA3 830		100	00	3NE4 122	125	0	–	–	–	–	3RT10 44	90
3NA3 140		200	1	3NE3 227	250	1	–	–	–	–	3TK50	190
3NA3 144		250	1	3NE3 230–0B	315	1	–	–	–	–	3TK52	315
3NA3 252		315	2	3NE3 233	450	1	–	–	–	–	3TK52	315
3NA3 260		400	2	3NE3 333	450	2	–	–	–	–	3TK54	380
3NA3 365		500	3	3NE3 335	560	2	–	–	–	–	3TK56	500
3NA3 372		630	3	3NE3 338–8	800	2	–	–	–	–	2 x 3TK52	567
3NA3 480[3)6)]		1000	4	Semiconductor protection fuses aR (without cable protection) already integrated in the standard unit			3NH3 530	1000/4	3WN61	800	3 x 3TK52	788
3NA3 682[3)6)]		1250	4a				3NH7 520	1250/4a	3WN62	1000	3 x 3TK54	950
2 x 3NA3 475[3)6)]		800	4				3NH3 530	1000/4	3WN63	1250	3 x 3TK56	1250
2 x 3NA3 480[3)6)]		1000	4				3NH3 530	1000/4	3WN65	2000	3 x 3TK15	1950
up to 500 V	**up to 600 V**											
3NA3 814	3NA3 814–6	35	00	3NE4 102	40	0	–	–	–	–	3RT10 25	35
3NA3 820	3NA3 820–6	50	00	3NE4 118	63	0	–	–	–	–	3RT10 34	45
3NA3 824	3NA3 824–6	80	00	3NE4 121	100	0	–	–	–	–	3RT10 44	90
3NA3 830	3NA3 830–6	100	00	3NE3 222	125	1	–	–	–	–	3RT10 44	90
3NA3 136	3NA3 136–6	160	1	3NE3 224	160	1	–	–	–	–	3TK50	190
3NA3 144	3NA3 144–6	250	2	3NE3 230–0B	315	1	–	–	–	–	3TK52	315
3NA3 252	3NA3 252–6	315	2	3NE3 231	350	1	–	–	–	–	3TK52	315
3NA3 260	3NA3 260–6	400	2	3NE3 333	450	2	–	–	–	–	3TK52	315
3NA3 365	3NA3 365–6	500	3	3NE3 334–0B	500	2	–	–	–	–	3TK54	380
3NA3 372	3NE1 436–0	630	3	3NE3 336	630	2	–	–	–	–	3TK56	500
3NA3 480[3)6)]		1000	4	Semiconductor protection fuses aR (without cable protection) already integrated in the standard unit			3NH3 530	1000/4	3WN61	800	2 x 3TK54	684
3NA3 682[3)6)]		1250	4a				3NH7 520	1250/4a	3WN62	1000	3 x 3TK54	950
2 x 3NA3 475[3)6)]		800	4				3NH3 530	1000/4	3WN63	1250	3 x 3TK56	1250
2 x 3NA3 475[3)6)]		800	4				3NH3 530	1000/4	3WN64	1600	3 x 3TK56	1250
2 x 3NA3 480[3)6)]		1000	4				3NH3 530	1000/4	3WN65	2000	3 x 3TK15	1950
3NA3 136–6		160	1	3NE3 224	160	1	–	–	–	–	3RT14 46	135
3NA3 144–6		250	2	2NE3 230–0B	315	1	–	–	–	–	3TK50	190
3NA3 252–6		315	2	3NE3 231	350	1	–	–	–	–	3TK52	315
3NA3 365–6		500	3	3NE3 335	560	2	–	–	–	–	3TK54	380
3NE1 436–0		630	3	3NE3 336	630	2	–	–	–	–	3TK56	500
				Semiconductor protection fuses aR (without cable protection) already integrated in the standard unit			–	–	3WN61	800	2 x 3TK54	684
							–	–	3WN62	1000	3 x 3TK54	950
							–	–	3WN63	1250	3 x 3TK56	1250
							–	–	3WN64	1600	3 x 3TK56	1250
							–	–	3WN65	2000	3 x 3TK15	1950

1) Does not provide 100 % protection for the input rectifier of the unit.

2) The cable cross-sections must be dimensioned according to DIN VDE 0100, VDE 0298 Part 4 as a function of the rated fuse currents.

3) See catalog "Low-voltage switchgear". Used for drive converters with a line supply inductance of ≥ 3 % referred to the drive converter impedance, i.e. so that the ratio of the system fault level to the converter output is 33 : 1 or 100 : 1 if an additional 2 % line reactor is used.

Impedance of unit:

$$Z = \frac{V}{\sqrt{3} \cdot I_{UN}}$$

4) See catalog "Low-voltage switchgear".

5) Size and quantity dependent on the fuses used. For further information see catalog "Low-voltage switchgear".

6) Cables can also be protected with circuit-breakers with appropriate cable protection. See catalog "Low-voltage switchgear".

Caution:
Short-circuit capacity and loadability at ambient temperature must be taken into account.

Recommended system components for rectifier/regenerative units, 25 % power-on duration in generating mode

Selection and ordering data

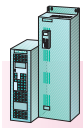
Nominal power rating	Rectifier/ regenerative unit	Radio-interference suppression filter	Commutating reactor[1] v_D = 2 %	P_v 50/60 Hz	Rated current	Commutating reactor[1] v_D = 4 %	P_v 50/60 Hz	Rated current
kW	Order No.	Order No.	Order No.	W	A	Order No.	W	A
Supply voltage 3-ph. 380 V to 480 V AC								
			400/480 V, 50/60 Hz			**400/480 V, 50/60 Hz**		
7.5	**6SE7022–1EC85–1AA0**	6SE7023–4ES87–0FB1[2]	4EP36 00–4US00	52/ 57	18	4EP37 00–7US00	57/ 60	18
15	**6SE7024–1EC85–1AA0**	6SE7023–4ES87–0FB1[2]	4EP37 00–2US00	57/ 60	35.5	4EP39 00–5US00	82/ 87	35.5
37	**6SE7028–6EC85–1AA0**	6SE7027–2ES87–0FB1[2]	4EP39 00–2US00	82/ 87	80	4EU24 52–4UA00–0AA0	154/163	80
75	**6SE7031–7EE85–1AA0**	6SE7031–8ES87–0FA1[2]	4EU24 52–2UA00–0AA0	154/163	160	4EU27 52–1UB00–0AA0	253/275	160
90	**6SE7032–2EE85–1AA0**	6SE7031–8ES87–0FA1[2]	4EU25 52–4UA00–0AA0	187/201	200	4EU27 52–2UB00–0AA0	253/275	200
132	**6SE7033–1EE85–1AA0**	6SE7033–2ES87–0FA1[2]	4EU27 52–0UB00–0AA0	253/275	280	4EU30 52–7UA00–0AA0	334/367	280
160	**6SE7033–8EE85–1AA0**	6SE7033–2ES87–0FA1[2]	4EU27 52–7UA00–0AA0	253/275	315	4EU30 52–8UA00–0AA0	334/367	355
200	**6SE7034–6EE85–1AA0**	6SE7036–0ES87–0FA1[2]	4EU27 52–8UA00–0AA0	253/275	400	4EU36 52–3UB00–0AA0	450/495	400
250	**6SE7036–1EE85–1AA0**	6SE7036–0ES87–0FA1[2]	4EU30 52–5UA00–0AA0	334/367	560	4EU36 52–4UB00–0AA0	450/495	560
400	**6SE7038–2EH85–1AA0**	6SE7041–0ES87–0FA1[2]	4EU36 52–8UA00–1BA0	450/495	720	4EU39 51–6UA00–0A	570/627	710
500	**6SE7041–0EH85–1AA0**	6SE7041–0ES87–0FA1[2]	4EU36 52–0UB00–1BA0	450/495	910	4EU39 51–1UB00–0A	570/627	910
630	**6SE7041–3EK85–1A□0**	6SE7041–6ES87–0FA1[2]	4EU36 52–7UC00–1BA0	450/495	1120	4EU43 51–3UB00–0A	750/830	1120
800	**6SE7041–8EK85–1A□0**	6SE7041–6ES87–0FA1[2]	4EU39 51–0UC00–0A	570/627	1600	4EU43 51–5UB00–0A	750/830	1600
Supply voltage 3-ph. 500 V to 600 V AC								
			500 V, 50 Hz			**500 V, 50 Hz**		
11	**6SE7022–7FC85–1AA0**	B84143–A25–R21[2][3]	4EP36 00–3US00	52	22.4	4EP38 00–8US00	67	22.4
22	**6SE7024–1FC85–1AA0**	B84143–A36–R21[2][3]	4EP37 00–1US00	57	35.5	4EP40 01–0US00	96	35.5
37	**6SE7027–2FC85–1AA0**	B84143–A80–R21[2][3]	4EP39 00–1US00	82	63	4EU24 52–5UA00–0AA0	154	63
55	**6SE7028–8FC85–1AA0**	B84143–A80–R21[2][3]	4EP40 00–1US00	96	80	4EU25 52–1UB00–0AA0	187	80
90	**6SE7031–5FE85–1AA0**	B84143–A150–R21[2][3]	4EU24 52–1UA00–0AA0	154	140	4EU27 52–3UB00–0AA0	253	140
132	**6SE7032–4FE85–1AA0**	B84143–B 250–S□□[3]	4EU25 52–6UA00–0AA0	187	200	4EU30 52–0UB00–0AA0	334	200
160	**6SE7032–7FE85–1AA0**	B84143–B 250–S□□[3]	4EU27 52–2UA00–0AA0	253	250	4EU30 52–1UB00–0AA0	334	250
200	**6SE7033–5FE85–1AA0**	B84143–B 320–S□□[3]	4EU27 52–3UA00–0AA0	253	315	4EU36 52–5UB00–0AA0	450	315
250	**6SE7034–2FE85–1AA0**	B84143–B 600–S□□[3]	4EU27 52–4UA00–0AA0	253	400	4EU36 52–6UB00–0AA0	450	400
315	**6SE7035–4FE85–1AA0**	B84143–B 600–S□□[3]	4EU30 52–2UA00–0AA0	334	450	4EU36 52–7UB00–1BA0	450	500
450	**6SE7037–7FH85–1AA0**	B84143–B1000–S□□[3]	4EU36 52–3UA00–0AA0	450	710	4EU39 51–7UA00–0A	570	710
630	**6SE7041–0FH85–1AA0**	B84143–B1000–S□□[3]	4EU36 52–4UA00–1BA0	450	910	4EU43 51–5UA00–0A	750	910
800	**6SE7041–3FK85–1A□0**	B84143–B1600–S□□[3]	4EU39 52–5UB00–0A	570	1120	4EU45 51–5UA00	840	1120
900	**6SE7041–5FK85–1A□0**	B84143–B1600–S□□[3]	4EU39 51–7UB00–0A	570	1250	4EU45 51–6UA00	840	1250
1100	**6SE7041–8FK85–1A□0**	B84143–B1600–S□□[3]	4EU43 51–2UB00–0A	750	1600	4EU47 51–3UA00	965	1600
Supply voltage 3-ph. 660 V to 690 V AC								
			690 V, 50 Hz			**690 V, 50 Hz**		
110	**6SE7031–4HE85–1AA0**	B84143–B 250–S□□[3]	4EU25 52–3UA00–0AA0	187	125	4EU27 52–4UB00–0AA0	253	125
160	**6SE7032–2HE85–1AA0**	B84143–B 250–S□□[3]	4EU27 52–6UA00–0AA0	253	224	4EU36 52–8UB00–0AA0	450	224
200	**6SE7032–7HE85–1AA0**	B84143–B 320–S□□[3]	4EU27 52–6UA00–0AA0	253	224	4EU36 52–8UB00–0AA0	450	224
315	**6SE7034–2HE85–1AA0**	B84143–B 600–S□□[3]	4EU30 52–4UA00–0AA0	334	400	4EU39 51–8UA00–0A	570	400
400	**6SE7035–3HE85–1AA0**	B84143–B 600–S□□[3]	4EU36 52–5UA00–0AA0	450	500	4EU39 51–0UB00–0A	570	500
630	**6SE7037–7HH85–1AA0**	B84143–B1000–S□□[3]	4EU36 52–7UA00–1BA0	450	710	4EU43 51–6UA00–0A	750	710
800	**6SE7041–0HH85–1AA0**	B84143–B1000–S□□[3]	4EU39 51–0UA00–0A	570	910	4EU45 51–3UA00	840	910
1000	**6SE7041–3HK85–1A□0**	B84143–B1600–S□□[3]	4EU39 51–6UB00–0A	570	1120	4EU47 51–2UA00	965	1120
1100	**6SE7041–5HK85–1A□0**	B84143–B1600–S□□[3]	4EU43 51–0UB00–0A	750	1250	4EU50 51–1UA00	1180	1250
1500	**6SE7041–8HK85–1A□0**	B84143–B1600–S□□[3]	4EU45 51–4UA00	840	1600	4EU52 51–1UA00	1350	1600

Rectifier/regenerative unit	A	
Rectifier/regenerative unit for parallel connection	D	
for 500 V TT and TN systems (earthed system)	2	0
for 690 V TT and TN systems (earthed system)	2	1
for 380 V to 690 V IT systems (non-earthed and insulated system)	2	4

1) For commutating reactors for converters and rectifier units, see catalog PD 30.

2) Can only be used with TT and TN systems (earthed system).

3) Further information on the filters can be obtained from EPCOS (www.epcos.com) at www4.ad.siemens.de. Please enter the following number under "Entry ID": 65 67 129.



Recommended system components for rectifier/regenerative units, 25 % power-on duration in generating mode

Regenerative autotransformer[1]			
25 % power-on duration	P_V 50/60 Hz	25 % power-on duration	P_V 50/60 Hz
Order No.	kW	Order No.	kW
380 V to 415 V, 50/60 Hz		**440 V to 480 V, 60 Hz**	
4AP25 95–0UA11–8AN2	0.35	4AP25 95–0UA21–8AN2	0.35
4AP27 95–0UA01–8AN2	0.45	4AP27 95–0UA51–8AN2	0.45
4AP30 95–0UA01–8AN2	0.65	4AP30 95–0UA71–8AN2	0.65
4AU39 95–0UA51–8AN2	2.20	4AU36 95–0UA21–8AN2	1.70
4AU39 95–0UA61–8AN2	2.20	4AU39 95–0UB01–8AN2	2.20
4BU43 95–0UA41–8A	2.70	4BU43 95–0UA51–8A	2.70
4BU45 95–0UA61–8A	2.80	4BU45 95–0UA71–8A	2.80
4BU47 95–0UA61–8A	3.00	4BU47 95–0UA71–8A	3.00
4BU51 95–0UA31–8A	6.00	4BU51 95–0UA41–8A	6.00
4BU53 95–0UA61–8A	6.20	4BU52 95–0UA41–8A	6.20
4BU54 95–0UA21–8A	7.30	4BU54 95–0UA31–8A	7.30
4BU56 95–0UA41–8A	8.00	4BU55 95–0UA31–8A	7.50
4BU58 95–0UA51–8A	14.8	4BU56 95–0UA51–8A	8.00
500 V, 50/60 Hz		**600 V, 60 Hz**	
4AP27 95–0UA61–8AN2	0.45	4AP25 95–0UA01–8AN2	0.35
4AP27 95–0UA71–8AN2	0.45	4AP27 95–0UA31–8AN2	0.45
4AP30 95–0UA81–8AN2	0.65	4AP30 95–0UA61–8AN2	0.65
4AU36 95–0UA31–8AN2	1.70	4AP30 95–0UA61–8AN2	0.65
4AU39 95–0UB11–8AN2	2.20	4AU39 95–0UA41–8AN2	2.20
4BU43 95–0UA61–8A	2.70	4BU43 95–0UA11–8A	2.70
4BU45 95–0UA81–8A	2.80	4BU43 95–0UA21–8A	2.70
4BU45 95–0UB01–8A	2.80	4BU45 95–0UA41–8A	2.80
4BU47 95–0UA81–8A	3.00	4BU47 95–0UA41–8A	3.00
4BU51 95–0UA51–8A	6.00	4BU51 95–0UA21–8A	6.00
4BU54 95–0UA41–8A	7.30	4BU53 95–0UA41–8A	6.20
4BU55 95–0UA41–8A	7.50	4BU55 95–0UA21–8A	7.50
4BU56 95–0UA61–8A	8.00	4BU56 95–0UA21–8A	8.00
4BU58 95–0UA61–8A	8.00	on request	
4BU59 95–0UA21–8A	15.5	on request	
		690 V, 50/60 Hz	
		4BU43 95–0UA31–8A	2.70
		4BU45 95–0UA51–8A	2.80
		4BU47 95–0UA51–8A	3.00
		4BU52 95–0UA31–8A	6.00
		4BU53 95–0UA51–8A	6.20
		4BU56 95–0UA31–8A	8.00
		4BU58 95–0UA41–8A	14.8
		4BU59 95–0UA11–8A	15.5
		4BU60 95–0UA31–8A	16.3
		4BU62 95–0UA41–8A	20.2

1) Transformer: Cycle duration refers to 22 min., i.e. with 25 % power-on duration, maximum 5.5 min regenerating mode, 16.5 min rectifying mode.

Recommended system components for rectifier/regenerative units, 100 % power-on duration in generating mode

Selection and ordering data

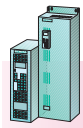
Nominal power rating	Rectifier/ regenerative unit	Switch disconnector[2]		Switch disconnector with fuse holders[1][2]			Fuse switch disconnectors[1][2]		
			Rated current		Rated current	Max. fuse size		Rated current	Max. fuse size
kW	Order No.	Order No.	A	Order No.	A		Order No.	A	
Supply voltage 3-ph. 380 V to 480 V AC									
7.5	**6SE7022–1EC85–1AA0**	3KA50 30–1EE01	63	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
15	**6SE7024–1EC85–1AA0**	3KA50 30–1EE01	63	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
37	**6SE7028–6EC85–1AA0**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
75	**6SE7031–7EE85–1AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
90	**6SE7032–2EE85–1AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
132	**6SE7033–1EE85–1AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
160	**6SE7033–8EE85–1AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
200	**6SE7034–6EE85–1AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
250	**6SE7036–1EE85–1AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
400	**6SE7038–2EH85–1AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
500	**6SE7041–0EH85–1AA0**	②	1250	–	–	–	–	–	–
630	**6SE7041–3EK85–1A□0**	②	1250	–	–	–	–	–	–
800	**6SE7041–8EK85–1A□0**	②	1600	–	–	–	–	–	–
Supply voltage 3-ph. 500 V to 600 V AC									
11	**6SE7022–7FC85–1AA0**	3KA50 30–1EE01	63	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
22	**6SE7024–1FC85–1AA0**	3KA50 30–1EE01	63	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
37	**6SE7027–2FC85–1AA0**	3KA51 30–1EE01	80	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
55	**6SE7028–8FC85–1AA0**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
90	**6SE7031–5FE85–1AA0**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
132	**6SE7032–4FE85–1AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
160	**6SE7032–7FE85–1AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
200	**6SE7033–5FE85–1AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
250	**6SE7034–2FE85–1AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
315	**6SE7035–4FE85–1AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
450	**6SE7037–7FH85–1AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
630	**6SE7041–0FH85–1AA0**	②	1250	–	–	–	–	–	–
800	**6SE7041–3FK85–1A□0**	②	1600	–	–	–	–	–	–
900	**6SE7041–5FK85–1A□0**	②	1600	–	–	–	–	–	–
1100	**6SE7041–8FK85–1A□0**	②	2000	–	–	–	–	–	–
Supply voltage 3-ph. 660 V to 690 V AC									
110	**6SE7031–4HE85–1AA0**	3KA53 30–1EE01	160	3KL55 30–1EB01	250	0; 1; 2	3NP42 70–0CA01	250	0; 1
160	**6SE7032–2HE85–1AA0**	3KA55 30–1EE01	250	3KL55 30–1EB01	250	0; 1; 2	3NP53 60–0CA00	400	1; 2
200	**6SE7032–7HE85–1AA0**	3KA57 30–1EE01	400	3KL57 30–1EB01	400	1; 2	3NP53 60–0CA00	400	1; 2
315	**6SE7034–2HE85–1AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
400	**6SE7035–3HE85–1AA0**	3KA58 30–1EE01	630	3KL61 30–1AB0	630	2; 3	3NP54 60–0CA00	630	2; 3
630	**6SE7037–7HH85–1AA0**	3KE45 30–0AA	1000	–	–	–	–	–	–
800	**6SE7041–0HH85–1AA0**	②	1250	–	–	–	–	–	–
1000	**6SE7041–3HK85–1A□0**	②	1600	–	–	–	–	–	–
1100	**6SE7041–5HK85–1A□0**	②	1600	–	–	–	–	–	–
1500	**6SE7041–8HK85–1A□0**	②	2000	–	–	–	–	–	–

Rectifier/regenerative unit	**A**
Rectifier/regenerative unit for parallel connection	**D**

1) Switch disconnectors: Note size of cable-protection and semiconductor-protection fuses!

2) Can be optionally used depending on requirements. For further information see catalog "Low-voltage switchgear".

② Not available from Siemens.



Compact and chassis units

Recommended system components for rectifier/regenerative units, 100 % power-on duration in generating mode

Cable-protection fuses Duty class gL[1)2)]				Semiconductor-protection fuses Duty class aR[2)] (incl. cable protection)			Fuse bases to IEC/DIN[5)]		Circuit-breaker[4)]		Main contactor/ AC contactor[4)]	
		Rated current	Size		Rated current	Size		Rated current/ Size		Rated current	AC 1 duty 55 °C	Rated current
Order No.		A		Order No.	A		Order No.	A	Order No.	A	Order No.	A
3NA3 810		25	00	3NE4 101	32	0	–	–	–	–	3RT10 25	35
3NA3 820		50	00	3NE4 118	63	0	–	–	–	–	3RT10 34	45
3NA3 830		100	00	3NE4 122	125	0	–	–	–	–	3RT10 44	90
3NA3 140		200	1	3NE3 227	250	1	–	–	–	–	3TK50	190
3NA3 144		250	1	3NE3 230–0B	315	1	–	–	–	–	3TK52	315
3NA3 252		315	2	3NE3 233	450	1	–	–	–	–	3TK54	380
3NA3 260		400	2	3NE3 333	450	2	–	–	–	–	3TK56	500
3NA3 365		500	3	3NE3 335	560	2	–	–	–	–	3TK56	500
3NA3 372		630	3	3NE3 338–8	800	2	–	–	–	–	2 x 3TK54	684
3NA3 480[3)6)]		1000	4	Semiconductor protection fuses aR (without cable protection) already integrated in the standard unit			3NH3 530	1000/4	3WN62	1000	3 x 3TK52	788
3NA3 682[3)6)]		1250	4a				3NH7 520	1250/4a	3WN63	1250	3 x 3TK56	1250
2 x 3NA3 475[3)6)]		800	4				3NH3 530	1000/4	3WN64	1600	3 x 3TK56	1250
2 x 3NA3 480[3)6)]		1000	4				3NH3 530	1000/4	3WN65	2000	3 x 3TK15	1950
up to 500 V	**up to 600 V**											
3NA3 814	3NA3 814–6	35	00	3NE4 102	40	0	–	–	–	–	3RT10 25	35
3NA3 820	3NA3 820–6	50	00	3NE4 118	63	0	–	–	–	–	3RT10 34	45
3NA3 824	3NA3 824–6	80	00	3NE4 121	100	0	–	–	–	–	3RT10 44	90
3NA3 830	3NA3 830–6	100	00	3NE3 222	125	1	–	–	–	–	3RT10 44	90
3NA3 136	3NA3 136–6	160	1	3NE3 224	160	1	–	–	–	–	3TK50	190
3NA3 144	3NA3 144–6	250	2	3NE3 230–0B	315	1	–	–	–	–	3TK52	315
3NA3 252	3NA3 252–6	315	2	3NE3 231	350	1	–	–	–	–	3TK52	315
3NA3 260	3NA3 260–6	400	2	3NE3 333	450	2	–	–	–	–	3TK54	380
3NA3 365	3NA3 365–6	500	3	3NE3 334–0B	500	2	–	–	–	–	3TK56	500
3NA3 372	3NE1 436–0	630	3	3NE3 336	630	2	–	–	–	–	2 x 3TK54	684
3NA3 480[3)6)]		1000	4	Semiconductor protection fuses aR (without cable protection) already integrated in the standard unit			3NH3 530	1000/4	3WN61	800	2 x 3TK56	900
3NA3 682[3)6)]		1250	4a				3NH7 520	1250/4a	3WN63	1250	3 x 3TK56	1250
2 x 3NA3 475[3)6)]		800	4				3NH3 530	1000/4	3WN64	1600	3 x 3TK56	1250
2 x 3NA3 475[3)6)]		800	4				3NH3 530	1000/4	3WN64	1600	3 x 3TK14	1410
2 x 3NA3 480[3)6)]		1000	4				3NH3 530	1000/4	3WN65	2000	3 x 3TK15	1950
3NA3 136–6		160	1	3NE3 224	160	1	–	–	–	–	3TK50	190
3NA3 144–6		250	2	3NE3 230–0B	315	1	–	–	–	–	3TK52	315
3NA3 252–6		315	2	3NE3 231	350	1	–	–	–	–	3TK52	315
3NA3 365–6		500	3	3NE3 335	560	2	–	–	–	–	3TK56	500
3NE1 436–6		630	3	3NE3 336	630	2	–	–	–	–	2 x 3TK54	684
				Semiconductor protection fuses aR (without cable protection) already integrated in the standard unit			–	–	3WN61	800	2 x 3TK56	900
							–	–	3WN63	1250	3 x 3TK56	1250
							–	–	3WN64	1600	3 x 3TK56	1250
							–	–	3WN64	1600	3 x 3TK14	1410
							–	–	3WN65	2000	3 x 3TK15	1950

1) Does not provide 100 % protection for the input rectifier of the unit.

2) The cable cross-sections must be dimensioned according to DIN VDE 0100, VDE 0298 Part 4 as a function of the rated fuse currents.

3) See catalog "Low-voltage switchgear". Used for drive converters with a line supply inductance of ≥ 3 % referred to the drive converter impedance, i.e. so that the ratio of the system fault level to the converter output is 33 : 1 or 100 : 1 if an additional 2 % line reactor is used.

Impedance of unit:

$$Z = \frac{V}{\sqrt{3} \cdot I_{UN}}$$

4) See catalog "Low-voltage switchgear".

5) Size and quantity dependent on the fuses used. For further information see catalog "Low-voltage switchgear".

6) Cables can also be protected with circuit-breakers with appropriate cable protection. See catalog "Low-voltage switchgear".

Caution:
Short-circuit capacity and loadability at ambient temperature must be taken into account.

Recommended system components for rectifier/regenerative units, 100 % power-on duration in generating mode

Selection and ordering data

Nominal power rating	Rectifier/ regenerative unit	Radio-interference suppression filter	Commutating reactor[1] v_D = 2 %	P_v 50/60 Hz	Rated current	Commutating reactor[1] v_D = 4 %	P_v 50/60 Hz	Rated current
kW	Order No.	Order No.	Order No.	W	A	Order No.	W	A
Supply voltage 3-ph. 380 V to 480 V AC								
			400/480 V, 50/60 Hz			**400/480 V, 50/60 Hz**		
7.5	**6SE7022–1EC85–1AA0**	6SE7023–4ES87–0FB1[2]	4EP36 01–0US00	52/ 57	22.5	4EP38 01–0US00	67/ 71	22.5
15	**6SE7024–1EC85–1AA0**	6SE7027–2ES87–0FB1[2]	4EP38 01–1US00	67/ 71	45	4EP40 01–1US00	96/103	45
37	**6SE7028–6EC85–1AA0**	6SE7031–2ES87–0FA1[2]	4EP40 01–3US00	96/103	91	4EU25 52–2UB00–0AA0	187/201	91
75	**6SE7031–7EE85–1AA0**	6SE7031–8ES87–0FA1[2]	4EU25 52–4UA00–0AA0	187/201	200	4EU27 52–2UB00–0AA0	253/275	200
90	**6SE7032–2EE85–1AA0**	6SE7033–2ES87–0FA1[2]	4EU25 52–8UA00–0AA0	187/201	224	4EU27 52–5UB00–0AA0	253/275	224
132	**6SE7033–1EE85–1AA0**	6SE7033–2ES87–0FA1[2]	4EU27 52–7UA00–0AA0	253/275	315	4EU30 52–3UB00–0AA0	334/367	315
160	**6SE7033–8EE85–1AA0**	6SE7036–0ES87–0FA1[2]	4EU27 52–8UA00–0AA0	253/275	400	4EU30 52–8UA00–0AA0	334/367	355
200	**6SE7034–6EE85–1AA0**	6SE7036–0ES87–0FA1[2]	4EU30 52–4UB00–0AA0	334/367	500	4EU36 52–5UC00–0AA0	450/495	500
250	**6SE7036–1EE85–1AA0**	6SE7041–0ES87–0FA1[2]	4EU30 52–6UA00–1BA0	334/367	630	4EU36 52–6UC00–1BA0	450/495	630
400	**6SE7038–2EH85–1AA0**	6SE7041–0ES87–0FA1[2]	4EU36 52–0UB00–1BA0	450/495	910	4EU39 51–1UB00–0A	570/627	910
500	**6SE7041–0EH85–1AA0**	6SE7041–0ES87–0FA1[2]	4EU36 52–7UC00–1BA0	450/495	1120	4EU43 51–3UB00–0A	750/830	1120
630	**6SE7041–3EK85–1A□0**	6SE7041–6ES87–0FA1[2]	4EU39 51–8UB00–0A	570/627	1400	4EU43 51–4UB00–0A	750/830	1500
800	**6SE7041–8EK85–1A□0**	6SE7041–6ES87–0FA1[2]	on request		1800	on request		1800
Supply voltage 3-ph. 500 V to 600 V AC								
			500 V, 50 Hz			**500 V, 50 Hz**		
11	**6SE7022–7FC85–1AA0**	B84143–A36–R21[2][3]	4EP37 00–7US00	57	31.5	4EP40 01–0US00	96	35.5
22	**6SE7024–1FC85–1AA0**	B84143–A50–R21[2][3]	4EP38 01–2US00	67	45	4EP40 01–2US00	96	45
37	**6SE7027–2FC85–1AA0**	B84143–A80–R21[2][3]	4EP40 00–1US00	96	80	4EU25 52–1UB00–0AA0	187	80
55	**6SE7028–8FC85–1AA0**	B84143–A120–R21[2][3]	4EP40 00–2US00	96	100	4EU25 52–3UB00–0AA0	187	100
90	**6SE7031–5FE85–1AA0**	B84143–A150–R21[2][3]	4EU25 52–2UA00–0AA0	187	160	4EU27 52–6UB00–0AA0	253	160
132	**6SE7032–4FE85–1AA0**	B84143–B 250–S□□[3]	4EU27 52–2UA00–0AA0	253	250	4EU30 52–1UB00–0AA0	334	250
160	**6SE7032–7FE85–1AA0**	B84143–B 320–S□□[3]	4EU27 52–3UA00–0AA0	253	315	4EU36 52–5UB00–0AA0	450	315
200	**6SE7033–5FE85–1AA0**	B84143–B 320–S□□[3]	4EU27 52–4UA00–0AA0	253	400	4EU36 52–6UB00–0AA0	450	400
250	**6SE7034–2FE85–1AA0**	B84143–B 600–S□□[3]	4EU30 52–2UA00–0AA0	334	450	4EU36 52–7UB00–1BA0	450	500
315	**6SE7035–4FE85–1AA0**	B84143–B 600–S□□[3]	4EU30 52–5UB00–0AA0	334	560	4EU39 51–4UB00–0A	570	560
450	**6SE7037–7FH85–1AA0**	B84143–B1000–S□□[3]	on request		800	on request		800
630	**6SE7041–0FH85–1AA0**	B84143–B1000–S□□[3]	4EU39 51–5UB00–0A	570	1120	4EU45 51–5UA00	840	1120
800	**6SE7041–3FK85–1A□0**	B84143–B1600–S□□[3]	4EU39 51–7UB00–0A	570	1250	4EU45 51–6UA00	840	1250
900	**6SE7041–5FK85–1A□0**	B84143–B1600–S□□[3]	4EU43 51–2UB00–0A	750	1600	4EU47 51–3UA00	965	1600
1100	**6SE7041–8FK85–1A□0**	B84143–B2500–S□□[3]	on request		2000	on request		2000
Supply voltage 3-ph. 660 V to 690 V AC								
			690 V, 50 Hz			**690 V, 50 Hz**		
110	**6SE7031–4HE85–1AA0**	B84143–B 250–S□□[3]	4EU25 52–0UB00–0AA0	187	160	4EU30 52–2UB00–0AA0	334	180
160	**6SE7032–2HE85–1AA0**	B84143–B 250–S□□[3]	4EU27 52–6UA00–0AA0	253	224	4EU36 52–8UB00–0AA0	450	224
200	**6SE7032–7HE85–1AA0**	B84143–B 320–S□□[3]	4EU27 52–6UA00–0AA0	253	224	4EU36 52–8UB00–0AA0	450	224
315	**6SE7034–2HE85–1AA0**	B84143–B 600–S□□[3]	4EU30 52–4UA00–0AA0	334	400	4EU39 51–8UA00–0A	570	400
400	**6SE7035–3HE85–1AA0**	B84143–B 600–S□□[3]	4EU36 52–4UC00–0AA0	450	560	4EU39 51–4UB00–0A	570	560
630	**6SE7037–7HH85–1AA0**	B84143–B1000–S□□[3]	on request		800	on request		800
800	**6SE7041–0HH85–1AA0**	B84143–B1000–S□□[3]	4EU39 51–6UB00–0A	570	1120	4EU47 51–2UA00	965	1120
1000	**6SE7041–3HK85–1A□0**	B84143–B1600–S□□[3]	4EU43 51–0UB00–0A	750	1250	4EU50 51–1UA00	1180	1250
1100	**6SE7041–5HK85–1A□0**	B84143–B1600–S□□[3]	4EU45 51–4UA00	840	1600	4EU52 51–1UA00	1350	1600
1500	**6SE7041–8HK85–1A□0**	B84143–B1600–S□□[3]	on request		2000	on request		2000

Rectifier unit	**A**		
Rectifier unit for parallel connection	**D**		
for 500 V TT and TN systems (earthed system)		**2**	**0**
for 690 V TT and TN systems (earthed system)		**2**	**1**
for 380 V to 690 V IT systems (non-earthed and insulated system)		**2**	**4**

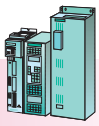
1) For commutating reactors for converters and rectifier units, see catalog PD 30.

2) Can only be used with TT and TN systems (earthed system).

3) Further information on the filters can be obtained from EPCOS (www.epcos.com) at www4.ad.siemens.de. Please enter the following number under "Entry ID": 65 67 129.

Recommended system components for rectifier/regenerative units, 100 % power-on duration in generating mode

Regenerative autotransformer			
100 % power-on duration	P_V 50/60 Hz	100 % power-on duration	P_V 50/60 Hz
Order No.	kW	Order No.	kW
380 V to 415 V, 50/60 Hz		**440 V to 480 V, 60 Hz**	
4AP27 95–0UA11–8AN2	0.15	4AP27 95–0UA21–8AN2	0.15
4AP30 95–0UA11–8AN2	0.20	4AP30 95–0UA21–8AN2	0.20
4AU39 95–0UA01–8AN2	0.60	4AU39 95–0UA11–8AN2	0.60
4BU45 95–0UA01–8A	0.90	4BU43 95–0UA01–8A	0.80
4BU45 95–0UA11–8A	0.90	4BU45 95–0UA21–8A	0.90
4BU47 95–0UA01–8A	1.00	4BU47 95–0UA11–8A	1.00
4BU52 95–0UA01–8A	1.70	4BU51 95–0UA01–8A	1.60
4BU53 95–0UA01–8A	1.80	4BU53 95–0UA11–8A	1.80
4BU54 95–0UA11–8A	2.10	4BU54 95–0UA01–8A	2.10
4BU56 95–0UA01–8A	2.30	4BU56 95–0UA11–8A	2.30
4BU58 95–0UA01–8A	4.10	4BU58 95–0UA11–8A	4.10
4BU60 95–0UA01–8A	4.60	4BU59 95–0UA01–8A	4.40
4BU62 95–0UA01–8A	5.70	on request	
500 V, 50/60 Hz		**600 V, 60 Hz**	
4AP30 95–0UA31–8AN2	0.20	4AP30 95–0UA51–8AN2	0.20
4AU36 95–0UA41–8AN2	0.48	4AU36 95–0UA01–8AN2	0.48
4AU39 95–0UA21–8AN2	0.60	4AU36 95–0UA11–8AN2	0.48
4AU39 95–0UA31–8A	0.60	on request	
4BU45 95–0UA31–8A	0.90	on request	
4BU47 95–0UA21–8A	1.00	on request	
4BU51 95–0UA11–8A	1.60	on request	
4BU52 95–0UA11–8A	1.70	on request	
4BU53 95–0UA21–8A	1.80	on request	
4BU55 95–0UA01–8A	2.20	on request	
4BU58 95–0UA21–8A	4.10	on request	
4BU60 95–0UA11–8A	4.60	on request	
4BU62 95–0UA11–8A	5.70	on request	
4BU62 95–0UA21–8A	5.70	on request	
4BU64 95–0UA01–8A	6.40	on request	
		690 V, 50/60 Hz	
		4BU47 95–0UA31–8A	1.00
		4BU52 95–0UA21–8A	1.70
		4BU53 95–0UA31–8A	1.80
		4BU55 95–0UA11–8A	2.20
		4BU58 95–0UA31–8A	4.10
		4BU60 95–0UA21–8A	4.60
		4BU62 95–0UA31–8A	5.70
		4BU63 95–0UA01–8A	6.00
		4BU64 95–0UA11–8A	6.40
		4BU65 95–0UA01–8A	6.80



Selection and ordering data

Nominal power rating P_{20}	Components for braking units[1]	Fuse switch disconnector for DC coupling			Fuses for braking units		
			Rated current	Max. fuse size		Rated current	Size
kW	Order No.	Order No.	A		Order No.	A	
DC link voltage 510 V to 650 V DC							
5	**6SE7018–0ES87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE4 101	32	0
10	**6SE7021–6ES87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE4 101	32	0
20	**6SE7023–2EA87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE4 102	40	0
50	**6SE7028–0EA87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE4 121	100	0
100	**6SE7031–6EB87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 225	200	1
170	**6SE7032–7EB87–2DA0**	3NP53 60–0CA00	400	0; 1	2 x 3NE3 230–0B	315	1
DC link voltage 675 V to 810 V DC							
5	**6SE7016–4FS87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE4 101	32	0
10	**6SE7021–3FS87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE4 101	32	0
50	**6SE7026–4FA87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE4 120	80	0
100	**6SE7031–3FB87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 224	160	1
200	**6SE7032–5FB87–2DA0**	3NP 53 60–0CA00	400	1; 2	2 x 3NE3 230–0B	315	1
DC link voltage 890 V to 930 V DC							
50	**6SE7025–3HA87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE4 118	63	0
200	**6SE7032–1HB87–2DA0**	3NP42 70–0CA01	250	0; 1	2 x 3NE3 227	250	1

System components
Capacitor module and DC link module

Capacitor module for Compact PLUS units

The capacitor module enables short-time energy buffering.

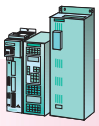
Capacitance		Max. DC link voltage		Dimensions W x H x D	Weight
		continuous	short-time		
mF	Order No.	V	V	mm	kg
5.1	**6SE7025–0TP87–2DD0**	715	780	90 x 360 x 260	6

DC link module for compact and chassis units

The DC link coupling module enables transition of the power wiring from the Cu busbar system to cables, e.g. for connecting other unit types from the SIMOVERT MASTERDRIVES series such as compact or chassis AFE rectifier/regenerative units.

Continuous current		Voltage range	Dimensions W x H x D	Weight
A	Order No.		mm	kg
120	**6SE7090–0XP87–3CR0**	510 V DC –15 % to 650 V +10 %	90 x 360 x 260	2.7

1) Braking units which are connected in parallel on a DC bus or several converters must be fused using the specified fuses.



Selection and ordering data

Panels for increasing the degree of protection of chassis units

The units can also be supplied with fitted panels.

See section "Other options".

Description	Size	Order No.	Dimensions W x H x D mm	Weight kg
IP20 panels (retrofit kit)				
For converters and inverters without PMU[1])	E	**6SE7090–0XE87–3AC0**	270 x 1050 x 370	15
	F	**6SE7090–0XF87–3AC0**	360 x 1050 x 370	17
	G	**6SE7090–0XG87–3AC0**	508 x 1450 x 480	25
For rectifier units	E	**6SE7090–0XE85–0TC0**	270 x 1050 x 370	15
For rectifier/regenerative units without PMU[1])	E	**6SE7090–0XE85–1TC0**	270 x 1050 x 370	15

G rail for mounting the compact units

Supplier	Length	Order No.
G rail to EN 50 035, steel		
Phönix Contact, Blomberg	2 m	**12 01 002**
Wieland, Bamberg	2 m	**98.190.0000.0**
Weidmüller GmbH u. Co., Paderborn	5 x 2 m	**05 1440**
Weidmüller GmbH u. Co., Paderborn	10 x 1 m	**05 1441**

DIN rail 35 mm for mounting the interface modules e.g.: ATI, DTI, SCI

Supplier	Length	Order No.
DIN rail acc. to EN 50 022		
Siemens AG (I-Center)	0.5 m	**8GR4 926**
Siemens AG (I-Center)	1 m	**8GR4 928**

Tinned copper busbars for Compact PLUS

The DC link connection is made using three busbars:

positive connection (C)
negative connection (D)
protective earth (PE)

Supplier	Length	Order No.
Copper busbar E-Cu 3 x 10 tinned and rounded to DIN 46 433[2]), rated current 120 A		
Siemens	1 m	**8WA2 842**
Phoenix Contact		**NLS–Cu 3/10**

Connecting adapter for cable shields – for compact units

The shield of the load-side cable and the shields of an additional 8 control cable can be connected here. Absolutely necessary for compliance with limit-value class B1!

Size	Order No.
Connecting adapter for cable shields incl. shield clamp for power lines	
A	**6SE7090–0XA87–3CA1**
B	**6SE7090–0XB87–3CA1**
C	**6SE7090–0XC87–3CA1**
D	**6SE7090–0XD87–3CA1**

Shield clamps to connect control-cable shields

Designation	Order No.
Shield clamps	
Shield clamps, quantity = 15	**6SY7000–0AD60**

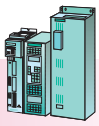
Plug set for Compact PLUS units

Plug set with power socket connectors X1, X2, X6 (motor, power supply, braking resistor) for all sizes and plugs for the terminal strips of the base unit X100, X101, X104, X533 and X9.

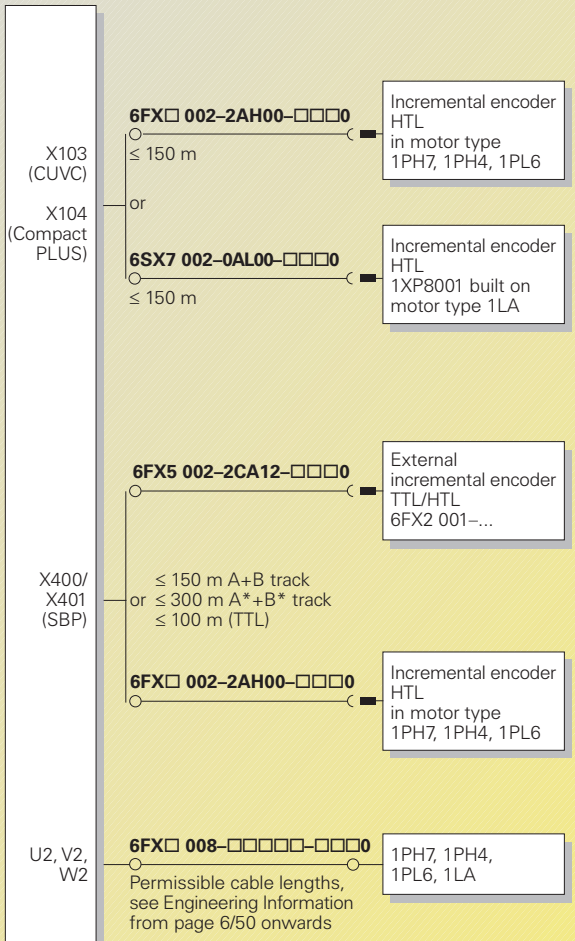
Designation	Order No.
Plug set	
Plug set Compact PLUS	**6SY7000–0AE51**

1) The retrofit kit contains all the mechanical components and cables. The PMU of the base unit is to be integrated into the front door.

2) DIN 46 433 has been replaced by EN 13 601. Busbar designation according to the new standard: e.g. bar EN 13 601 – CW004A – D – 3 x 10 – RD tinned.



Connection overview



Please note the maximum permissible cable lengths. Longer cables can interfere with the correct functioning of the unit. The order number supplement □ for the cable type 6FX□ ... and the length code in general (–□□□0) as well as preferred lengths can be found on page 3/81.

Current carrying capacity (I_z) of PVC-insulated copper cables acc. to IEC 60 204-1: 1997 ++ Corrigendum 1998

Cross-section	Current carrying capacity I_z (A) for different installation methods (see C 1.2)			
mm²	B1	B2	C	E
0.75	7.6	–	–	–
1.0	10.4	9.6	11.7	11.5
1.5	13.5	12.2	15.2	16.1
2.5	18.3	16.5	21	22
4	25	23	28	30
6	32	29	36	37
10	44	40	50	52
16	60	53	66	70
25	77	67	84	88
35	97	83	104	114
50	–	–	123	123
70	–	–	155	155
95	–	–	192	192
120	–	–	221	221
Electronics (pairs)				
0.2	–	–	4.0	4.0
0.3	–	–	5.0	5.0
0.5	–	–	7.1	7.1
0.75	–	–	9.1	9.1

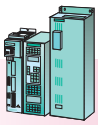
Correction factors

Ambient air temperature °C	Correction factor
30	1.15
35	1.08
40	1.00
45	0.91
50	0.82
55	0.71
60	0.58

Note: The correction factors are taken from IEC 60 364-5-523, Table 52-D1.

The current carrying capacity, I_z, of PVC-insulated cables given in the table above assumes an ambient air temperature of 40 °C. For other ambient air temperatures, the installer must correct these values using the factors given in the "Correction factors" table.

PUR cables are also subject to this standard.



Power cables for connecting 1PH7, 1PH4, 1PL6 and 1LA type motors

6FX□ 008–1BB . .
without brake cable with total shield

	Cable sold by the meter	Weight[1]		Smallest permissible bending radius	
		6FX8	6FX5	6FX8	6FX5
mm²	Order No.	kg/m	kg/m	mm	mm
4 x 1.5	**6FX□ 008–1BB11–□□A0**	0.16		100	
4 x 2.5	**6FX□ 008–1BB21–□□A0**	0.24		120	
4 x 4	**6FX□ 008–1BB31–□□A0**	0.31		130	
4 x 6	**6FX□ 008–1BB41–□□A0**	0.43		170	
4 x 10	**6FX□ 008–1BB51–□□A0**	0.63		210	
4 x 16	**6FX□ 008–1BB61–□□A0**	0.95		260	
4 x 25	**6FX 5 008–1BB25–□□A0**				
4 x 35	**6FX 5 008–1BB35–□□A0**				
4 x 50[2]	**6FX 5 008–1BB50–□□A0**				
4 x 70[2]	**6FX 5 008–1BB70–□□A0**				
4 x 95[2]	**6FX 5 008–1BB05–□□A0**				
4 x 120[2]	**6FX 5 008–1BB12–□□A0**				
4 x 150[2]	**6FX 5 008–1BB15–□□A0**				
4 x 185[2]	**6FX 5 008–1BB18–□□A0**				

MOTION CONNECT 800 **8**
MOTION CONNECT 500 **5**

1 B	10 m	Rings only for 6FX8 (only for 25, 35, 50 mm²)
1 F	50 m	Rings (for deviations see table)
2 A	100 m	Rings (for deviations see table)
3 A	200 m	Disposable drum (not for cables larger than 10 mm²)
6 A	500 m	Disposable drum only for 6FX8 (not for cables larger than 10 mm²)

Supplied form

6FX□ 008–1BA . .
with brake cable with total shield

	Cable sold by the meter	Weight[1]		Smallest permissible bending radius	
		6FX8	6FX5	6FX8	6FX5
mm²	Order No.	kg/m	kg/m	mm	mm
4 x 1.5 + 2 x 1.5	**6FX□ 008–1BA11–□□A0**	0.25		125	
4 x 2.5 + 2 x 1.5	**6FX□ 008–1BA21–□□A0**	0.31		140	
4 x 4 + 2 x 1.5	**6FX□ 008–1BA31–□□A0**	0.40		150	
4 x 6 + 2 x 1.5	**6FX□ 008–1BA41–□□A0**	0.53		195	
4 x 10 + 2 x 1.5	**6FX□ 008–1BA51–□□A0**	0.74		230	
4 x 16 + 2 x 1.5	**6FX□ 008–1BA61–□□A0**	1.10		275	
4 x 25 + 2 x 1.5	**6FX□ 008–1BA25–□□A0**	1.46		325	
4 x 35 + 2 x 1.5	**6FX□ 008–1BA35–□□A0**	2.10		380	
4 x 50 + 2 x 1.5	**6FX□ 008–1BA50–□□A0**	2.75		420	

MOTION CONNECT 800 **8**
MOTION CONNECT 500 **5**

1 B	10 m	Rings only for 6FX8 (only for 25, 35, 50 mm²)
1 F	50 m	Rings (for deviations see table)
2 A	100 m	Rings (for deviations see table)
3 A	200 m	Disposable drum (not for cables larger than 10 mm²)
6 A	500 m	Disposable drum only for 6FX8 (not for cables larger than 10 mm²)

Supplied form

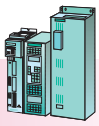
Deviations from standard supply forms

6FX . 008–	50 m (–1FA0)	100 m (–2AA0)
–1BA25	Disposable drum	Disposable drum
–1BA35	Disposable drum	Disposable drum
–1BA50	Disposable drum	Disposable drum
–1BA51 / –1BB51		Disposable drum
–1BA61 / –1BB61		Disposable drum

The cross-sections 25, 35 and 50 mm² can also be ordered and supplied by the meter from 10 to 49 m – according to the length code of the prefabricated cables – and in 10 m rings.

1) Weight of the cables without connectors.

2) The cable is delivered on drums for cable cross-sections of ≥ 50 mm² and 50 m, 100 m and 200 m lengths.



PROTOFLEX-EMV cables for motor connection and PROTODUR power cable

PROTOFLEX-EMV

Shielded cables with copper braiding for power cabling of frequency converters in order to comply with EMC regulations.
Available from Pirelli Kabel und Systeme GmbH & Co. KG, Gertenfelder Str. 28, 13599 Berlin, Germany.

Type code	Number of cores and rated cross-section mm²	External diameter approx. mm	Order No.	Weight kg/km
PROTOFLEX-EMV-CY PE/PVC, transparent outer sheath				
2YSLCY–J	4 x 1.5	10.4	**5DE6 950**	154
2YSLCY–J	4 x 2.5	12.3	**5DE6 951**	229
2YSLCY–J	4 x 4	14.5	**5DE6 952**	339
2YSLCY–J	4 x 6	16.8	**5DE6 953**	451
2YSLCY–J	4 x 10	19.7	**5DE6 954**	667
2YSLCY–J	4 x 16	22.0	**5DE6 955**	892
2YSLCY–J	4 x 25	27.0	**5DE6 956**	1 440
2YSLCY–J	4 x 35	30.3	**5DE6 957**	1 861
2YSLCY–J	4 x 50	35.0	**5DE6 958**	2 547
2YSLCY–J	4 x 70	39.4	**5DE6 960**	3 404
2YSLCY–J	4 x 95	46.0	**5DE6 961**	4 545
2YSLCY–J	4 x 120	51.4	**5DE6 962**	5 703
2YSLCY–J	4 x 150	58.8	**5DE6 963**	7 040
2YSLCY–J	4 x 185	61.1	**5DE6 964**	8 380
PROTOFLEX-EMV-4PLUS-UV PE/PVC, black outer sheath, for outdoor use				
2YSLCYK–J	4 x 1.5	10.4	**5DE6 450**	154
2YSLCYK–J	4 x 2.5	12.3	**5DE6 451**	229
2YSLCYK–J	4 x 4	14.5	**5DE6 452**	339
2YSLCYK–J	4 x 6	16.8	**5DE6 453**	451
2YSLCYK–J	4 x 10	19.7	**5DE6 454**	667
2YSLCYK–J	4 x 16	22.0	**5DE6 455**	892
2YSLCYK–J	4 x 25	27.0	**5DE6 456**	1 440
2YSLCYK–J	4 x 35	30.3	**5DE6 457**	1 861
2YSLCYK–J	4 x 50	35.0	**5DE6 458**	2 547
2YSLCYK–J	4 x 70	39.4	**5DE6 460**	3 404
2YSLCYK–J	4 x 95	46.0	**5DE6 461**	4 545
2YSLCYK–J	4 x 120	51.4	**5DE6 462**	5 703
2YSLCYK–J	4 x 150	58.8	**5DE6 463**	7 040
2YSLCYK–J	4 x 185	61.1	**5DE6 464**	8 380
PROTOFLEX-EMV-3PLUS PE/PVC, transparent orange outer sheath				
2YSLCY–J	3 x 25 + 3 x 4	26.2	**5DE6 982**	1 402
2YSLCY–J	3 x 35 + 3 x 6	29.0	**5DE6 983**	1 718
2YSLCY–J	3 x 50 + 3 x 10	34.6	**5DE6 984**	2 340
2YSLCY–J	3 x 70 + 3 x 10	38.3	**5DE6 985**	3 173
2YSLCY–J	3 x 95 + 3 x 16	44.0	**5DE6 986**	4 162
2YSLCY–J	3 x 120 + 3 x 16	50.8	**5DE6 987**	5 253
2YSLCY–J	3 x 150 + 3 x 25	55.2	**5DE6 988**	6 430
2YSLCY–J	3 x 185 + 3 x 35	62.0	**5DE6 990**	12 250
2YSLCY–J	3 x 240 + 3 x 40	67.0	**5DE6 991**	14 945

PROTODUR-power cable

Motor connection cable with concentric CEANDER conductors.

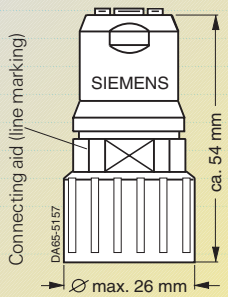
PROTODUR-power cable PVC/PVC, black outer sheath				
NYCWY	3 x 10 RE/10	20.0	**5BC1734**	
NYCWY	3 x 16 RE/16	22.0	**5BC1735**	
NYCWY	3 x 25 RE/25	28.0	**5BC1736**	
NYCWY	3 x 35 SM/35	27.0	**5BC2550**	
NYCWY	3 x 50 SM/50	31.0	**5BC2551**	
NYCWY	3 x 70 SM/70	34.0	**5BC2552**	
NYCWY	3 x 95 SM/95	39.0	**5BC2553**	
NYCWY	3 x 120 SM/120	43.0	**5BC2554**	
NYCWY	3 x 150 SM/150	47.0	**5BC2555**	
NYCWY	3 x 35 SM/16	26.0	**5BC2560**	
NYCWY	3 x 50 SM/25	30.0	**5BC2561**	
NYCWY	3 x 70 SM/35	34.0	**5BC2562**	
NYCWY	3 x 95 SM/50	39.0	**5BC2563**	
NYCWY	3 x 120 SM/70	41.0	**5BC2564**	
NYCWY	3 x 150 SM/70	46.0	**5BC2565**	
NYCWY	3 x 185 SM/95	50.0	**5BC2566**	
NYCWY	3 x 240 SM/120	56.0	**5BC2567**	

Encoder cables for connecting to motors with HTL incremental encoder (cable length ≤ 150 m without transmission of the inverted signals and cable lengths 150 to 300 m with transmission of the inverted signals and use of the DTI or SBP module)

Cable design and connector assignment

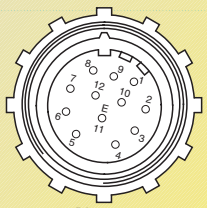
Type 6FX5002–2AH00– . , consisting of:

Motor side Connector type: 6FX2003–0CE12 Dimension drawing	PIN	Signal name	Cable sold by the meter 6FX . 008–1BD21–. . .  Core color	Free end Signal name	Converter side X103 terminal strip on CUVC Pin No.
	2	KTY 84+	white-red (0.5 mm²)	KTY 84+	30
	11	KTY 84–	white-black (0.5 mm²)	KTY 84–	29
	12	+15 V	white-yellow (0.5 mm²)	+15 V	28
	10	0 V	white-blue (0.5 mm²)	0 V	23
	5	Track A	black	Track A	24
	7	CTRL TACHO	green	CTRL TACHO	27
	8	Track B	red	Track B	25
	3	Zero track	blue	Zero track	26
	1	$\overline{\text{Track B}}$	orange	$\overline{\text{Track B}}$	only with DTI, X402
	6	$\overline{\text{Track A}}$	brown	$\overline{\text{Track A}}$	only with DTI, X402
	4	$\overline{\text{Zero track}}$	violet	$\overline{\text{Zero track}}$	–
	9	free	yellow	free	–
			Outer shield on connector housing		



Connector with union nuts and female contacts

View of the female contacts



Selection and ordering data

Cable	Order No.
Prefabricated cables (Length ≤ 150 m) MOTION CONNECT 500	
Encoder cable for connection to motors with HTL incremental encoder	**6FX5002–2AH00 – □ □ □ 0**

1	0 m	**A**	0 m	**A**	0 m
2	100 m	**B**	10 m	**B**	1 m
		C	20 m	**C**	2 m
		D	30 m	**D**	3 m
		E	40 m	**E**	4 m
		F	50 m	**F**	5 m
		G	60 m	**G**	6 m
		H	70 m	**H**	7 m
		J	80 m	**J**	8 m
		K	90 m	**K**	9 m

Length code

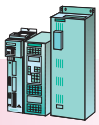
Example:

1 m: . . .	–	1	A	B	0
8 m: . . .	–	1	A	J	0
17 m: . . .	–	1	B	H	0
59 m: . . .	–	1	F	K	0
111 m: . . .	–	2	B	B	0

Cable	Length m	Order No.
Not prefabricated, sold by the meter		
Encoder cables for connection to motors with HTL incremental encoder Number of cores x cross-section [mm²] 4 x 2 x 0.38 + 4 x 0.5 External diameter for 6FX5: 10.0 mm	50	**6FX□008–1BD21–1FA0**
	100	**6FX□008–1BD21–2AA0**
	200	**6FX□008–1BD21–3AA0**
	500	**6FX□008–1BD21–6AA0**

MOTION CONNECT 800	**8**
MOTION CONNECT 500	**5**

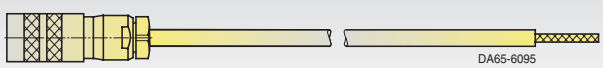
Designation	Order No.	Packaging unit quantity
Accessories		
Signal connector with union nut and female contact for encoder-cable connection to the motor, 12-pin.	**6FX2003–0CE12**	**3**
Signal connector with external winding and pin contacts for extending cables, 12-pin.	**6FX2003–1CF12**	**3**



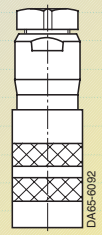
Encoder cables for connecting 1LA type motors with 1XP8001–1 incremental encoder

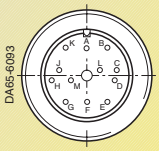
Cable design and connector assignment

Type 6SX7002–0AL00– . . . 0, prefabricated



Motor side with connector		Converter side X103 terminal strip on CUVC	
PIN	Signal name	Signal name	Pin No.
A	$\overline{U_{a2}}$		
B	U_p = +10 ... 30 V	Tacho P15	28
C	U_{a0}	Zero pulse	26
D	$\overline{U_{a0}}$		
E	U_{a1}	Track A	24
F	$\overline{U_{a1}}$		
G	$\overline{U_{a5}}$	Control	27
H	U_{a2}	Track B	25
K	0 V		
L	0 V	Tacho M	23
M	U_p = +10 ... 30 V		





Selection and ordering data

Cable	Order No.

Prefabricated (Length ≤ 150 m)

Encoder cable for connection to 1LA type motors with 1PX8001–1 incremental encoder

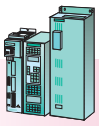
6SX7002–0AL00 – □ □ □ 0

1	0 m	**A**	0 m	**A**	0 m
2	100 m	**B**	10 m	**B**	1 m
		C	20 m	**C**	2 m
		D	30 m	**D**	3 m
		E	40 m	**E**	4 m
		F	50 m	**F**	5 m
		G	60 m	**G**	6 m
		H	70 m	**H**	7 m
		J	80 m	**J**	8 m
		K	90 m	**K**	9 m

Length code

Example:

1 m: . . .	– 1 A B 0
8 m: . . .	– 1 A J 0
17 m: . . .	– 1 B H 0
59 m: . . .	– 1 F K 0
111 m: . . .	– 2 B B 0



CBP2 communication board

CBP2 for PROFIBUS DP

The CBP2 communication board (*C*ommunication *B*oard *P*ROFIBUS) is for connecting SIMOVERT MASTERDRIVES to the PROFIBUS DP field bus system.

The CBP2 communication board supports the extended functionality of PROFIBUS DP, such as:

- flexible configuration of cyclic messages
- slave-to-slave communication between drives
- operation of SIMATIC OP as PROFIBUS DP master class 2

The CBP2 is fully compatible with the CBP and replaces this board.

For a more detailed description of communication via PROFIBUS DP and integration of the CBP or CBP2 boards in the electronics box, see Engineering Information, Section 6.

When ordering the board, the order number of the compact and chassis units is to be supplemented with "–Z" and the corresponding code for direct mounting in the appropriate mounting slot.

Only available as a mounting kit for AFE inverters and rectifier units (sizes H and K) and for rectifier/ regenerative units.

Note

Catalog ST 70 describes the functions and components such as Profibus connectors (e.g. 6SE7972–0BA40–0XA0, Profibus cable (e.g. 6XV18 30–0AH10), optical bus terminals or optical link modules (for connection to the optical PROFIBUS DP).

Factory mounted, plugged into slot	Supplementary order code	Retrofit kit (supplied loose) Order No.	Spare part (board without connectors and instruction manual) Order No.
CBP 2	**Communication board for PROFIBUS DP**		
		6SX7010–0FF05	**6SE7090–0XX84–0FF5**
A	**G91**	Compact and chassis units	
C	**G93**		
E	**G95**		
G	**G97**		
A	**G91**	Compact PLUS units	
B	**G92**		

CBC communication board

CBC for CAN

The CBC communication board (*C*ommunication *B*oard *C*AN) is for connecting SIMOVERT MASTERDRIVES to the CAN protocol.

For a more detailed description of communication via CAN and integration of the CBC board in the electronics box, see Engineering Information, Section 6.

When ordering the board, the order number of the compact and chassis units is to be supplemented with "–Z" and the corresponding code for direct mounting in the appropriate mounting slot.

Only available as a mounting kit for AFE inverters and rectifier units (sizes H and K) and for rectifier/ regenerative units.

Factory mounted, plugged into slot	Supplementary order code	Retrofit kit (supplied loose) Order No.	Spare part (board without connectors and instruction manual) Order No.
CBC	**Communication board for CAN**		
		6SX7010–0FG00	**6SE7090–0XX84–0FG0**
A	**G21**	Compact and chassis units	
C	**G23**		
E	**G25**		
G	**G27**		
A	**G21**	Compact PLUS units	
B	**G22**		

SLB communication board

SLB for SIMOLINK

The SLB (*SI*MO*L*INK *B*OARD) communication board is for the rapid exchange of data between different drives.

For a more detailed description of communication via SIMOLINK and integration of the SLB board in the electronics box, see Engineering Information, Section 6.

When ordering the board, the order number of the compact and chassis units is to be supplemented with "-Z" and the corresponding code for direct mounting in the appropriate mounting slot.

Note

Only available for converters and inverters.

Factory mounted, plugged into slot	Supplementary order code[1])	Retrofit kit (supplied loose) Order No.	Spare part (board without connectors and instruction manual) Order No.
SLB	**Communication board for SIMOLINK**		
		6SX7010–0FJ00[1])	**6SE7090–0XX84–0FJ0**
A	**G41**	Compact and chassis units	
C	**G43**		
D	**G44**		
E	**G45**		
F	**G46**		
G	**G47**		
A	**G41**	Compact PLUS units	
B	**G42**		

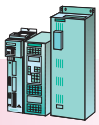
System package for SLB

consisting of
40 fiber optic cable
20 plugs X470
100 m plastic fiber optic cable — **6SX7010–0FJ50**

Extra package for SLB (supplied with the SLB)

consisting of
2 fiber optic cable
1 plug X470
5 m plastic fiber optic cable
fine and coarse emery paper — **6SY7000–0AD15**

1) Including 5 m of plastic fiber optic cable and connectors.



EB1 terminal expansion board

The EB1 expansion board (*E*xpansion *B*oard *1*) enables the number of digital and analog inputs and outputs to be expanded as follows:

- 3 digital inputs
- 4 bidirectional digital inputs/outputs
- 24 V voltage supply for the digital outputs
- 1 analog input with a differential amplifier input
- 2 analog inputs
- 2 analog outputs.

For a more detailed description, diagram and circuit diagram, see Engineering Information, Section 6.

For integration of the EB1 in the electronics box, see Engineering Information, Section 6.

Only available for converters and inverters.

Board, plugged into slot	Supplementary order code	Retrofit kit (supplied loose) Order No.	Spare part (board without connectors and instruction manual) Order No.
EB1	**Expansion board 1**		
		6SX7010–0KB00	**6SE7090–0XX84–0KB0**
A	**G61**	Compact and chassis units	
C	**G63**		
D	**G64**		
E	**G65**		
F	**G66**		
G	**G67**		
A	**G61**	Compact PLUS units	
B	**G62**		

EB2 terminal expansion board

The EB2 expansion board (*E*xpansion *B*oard *2*) enables the number of digital and analog inputs and outputs to be expanded as follows:

- 2 digital inputs
- 24 V voltage supply for the digital inputs
- 1 relay output with changeover contacts
- 3 relay outputs with NO contact
- 1 analog input with differential amplifier inputs
- 1 analog output.

For a more detailed description, its appearance and circuit diagram, see Engineering Information, Section 6.

For integration of the EB2 in the electronics box, see Engineering Information, Section 6.

Only available for converters and inverters.

Board, plugged into slot	Supplementary order code	Retrofit kit (supplied loose) Order No.	Spare part (board without connectors and instruction manual) Order No.
EB2	**Expansion board 2**		
		6SX7010–0KC00	**6SE7090–0XX84–0KC0**
A	**G71**	Compact and chassis units	
C	**G73**		
D	**G74**		
E	**G75**		
F	**G76**		
G	**G77**		
A	**G71**	Compact PLUS units	
B	**G72**		

SBP incremental encoder board

The incremental encoder SBP (Sensor Board Pulse) enables an incremental encoder or frequency generator setpoint to be connected to converters and inverters.

For a detailed description of the SBP board and its integration in the electronics box, see Engineering Information in Section 6.

When ordering the board, the order number of the compact and chassis units is to be supplemented with "-Z" and the corresponding code for direct mounting in the appropriate mounting slot.

Factory mounting, plugged into slot	Supplementary order code	Retrofit kit for retrofitting (supplied loose) Order No.	Spare part (board without connectors and instruction manual) Order No.
SBP	**Incremental encoder board**		
		6SX7010–0FA00	**6SE7090–0XX84–0FA0**
A	**C11**	Compact and chassis units	
C	**C13**		
D	**C14**		
E	**C15**		
F	**C16**		
G	**C17**		
A	**C11**	Compact PLUS units	
B	**C12**		

Bus adapter[1])

Bus adapter for the electronics box LBA

The electronics box can easily be retrofitted with the backplane bus adapter LBA (*L*ocal *B*us *A*dapter). Two supplementary boards or the optional boards plugged onto the ADB (*Ad*apter *B*oard) can be combined with the CUVC (CUR, CUSA) control board.

This is only available separately for AFE inverters and rectifier units (sizes H and K) and rectifier/regenerative units.

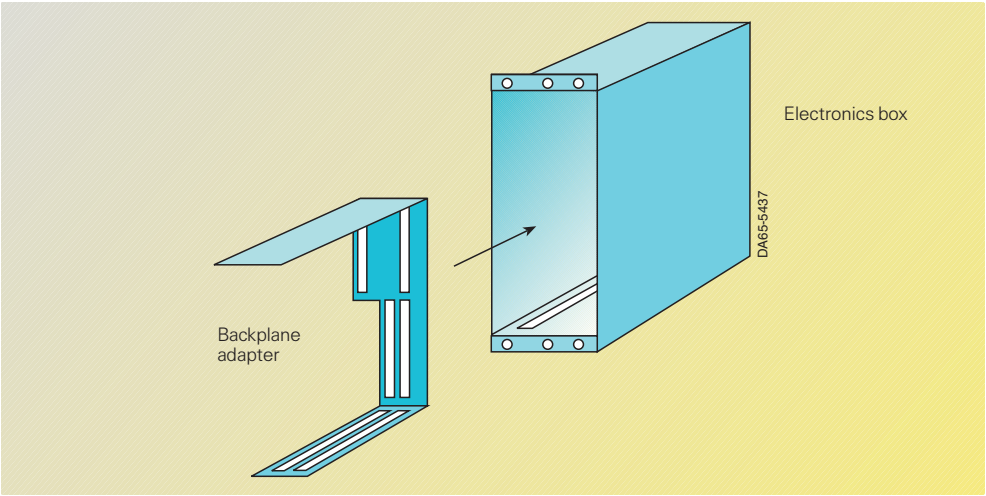


Fig. 3/14

Adapter	Supplementary order code	Supplied loose Order No.
LBA	**Backplane adapter**	
		6SE7090–0XX84–4HA0
Integrated into the electronics box	**K11**	

ADB adapter board[1])

The ADB (*A*dapter *B*oard) is for connecting option boards as described in Section 6 "Integration of the options in the electronics box".

This is only available separately for AFE inverters and rectifier units (sizes H and K) and rectifier/regenerative units.

Board, plugged into slot	Supplementary order code	Retrofit kit and spare part (supplied loose) Order No.
ADB	**Backplane adapter**	
		6SX7090–0XX84–0KA0
2 (Slot D and E)	**K01**	
3 (Slot F and G)	**K02**	

T100 technology board[1])

The T100 technology board expands the base unit with many drive-related technological functions such as:

- higher-level PID controller
- comfort ramp-function generator with smoothing
- comfort motorized potentiometer
- wobble generator
- drive-related control.

For a more detailed description of the T100 board, see Engineering Information, Section 6.

For integration of the T100 in the electronics box, see Engineering Information, Section 6.

Board		Order No.
T100	**Technology board**	
	Supplied loose, including hardware instruction manual, without software module[2])	**6SE7090–0XX87–0BB0**
	Additional hardware instruction manual, for additional requirements in 5 languages (G/E/F/I/S)	**6SE7080–0CX87–0BB0**
	MS100 software module "Universal Drive" for the T100 (EPROM), without manual	**6SE7098–0XX84–0BB0**
	The manual for the MS100 software module "Universal Drive" is available in the following languages:	
	German (G)	**6SE7080–0CX84–0BB1**
	English (E)	**6SE7087–6CX84–0BB1**
	French (F)	**6SE7087–7CX84–0BB1**
	Italian (I)	**6SE7087–2CX84–0BB1**
	Spanish (S)	**6SE7087–8CX84–0BB1**

T300 technology board[1])

The T300 technology board can be used to create technological functions for various applications such as:

- closed-loop tension and position control
- winders
- coilers
- synchronous and positioning control
- hoisting drives
- drive-related control functions.

For a more detailed description of the T300 board, see Engineering Information, Section 6.

For integrating the T300 in the electronics box, see Engineering Information, Section 6.

For selection and ordering data, see page 3/88.

1) Attention!
Only for compact and chassis units.

2) The LBA backplane bus adapter is required for mounting (see above).

T300 technology board · Components

The selection table specifies which supplementary technological components are needed for a specific task.
Example: The multi-motor drive function is required. All products which are listed in the multi-motor drive column are required.

Ordering information			Components required for the standard software package				Components required for self-generated application software, using	
Product description	Comment	Order No.	Multi-motor drive	Axial winder	Angular synchronous control	Positioning control	STRUC L	STRUC G
T300 technology board with two SC58 and SC60 connecting cables, SE300 terminal block and G/E hardware instruction manual	German/English	**6SE7090–0XX87–4AH0**	•	•	•	•	•	•
T300 technology boards as spare part		**6SE7090–0XX84–0AH2**	•	•	•	•	•	•
LBA local bus adapter for MASTERDRIVES electronics box	Also used to install a communication board	**6SE7090–0XX84–4HA0**	•	•	•	•	•	•
Additional instruction manual for the T300 hardware	German/English French	**6SE7087–6CX84–0AH1** **6SE7087–7CX84–0AH1**						
Standard software package, multi-motor drive on an MS360 memory module without manual		**6SE7098–6XX84–0AH0**	•					
Manual, multi-motor drive[2]	German English	**6SE7080–0CX84–6AH1** **6SE7087–6CX84–6AH1**	•					
Multi-motor drive standard softw. package on floppy disk in STRUC source code[3] MD360		**6SW1798–6XX84–0AH0**						
Standard software package, axial winder on an MS320 memory module, without manual		**6SE7098–2XX84–0AH0**		•				
Manual, axial winder[2]	German English	**6SE7080–0CX84–2AH1** **6SE7087–6CX84–2AH1**		•				
Axial winder standard software package on floppy disk in STRUC source code[3] MD320		**6SW1798–2XX84–0AH0**						
Standard software package, angular synchronous control [4] on an MS340 memory module without manual		**6SE7098–4XX84–0AH0**			•			
Manual, angular synchronous control[2]	German English French	**6SE7080–0CX84–4AH1** **6SE7087–6CX84–4AH1** **6SE7087–7CX84–4AH1**			•			
Angular synchronous control standard software package on floppy disk in STRUC source code[3] MD340		**6SW1798–4XX84–0AH0**						
Standard software package, positioning control on an MS380 memory module without manual		**6SE7098–8XX84–0AH0**				•		
Manual, positioning control[2]	German English	**6SE7080–0CX84–8AH1** **6SE7087–6CX84–8AH1**				•		
Standard software package, positioning control on floppy disk in STRUC® source code[3] MD380		**6SW1798–8XX84–0AH0**						
Generation software and accessories for configuring (see Catalog ST DA)								
STRUC G/L Version 4.2 on CD-ROM with the Service IBS start-up program	See the text German/English	**6DD1801–1DA2**						•
Configuring PC for STRUC G PT, installed ready to run	See the text							•
Empty MS300 memory module for T300, 8 Kbytes EEPROM	MS300 or MS301	**6SE7098–0XX84–0AH0**					•	•
Empty MS301 memory module for T300, 8 Kbytes EEPROM		**6SE7098–0XX84–0AH1**					•	•
Parallel programming unit PPX1, external programming unit, for connection to a printer port with power supply unit (for PC/PG) with UP3 progr. Adapter	The same for STRUC L PT and G PT	**6DD1672–0AD0**					•	•
PG7x0 connecting cable to T300 if Service IBS start-up program is used[1]	Self-assembly according to the T300 instruction manual	–					•	•
PC-AT connecting cable to T300 if Service IBS start-up program is used[1]	Self-assembly according to the T300 instruction manual	–					•	•

1) Depending on whether a SIMATIC-PG or a standard PC is used for start-up only one of the two cables is required.

2) Order the required number of manuals in the desired language, irrespective of the number of T300 standard software packages which have been ordered.

3) Only required if the standard is to be changed; requires STRUC configuring software.

4) The standard software package is only required for the slave drive(s). Example: Two drives which operate in angular synchronism: One standard software package for angular synchronous control is required.

SCB1 interface board[1])

The SCB1 interface board (*S*erial *C*ommunication *B*oard *1*) has a fiber-optic cable connection and therefore provides the following possibilities:

- peer-to-peer connection between several drive units with a max. data transfer rate of 38.4 Kbit/s.
- serial I/O system with the SCI1 and SCI2 serial interface boards (e.g. NAMUR).

For a more detailed description of the SCB1 board, see Engineering Information, Section 6.

For integration of the SCB1 in the electronics box, see Engineering information, Section 6.

Board/ Conductor		Supplied loose Order No.
SCB1	**Interface board**	
	incl. 10 m fiber optic cable	**6SE7090–0XX84–0BC0**
LWL	**Plastic fiber optic cable 5 m**	
Use extra package for SLB board		**6SY7000–0AD15**

SCB2 interface board[1])

The SCB2 Interface Board (*S*erial *C*ommunication *B*oard 2) has a floating RS485 interface with a maximum data transfer rate of 187.5 Kbit/s and thus enables the following alternatives:

- peer-to-peer connection between several drive units
- bus coupling to a max. of 31 slaves connected to a master (e.g. SIMATIC) using the USS protocol.

For a more detailed description of the SCB2 board, see Engineering Information, Section 6.

For integration of the SCB2 in the electronics board, see Engineering Information, Section 6.

Board		Supplied loose Order No.
SCB2	**Interface board**	
		6SE7090–0XX84–0BD1

TSY synchronizing board[1])

The TSY synchronizing board (*T*achometer and *S*ynchronizing *B*oard) enables two converters or inverters to be synchronized to a common load (e.g. starting converter to main converter). TSY also may be used for conditioning and routing of net signals, tracked by the VSB board, for the supply synchronization function.

For a more detailed description and examples of connection, see Engineering Information, Section 6.

For integration of the TSY board in the electronics box, see Engineering Information, Section 6.

Board		Supplied loose Order No.
TSY	**Synchronizing board**	
		6SE7090–0XX84–0BA0

SCI1 and SCI2 interface boards[1])

With the SCI1 (*S*erial *C*ommunication *I*nterface *1*) and SCI2 (*S*erial *C*ommunication *I*nterface *2*) interface boards and the SCB1 interface board, a serial I/O system can be created with fiber-optic cables, thus enabling considerable additions to the binary and analog inputs and outputs.

In addition, the fiber-optic cables safely disconnect the drive units in accordance with VDE 0100 and 0160 (PELV function, e.g. for NAMUR).

For a more detailed description of the SCI1 and SCI2 boards, see Engineering Information, Section 6.

Board/ Conductor		Supplied loose Order No.
SCI1	**Interface board**	
	incl. 10 m fiber-optic cable	**6SE7090–0XX84–3EA0**
SCI2	**Interface board**	
	incl. 10 m fiber-optic cable	**6SE7090–0XX84–3EF0**
LWL	**Plastic fiber optic cable 5 m**	
Use extra package for SLB board		**6SY7000–0AD15**

DTI digital tachometer interface[1])

Digital tachometers with different voltage levels can be connected at the DTI (*D*igital *T*acho *I*nterface) board. The inputs are floating.

The board enables the following signals to be connected:

- HTL encoders with differential outputs
- floating HTL encoders
- TTL encoders
- encoder cables > 150 m
- TTL output at X405
- level converter, HTL to TTL.

For a more detailed description with an example of connection, see Engineering Information, Section 6.

Board		Supplied loose Order No.
DTI	**Digital tachometer interface**	
		6SE7090–0XX84–3DB0

VSB Voltage Sensing Board

The VSB board (*V*oltage *S*ensing *B*oard) is used for measuring the supply voltage and supply frequency. It is used for the AFE rectifier/regenerative unit for the supply synchronization function of a converter – fed motor to the supply or back. The VSB board works in the function of supply synchronization only together with the TSY board.

Board		Supplied loose Order No.
VSB	**Voltage Sensing Board**	
		6SX7010–0EJ00

1) Attention!
Only for compact and chassis units.

APMU adapter for cabinet-door mounting

The PMU parameterizing unit included in the standard version of all drive units can also be built into a cabinet door using the APMU adapter.

For dimensions and door cut-out, see below.

Note

The OP1S operator control panel can also be plugged onto the APMU.

Designation	Order No.
APMU adapter for mounting in cabinet door, incl. 2 m cable	**6SX7010–0AA10**

OP1S comfort operator control panel

The OP1S operator control panel (*O*perator *P*anel) is an optional input/output unit which can be used for parameterizing the drive units. Plain text displays greatly facilitate parameterization.

For a more detailed description of the OP1S operator control panel, see Section 2 "Operator control and visualization".

Designation		Order No.
OP1S control panel		**6SE7090–0XX84–2FK0**
AOP1S adapter for cabinet-door mounting incl. 5 m connecting cable		**6SX7010–0AA00**
Connecting cable PMU-OP1S 3 m	3 m	**6SX7010–0AB03**
Connecting cable PMU-OP1S 5 m	5 m	**6SX7010–0AB05**

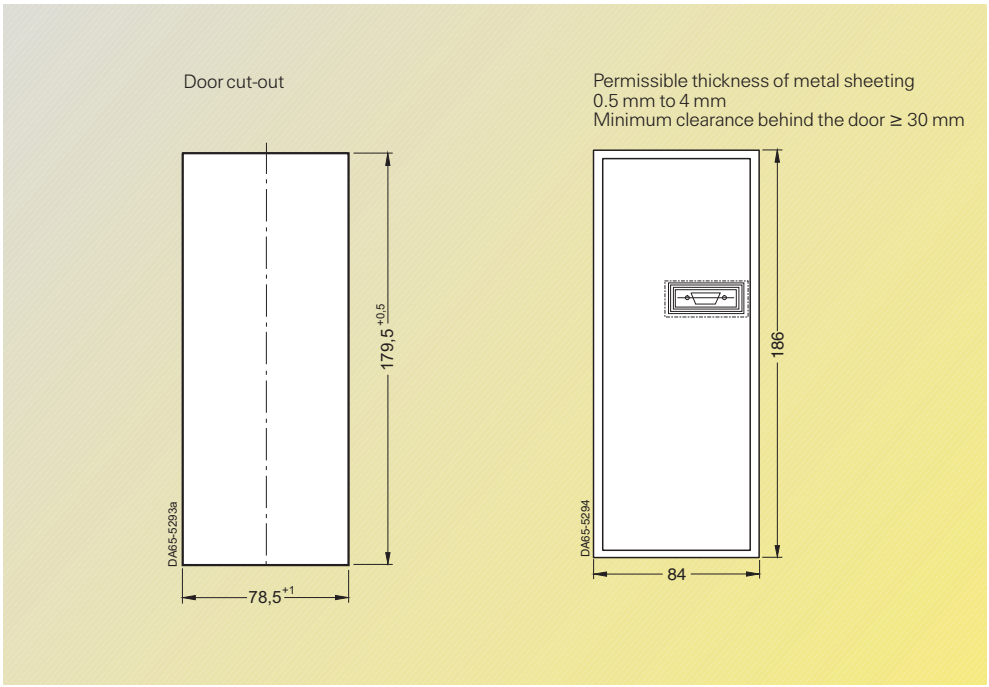
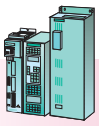


Fig. 3/15
AOP1S/APMU adapter and door cut-out



Integration of drives in SIMATIC S7 with Drive ES

Drive ES Basic is used for convenient startup, servicing and diagnostics of Siemens drives. It can be integrated in STEP 7 or installed on a PC/PG as a stand-alone version. For the stand-alone version, Drive ES Basic installs a drive manager instead of the SIMATIC manager but the drive manager has the same look and feel. For integrated installation as an option for STEP 7, the basic STEP 7 version as indicated in the ordering data must be used.

In conjunction with SIMATIC tool CFC (Continuous Function Chart), Drive ES Graphic is used for the graphic configuring of functions provided in SIMOVERT MASTERDRIVES (base unit, free block and technology functions). Prerequisite: A Drive ES Basic V5 and a CFC > V 5.1 must already have been installed in the computer.

Drive ES SIMATIC makes SIMATIC block libraries available, so that configuring the communication between SIMATIC S7 and Siemens drives (e.g. SIMOVERT MASTERDRIVES) is reduced to simple parameter assignment. Drive ES SIMATIC replaces the DVA_S7 software package for all STEP 7 versions ≥ V 5.0 and can also be installed and used independently, i.e. without Drive ES Basic.

Drive ES PCS7 provides a block library with image and control blocks with which Siemens drives (e.g. SIMOVERT MASTERDRIVES) can be integrated in the SIMATIC PCS7 process control system on the basics of a speed interface. The drives can then be controlled and visualized from the operator station (OS) via the drive faceplates. The PCS7 library can also be used independently, i.e. without Drive ES Basic, under PCS7 versions V 5.0 and V 5.1.

Scope of supply

	Order No.	Supplied as	Documentation
Software packages Drive ES · Installation as integrated option for STEP 7 from version ≥ V 5.0			
Drive ES Basic V 5.0[1] Single licence	**6SW1700–0JA00–0AA0**	CD-ROM, 1 piece	five standard languages
Drive ES Graphic V 5.0 Single licence	**6SW1700–0JB00–0AA0**	CD-ROM, 1 piece	five standard languages
Drive ES SIMATIC V 5.0 Single licence	**6SW1700–0JC00–0AA0**	CD-ROM, 1 piece	five standard languages
Software packages Drive ES · Installation as integrated option for STEP 7 from version ≥ V 5.1			
Drive ES Basic V 5.1[1] Single licence	**6SW1700–5JA00–1AA0**	CD-ROM, 1 piece	five standard languages
Drive ES Basic V 5.1[1] copy licence (60 installations)	**6SW1700–5JA00–1AA1**	CD-ROM, 1 piece	five standard languages
Drive ES Graphic V 5.1 Single licence	**6SW1700–5JB00–1AA0**	CD-ROM, 1 piece	five standard languages
Drive ES SIMATIC V 5.1 Single licence	**6SW1700–5JC00–1AA0**	CD-ROM, 1 piece	five standard languages
Drive ES PCS7 V 5.1 Single licence	**6SW1700–5JD00–1AA0**	CD-ROM, 1 piece	five standard languages
Software packages Drive ES · Installation as integrated option for STEP 7 from version ≥ V 5.2			
Drive ES Basic V 5.2[1] Single licence	**6SW1700–5JA00–2AA0**	CD-ROM, 1 piece	five standard languages
Drive ES Basic Upgrade[1] **V 5.x → V 5.2** Single licence	**6SW1700–5JA00–2AA4**	CD-ROM, 1 piece	five standard languages
Drive ES Basic V 5.2[1] copy licence (60 installations)	**6SW1700–5JA00–2AA1**	CD-ROM, 1 piece + Copy licence contract	five standard languages
Drive ES Graphic V 5.2 Single licence	**6SW1700–5JB00–2AA0**	CD-ROM, 1 piece	five standard languages
Drive ES Graphic Upgrade V 5.x → V 5.2 Single licence	**6SW1700–5JB00–2AA4**	CD-ROM, 1 piece	five standard languages
Drive ES SIMATIC V 5.3 Single licence	**6SW1700–5JC00–3AA0**	CD-ROM, 1 piece	five standard languages
Drive ES SIMATIC Upgrade V 5.x → V 5.3 Single licence	**6SW1700–5JC00–3AA4**	CD-ROM, 1 piece	five standard languages
Drive ES SIMATIC V 5.x Copy runtime licence	**6SW1700–5JC00–1AC0**	Product document only (w/o software and documentation)	five standard languages
Drive ES PCS7 V 5.2 Single licence	**6SW1700–5JD00–2AA0**	CD-ROM, 1 piece	five standard languages
Drive ES PCS7 Upgrade V 5.x → V 5.2 Single licence	**6SW1700–5JD00–2AA4**	CD-ROM, 1 piece	five standard languages
Drive ES PCS7 V 5.x Copy runtime licence	**6SW1700–5JD00–1AC0**	Product document only (w/o software and documentation)	five standard languages

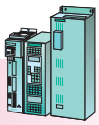
Contents of the Drive ES SIMATIC package

- **Communication software "PROFIBUS DP"** for
  S7-300 with CPUs with integrated DP interface (block libraries DRVDPS7, POSMO)
  S7-400 with CPUs with integrated DP interface or with CP443-5 (block libraries DRVDPS7, POSMO)
  S7-300 with CP342-5 (block library DRVDPS7C)
- **Communication software "USS-Protocoll"** for
  S7-200 with CPU 214/CPU 215/CPU 216 (driver program DRVUSS2 for programming tool STEP 7-micro)
  S7-300 with CP 340/341 and S7-400 with CP 411 (block library DRVUSSS7)
- **STEP 7-Slave object manager**
  for convenient configuration of drives as well as for acyclic PROFIBUS DP communication with the drives, support for conversion of DVA_S7 for Drive ES projects (only from V 5.1)
- **SETUP program** for installation of the software in the STEP 7 environment

Contents of the Drive ES PCS7 package (the PCS7 package can be used with the PCS7 versions V 5.0 and V 5.1)

- **Block library for SIMATIC PCS7**
  Image and control blocks for SIMOVERT MASTERDRIVES VC and MC as well as MICRO-/MIDIMASTER 3rd and 4th generation
- **STEP 7-Slave object manager**
  for convenient configuration of drives as well as for acyclic PROFIBUS DP communication with the drives
- **SETUP program** for software installation in the PCS7 environment

1) Drive ES Basic can also be installed stand-alone without STEP 7 (for details see accompanying text).



Software update service for Drive ES

A software update service can also be purchased for the Drive ES software. The user is automatically supplied with the current software, service packs and complete versions for one year after the date of ordering.

Scope of supply	Order No.
Software update service	
Drive ES Basic	**6SW1700–0JA00–0AB2**
Drive ES Graphic	**6SW1700–0JB00–0AB2**
Drive ES SIMATIC	**6SW1700–0JC00–0AB2**
Drive ES PCS7	**6SW1700–0JD00–0AB2**

Duration of the update service: 1 year.
6 weeks before expiry, the customer and his Siemens contact will be informed in writing that the update service will automatically be extended by another year if it is not cancelled on the part of the customer.

The update service can only be ordered if the customer already has a complete version of the software.

3

Communication packages for SIMATIC S5

The DVA_S5 software allows the incorporation of drives in the STEP 5 system environment for STEP 5 version ≥ 6.0.

For a more detailed description see Section 2 "SIMOVERT MASTERDRIVES in the world of automation".

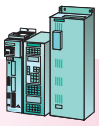
Scope of supply	Order No.	Supplied as	Documentation
"DVA_S5" option software for SIMATIC S5 (STEP 5 > V 6.0)			
• **"PROFIBUS DP" communication software** for S5-95U/DP-Master S5-115 to S5-155U with IM308-B/C	**6DD1800–0SW0**	3.5" floppy disk	German/English
• **"USS Protocol" communication software** for S5-95/S5-100 with CP 521Si S5-115 to S5-155U with CP 524			

Start-up, parameterization and diagnostics with DriveMonitor

The DriveMonitor program can be used for control and visualization of SIMOVERT MASTERDRIVES using a graphic user interface.

For a more detailed description of DriveMonitor, see Section 2 "Operator control and visualization".

Designation	Order No.	Supplied as
DriveMonitor Version ≥ V 5.1 for SIMOVERT MASTERDRIVES with operating instructions and Compendium		
Supplied separately	**6SX7010–0FA10**	CD-ROM
Interface converter SU1 RS 232 C – RS 485, incl. mounting accessories; Power supply: 1 AC 115/230 V	**6SX7005–0AA00**	–
Combination cable for the firmware boot function and communication with the PC Pre-assembled signal cables with a boot switch integrated in the cable connector case for booting firmware. The cable connects the MASTERDRIVES units with the RS 232 C interface of the PC via the –X300 or –X103 connector. Length 3 m.	**9AK1012–1AA00**	–



Options with code and description

Supplementary order code	Description of option	• Option possible – Not available												
		Converter			Inverter			Rectifier unit			AFE	Rectifier/regenerative unit		
		A – D P	E – G	K	A – D P	E – G	J, K, L, M, Q	B, C P	E	H, K		C	E	H, K
Documentation														
D77	Documentation in French/English	•	•	•	•	•	•	•	•	•	–	•	•	•
D78	Documentation in Spanish/English	•	•	•	•	•	•	•	•	•	–	•	•	•
D72	Documentation in Italian/English	•	•	•	•	•	•	•	•	•	–	•	•	•
D90	Documentation in Japanese/English	•	•	•	•	•	•	•	•	•	–	•	•	•
D99[2)]	Supplied without operating instructions and without DriveMonitor	•	•	•	•	•	•	•	•	•	–	•	•	•

L03

Basic-interference suppression together with radio-interference suppression filters and TT and TN systems

With the L03 option, unit sizes J to Q are fitted with discharge capacitors in the DC link. The option can be retrofitted by Siemens qualified personnel.

L20

Operation with an IT system

With the L20 option, operation with non-earthed systems (IT systems), the basic-interference capacitors built in as standard are no longer necessary. The control electronics are always earthed.

L30

Inverter fuses installed, fuse type for DIN/IEC approval and UL

Option L30 can only be ordered for inverter sizes E to G.
Inverter fuses are for protecting inverters connected to a DC bus. Inverter fuses must always be provided when at least 2 inverters are operated on this bus. The inverters do not have to be protected when a single inverter of a rectifier unit or a rectifier/regenerative unit is supplied with a matched power rating. The same conditions apply as with a converter. For option L30 the inverter fuses indicated are integrated in the inverter. The option can be retrofitted by Siemens qualified personnel.

L33

Compact inverters without fuses

For a description, see L30. With the L33 option, which can be used for compact inverters sizes A to D, the inverter fuses are not built into the inverter and are not supplied with the drive unit. The inverter fuses must be ordered separately and mounted externally.

K80

Safe Stop

The function "Safe Stop" is a "device for the prevention of an unexpected start-up" to EN 60 204-1, section 5.4. It is realized in connection with an external circuit.

- The function "Safe Stop" can be retrofitted by Siemens service personnel for chassis units size E and upwards.

K91

DC link current measurement

The DC link current is measured indirectly using line-side current transformers. Available for rectifier units B, C and E.

M08

Coated boards

Coating of the boards protects sensitive components, especially SMD components, against attack by harmful gases, chemically active dust and humidity. The M08 option thus increases the robustness of the boards in an aggressive environment. The coating does not serve as protection in a tropical climate. In the case of condensation or conductive contamination on the board, a voltage flashover in the power section is not prevented.

M20[1)]

IP20 panels

With the M20 option, unit sizes E to G are provided with an IP20 panel (wall mounting possible). Control is via a PMU built into the front panel. The option can be retrofitted by Siemens qualified personnel.

M65

Separate DC connection for d*v*/d*t* filter

With the help of the M65 option, available for unit sizes J, K, M and Q, the d*v*/d*t* filters can be connected (on the motor side) to a DC-link-voltage terminal lug (with size L; already integrated as standard).

D77

Documentation in French/English

Operating instructions are supplied in French/English.

D78

Documentation in Spanish/English

Operating instructions are supplied in Spanish/English.

D72

Documentation in Italian/English

Operating instructions are supplied in Italian/English.

D90

Documentation in Japanese/English

Operating instructions are supplied in Japanese/English additionally.

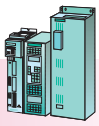
D99[2)]

Supplied without operating instructions and without DriveMonitor

If this option is chosen, no operating instructions or software tools (no CD-ROM) are supplied.

1) The panels can also be supplied separately, see page 3/79.

2) In accordance with the EU guidelines, the orderer of this option must ensure that the documentation is made available to the end user in the context of the machine and equipment documentation.



3

Isolation amplifier boards for DIN rail mounting

Knick isolation amplifier boards in a modular housing are recommended (www.knick.de).

Rectifier units for supplying 24 V DC

Power supply A	Order No.	
24 V DC rectifier units, single-phase 230 V AC and 400 V AC, can be used with +6 % and –10 % line-voltage tolerance[1])		
1 (230 V)	**4AV21 02–2EB00–0A**	For dimension drawings, see Catalog LV 10
1 (400 V)	**4AV21 06–2EB00–0A**	
3.5 (230 V)	**4AV23 02–2EB00–0A**	
2.5 (230/400 V)	**4AV20 00–2EB00–0A**	
5 (230/400 V)	**4AV22 00–2EB00–0A**	
10 (230/400 V)	**4AV24 00–2EB00–0A**	
15 (230/400 V)	**4AV26 00–2EB00–0A**	
24 V DC rectifier units, for 3-ph. 400 V AC, can be used with +6 % and –10 % line-voltage tolerance[1])		
10	**4AV30 00–2EB00–0A**	For dimension drawings, see Catalog LV 10
15	**4AV31 00–2EB00–0A**	
20	**4AV32 00–2EB00–0A**	
30	**4AV33 00–2EB00–0A**	
40	**4AV34 00–2FB00–0A**	
50	**4AV35 00–2FB00–0A**	
24 V DC power supply units, can be used with ±15 % line-voltage tolerance[2])		
2.5 (230 V)	**6EP1 332–1SH41**	For dimension drawings, see Catalog KT 10
5 (230 V)	**6EP1 333–3BA00**	
10 (230 V)	**6EP1 334–3BA00**	
20 (400 V)	**6EP1 336–3BA00**	

Coupling relay for connection to the control board's digital outputs

The coupling relay enables isolated energizing of a load.
Additionally, it is possible to switch loads requiring increased power which cannot be supplied directly by the digital output.

Typ. power requirement for 24 V DC	Switching capacity, output	Order No.	Supplier
< 7 mA	60 V DC / 1.5 A	**3TX7 002–3AB01**	Siemens
< 20 mA	48 V – 264 V AC / 1.8 A	**3TX7 002–3AB00**	Siemens
9 mA	250 V AC / 6 A	**PLC–RSC–24DC/21**	Phoenix Contact (www.phoenixcontact.com)
9 mA	250 V AC / 6 A	**PLC–RSP–24DC/21**	Phoenix Contact (www.phoenixcontact.com)

1) For technical data, see catalog "Switchgear and Systems".

2) For technical data, see catalog KT 10.

Vector Control
6SE71 Converter Cabinet Units

Fig. 4/1
6SE71 . . cabinet unit

Cooling type	Forced ventilation with integral fan
Permissible ambient and cooling-medium temperature • during operation • during storage • during transport	 0 °C to +40 °C –25 °C to +70 °C –25 °C to +70 °C
Installation altitude	≤ 1000 m above sea level (100 % load capability) > 1000 m to 4000 m above sea level (for reduction curves, see Section 6)
Permissible humidity rating	Relative humidity ≤ 85 % Moisture condensation not permissible
Climatic category	Class 3K3 to DIN IEC 60 721-3-3
Environmental class	Class 3C2 to DIN IEC 60 721-3-3
Insulation	Pollution degree 2 to DIN VDE 0110, Part 1 Moisture condensation not permissible
Overvoltage class	Category III to DIN VDE 0110, Part 2
Overvoltage strength	Class 1 to DIN VDE 0160
Degree of protection • standard • options	to DIN VDE 0470, Part 1 (EN 60 529) IP20 IP21, IP23, IP43, IP54 prepared and IP54b
Class of protection	Class 1 to DIN VDE 0106, Part 1
Shock protection	to DIN VDE 0106 Part 100 and BGV A2 (previously VBG4)
Radio-interference suppression • standard • options	to EN 61 800-3 No radio-interference suppression Radio-interference suppression filter for Class A1
Paint finish/color	For indoor installation / Pebble-gray RAL 7032
Mechanical specifications For stationary applications: • of deflection • of acceleration During transport: • of deflection • of acceleration	acc. to DIN IEC 60 68-2-6 0.075 mm in the frequency range 10 Hz to 58 Hz 9.8 m s^{-2} (1 x g) in the frequency range > 58 Hz to 500 Hz 3.5 mm in the frequency range 5 Hz to 9 Hz 9.8 m s^{-2} (1 x g) in the frequency range > 9 Hz to 500 Hz

Technical characteristics

The ready-to-connect converter cabinets can be connected to three-phase AC systems 380 V to 690 V, 50/60 Hz.

Due to their modular design, the base version of the units can be expanded to include additional functions.

The base version consists of:

- System cabinet
- Main switch with fuses for cable protection/semiconductor protection
- Line commutating reactor 2 %
- Converter or rectifier unit with inverter
- PMU parameterizing unit mounted in the door.

The additional items (options) for expanding the base version consist of mechanical and electrical system components which – depending on the respective application – can be ordered additionally (options are listed from page 4/26 onwards).

Examples of options:

- Supply connecting panel
- Main contactor
- Control current supply
- Control terminal strips
- Motor connecting panel
- User-friendly OP1S operator control panel
- Increased degree of protection.

Output ratings higher than those indicated in the following selection tables can be supplied on request.

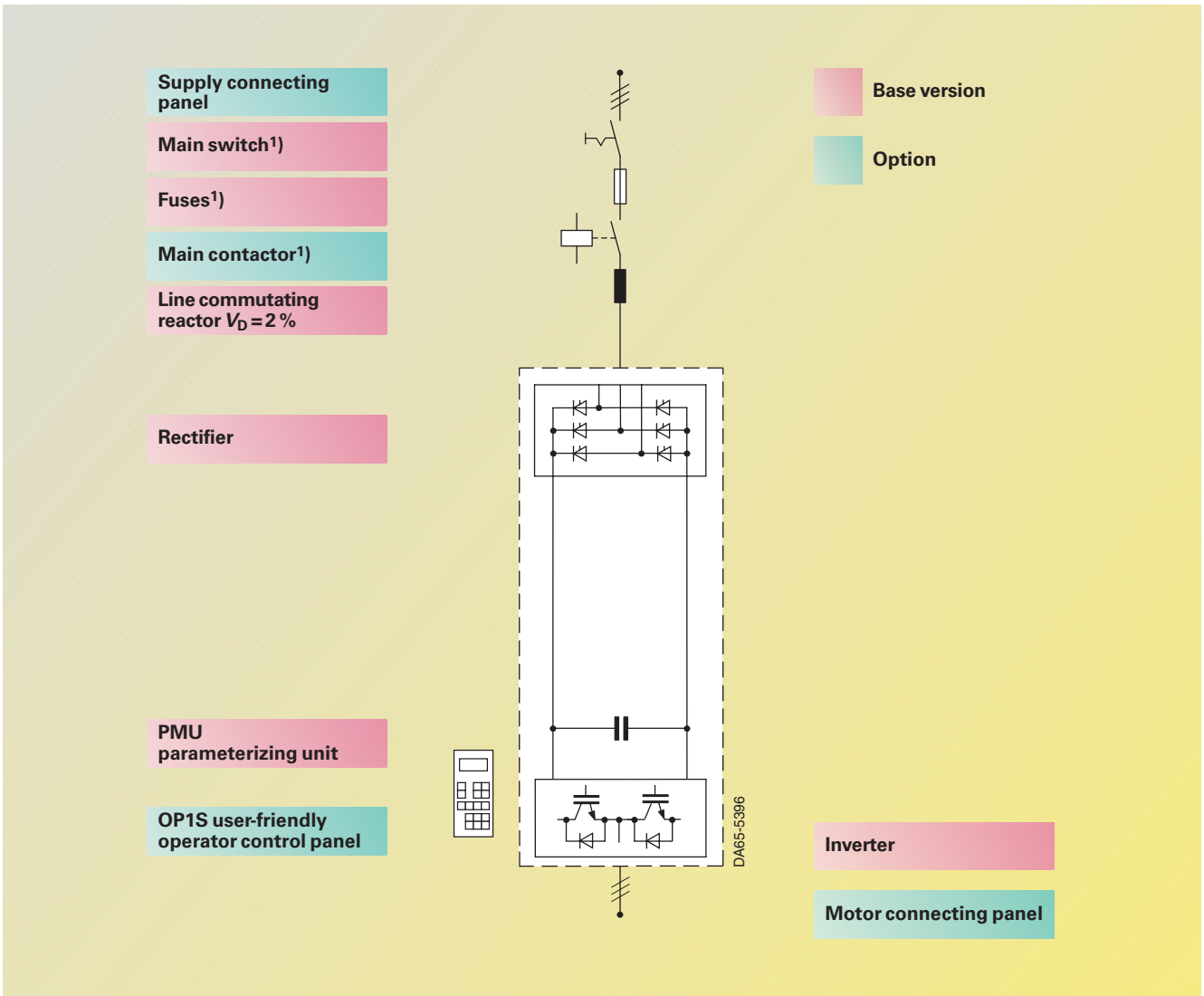


Fig. 4/2
Block diagram

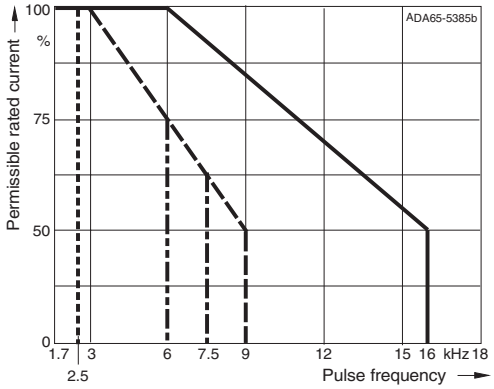
1) The functions of main switch, fuses and main contactor are implemented as standard with a circuit breaker 3WN6 and additional control voltage switch for:
630 kW, 710 kW at 380 V to 480 V,
800 kW to 1100 kW at 500 V to 600 V,
1000 kW to 1500 kW at 660 V to 690 V

Technical data

Rated voltage			
Supply voltage	3 AC 380 V – 15 % to 480 V +10 %	3 AC 500 V – 15 % to 600 V +10 %	3 AC 660 V – 15 % to 690 V +15 %
Output voltage Converter	3 AC 0 V up to supply voltage	3 AC 0 V up to supply voltage	3 AC 0 V up to supply voltage
Rated frequency			
Supply frequency	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)
Output frequency SIMOVERT Vector Control			
– *V/f* = constant	0 Hz to 200 Hz (textile to 500 Hz)	0 Hz to 200 Hz	0 Hz to 200 Hz
– *V* = constant	8 Hz to 300 Hz	8 Hz to 300 Hz	8 Hz to 300 Hz
Load class II to EN 60 146-1-1	See also Engineering Information, Section 6		
Base load current	0.91 x rated output current		
Short-time current	1.36 x rated output current during 60 s or 1.60 x rated output current during 30 s for all units up to cabinet size D and supply connection voltage of max. 600 V		
Cycle time	300 s		
Overload duration	60 s (20 % of the cycle time)		
Power factor • fundamental • overall	≥ 0.98 0.93 to 0.96		
Efficiency	0.97 to 0.98		

For reduction factors due to different installation conditions (installation altitude, temperature), see Engineering Information, Section 6.

Reduction curves



Maximum adjustable pulse frequency as a function of the output:

16 kHz
for 45 kW; 55 kW; 380 V to 480 V
for 37 kW; 45 kW; 500 V to 600 V

9 kHz
for 75 kW; 90 kW; 380 V to 480 V
for 55 kW; 500 V to 600 V

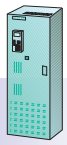
7.5 kHz
for 110 kW; 132 kW; 380 V to 480 V
for 75 kW; 90 kW; 500 V to 600 V
for 55 kW to 110 kW; 660 V to 690 V

6 kHz
for 160 kW to 250 kW; 380 V to 480 V
for 110 kW to 160 kW; 500 V to 600 V
for 132 kW to 200 kW; 660 V to 690 V

2.5 kHz
for 315 kW to 710 kW; 380 V to 480 V
for 200 kW to 1100 kW; 500 V to 600 V
for 250 kW to 1500 kW; 660 V to 690 V

6SE71 Converter Cabinet Units

Converters 37 kW to 1500 kW for single-quadrant operation, 6-pulse system



Cabinet units

Selection and ordering data

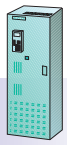
Nominal power rating	Rated output current	Base load current	Short-time current	Input current	Converter	Power loss at 2.5 kHz	Dimensions Frame measurements W x H x D	Dimension drawing, see Section 7	Weight approx.	Cooling-air requirement	Sound pressure level L_{pA} (1 m)
	I_{UN}	I_G	$I_{max.}$								
kW	A	A	A	A	Order No.	kW	mm	No.	kg	m³/s	dB
Supply voltage 3 AC 380 V to 480 V											
400 V											
45	92	84	126	101	**6SE7131–0EB61–3BA0**	1.3	600 x 2000 x 600	60	250	0.1	70
55	124	113	169	136	**6SE7131–2EC61–3BA0**	1.9	900 x 2000 x 600	61	300	0.14	70
75	146	133	199	160	**6SE7131–5EC61–3BA0**	2.1	900 x 2000 x 600	61	310	0.14	70
90	186	169	254	205	**6SE7131–8EC61–3BA0**	2.4	900 x 2000 x 600	61	320	0.14	70
110	210	191	287	231	**6SE7132–1ED61–3BA0**	3	1200 x 2000 x 600	62	420	0.31	80
132	260	237	355	286	**6SE7132–6ED61–3BA0**	3.6	1200 x 2000 x 600	62	430	0.31	80
160	315	287	430	346	**6SE7133–2ED61–3BA0**	4.5	1200 x 2000 x 600	62	450	0.41	80
200	370	337	503	407	**6SE7133–7ED61–3BA0**	5.2	1200 x 2000 x 600	62	500	0.41	80
250	510	464	694	561	**6SE7135–1EE62–3BA0**	7.4	1500 x 2000 x 600	63	750	0.46	80
315	590	537	802	649	**6SE7136–0EE62–3BA0**	8.6	1500 x 2000 x 600	63	750	0.46	80
400	690	628	938	759	**6SE7137–0EE62–3BA0**	10.7	1500 x 2000 x 600	63	800	1.3	85
500	860	782	1170	946	**6SE7138–6EG62–3BA0**	16	2100 x 2000 x 600	64	1420	1.3	85
630	1100	1000	1496	1190	**6SE7141–1EH62–3BA0**	18.7	2400 x 2000 x 600	65	1550	1.9	85
710	1300	1183	1768	1430	**6SE7141–3EJ62–3BA0**	20.3	2700 x 2000 x 600	66	1800	1.9	85
Supply voltage 3 AC 500 V to 600 V											
500 V											
37	61	55	83	67	**6SE7126–1FB61–3BA0**	1	600 x 2000 x 600	60	250	0.1	70
45	66	60	90	73	**6SE7126–6FB61–3BA0**	1.2	600 x 2000 x 600	60	250	0.1	70
55	79	72	108	87	**6SE7128–0FC61–3BA0**	1.4	900 x 2000 x 600	61	310	0.14	70
75	108	98	147	119	**6SE7131–1FC61–3BA0**	1.9	900 x 2000 x 600	61	310	0.14	70
90	128	117	174	141	**6SE7131–3FD61–3BA0**	2.4	1200 x 2000 x 600	62	420	0.31	80
110	156	142	213	172	**6SE7131–6FD61–3BA0**	2.8	1200 x 2000 x 600	62	450	0.31	80
132	192	174	262	211	**6SE7132–0FD61–3BA0**	3.6	1200 x 2000 x 600	62	450	0.41	80
160	225	205	307	248	**6SE7132–3FD61–3BA0**	4.3	1200 x 2000 x 600	62	500	0.41	80
200	297	270	404	327	**6SE7133–0FE62–3BA0**	6	1500 x 2000 x 600	63	750	0.46	80
250	354	322	481	400	**6SE7133–5FE62–3BA0**	7	1500 x 2000 x 600	63	750	0.46	80
315	452	411	615	497	**6SE7134–5FE62–3BA0**	8.6	1500 x 2000 x 600	63	750	0.46	80
400	570	519	775	627	**6SE7135–7FG62–3BA0**	12.5	2100 x 2000 x 600	64	1420	1.3	85
450	650	592	884	715	**6SE7136–5FG62–3BA0**	13.7	2100 x 2000 x 600	64	1420	1.3	85
630	860	783	1170	946	**6SE7138–6FG62–3BA0**	16.1	2100 x 2000 x 600	64	1420	1.45	85
800	1080	983	1469	1188	**6SE7141–1FJ62–3BA0**	20.1	2700 x 2000 x 600	66	1800	1.9	85
900	1230	1119	1673	1353	**6SE7141–2FJ62–3BA0**	23.1	2700 x 2000 x 600	66	1800	1.9	85
					without interphase transformer chassis						
1000	1400	1274	1904	1540	**6SE7141–4FL62–3BA0**	25.7	3300 x 2000 x 600	67	2300	2.7	88
1100	1580	1438	2149	1738	**6SE7141–6FL62–3BA0**	29.4	3300 x 2000 x 600	67	2300	2.7	88
					with interphase transformer chassis						
1000	1400	1274	1904	1540	**6SE7141–4FN62–3BA0**	26.7	3900 x 2000 x 600	68	2500	2.7	88
1100	1580	1438	2149	1738	**6SE7141–6FN62–3BA0**	30.4	3900 x 2000 x 600	68	2500	2.7	88

Converters 37 kW to 1500 kW for single-quadrant operation, 6-pulse system

Supply connection (connecting lugs, bottom)							Motor connection (connecting lugs, bottom)					
Recommended cross-section		Maximum cable cross-section		Terminal screws		Recommended supply-cable fuses	Recommended cross-section		Maximum cable cross-section		Terminal screws	
DIN VDE mm²	AWG/ MCM	Standard mm²	Option	Standard	Option	gL NH Type	DIN VDE mm²	AWG/ MCM	Standard mm²	Option	Standard	Option
35	0	70	2 x 240	M 6	M 12	3NA3 830 (100)	35	0	2 x 70	2 x 240	M 10	M 12
70	(000)	150	2 x 240	M 10	M 12	3NA3 136 (160)	70	(000)	2 x 70	2 x 240	M 10	M 12
70	(000)	150	2 x 240	M 10	M 12	3NA3 136 (160)	70	(000)	2 x 70	2 x 240	M 10	M 12
95	(4/0)	150	2 x 240	M 10	M 12	3NA3 140 (200)	95	(4/0)	2 x 70	2 x 240	M 10	M 12
120	(300)	150	2 x 240	M 10	M 12	3NA3 144 (250)	120	(300)	2 x 150	2 x 240	M 12	–
2 x 70	2 x (000)	2 x 150	2 x 240	M 10	M 12	3NA3 252 (315)	2 x 70	2 x (000)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 260 (400)	2 x 95	2 x (4/0)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 260 (400)	2 x 95	2 x (4/0)	2 x 150	2 x 240	M 12	–
2 x 150	2 x (400)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 150	2 x (400)	4 x 240	–	M 12/16	–
2 x 185	2 x (500)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 185	2 x (500)	4 x 240	–	M 12/16	–
2 x 240	2 x 600	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 240	2 x 600	4 x 240	–	M 12/16	–
3 x 185	3 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	–	M 12/16	–
4 x 185	4 x (500)	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 185	4 x (500)	4 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	–	M 12/16	–
25	2	70	2 x 240	M 6	M 12	3NA3 824 (80)	25	2	2 x 70	2 x 240	M 10	M 12
35	0	70	2 x 240	M 6	M 12	3NA3 830 (100)	35	0	2 x 70	2 x 240	M 10	M 12
35	0	70	2 x 240	M 6	M 12	3NA3 830 (100)	35	0	2 x 70	2 x 240	M 10	M 12
50	(00)	70	2 x 240	M 6	M 12	3NA3 132 (125)	50	(00)	2 x 70	2 x 240	M 10	M 12
70	(000)	150	2 x 240	M 10	M 12	3NA3 136 (160)	70	(000)	2 x 150	2 x 240	M 12	–
95	(4/0)	150	2 x 240	M 10	M 12	3NA3 140 (200)	95	(4/0)	2 x 150	2 x 240	M 12	–
120	(300)	150	2 x 240	M 10	M 12	3NA3 144 (250)	120	(300)	2 x 150	2 x 240	M 12	–
120	(300)	150	2 x 240	M 10	M 12	3NA3 144 (250)	120	(300)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 260 (400)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 360 (500)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 120	2 x (300)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 120	2 x (300)	4 x 240	–	M 12/16	–
2 x 185	2 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 185	2 x (500)	4 x 240	–	M 12/16	–
2 x 240	2 x 600	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 240	2 x 600	4 x 240	–	M 12/16	–
3 x 185	3 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	–	M 12/16	–
4 x 185	4 x (500)	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 185	4 x (500)	6 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	2 x 4 x 300	–	M 12/16	–
4 x 300	4 x 800	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 300	4 x 800	2 x 4 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	8 x 300	–	M 12/16	–
4 x 300	4 x 800	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 300	4 x 800	8 x 300	–	M 12/16	–

6SE71 Converter Cabinet Units

Converters 37 kW to 1500 kW for single-quadrant operation, 6-pulse system



Cabinet units

Selection and ordering data

Nominal power rating	Rated output current	Base load current	Short-time current	Input current	Converter	Power loss at 2.5 kHz	Dimensions Frame measurements W x H x D	Dimension drawing, see Section 7	Weight approx.	Cooling-air requirement	Sound pressure level L_{pA} (1 m)
	I_{UN}	I_G	$I_{max.}$								
kW	A	A	A	A	Order No.	kW	mm	No.	kg	m^3/s	dB
Supply voltage 3 AC 660 V to 690 V											
690 V											
55	60	55	82	66	**6SE7126–0HC61–3BA0**	1.2	900 x 2000 x 600	61	300	0.14	70
75	82	75	112	90	**6SE7128–2HC61–3BA0**	1.6	900 x 2000 x 600	61	310	0.14	70
90	97	88	132	107	**6SE7131–0HD61–3BA0**	2.1	1200 x 2000 x 600	62	420	0.31	80
110	118	107	161	130	**6SE7131–2HD61–3BA0**	2.5	1200 x 2000 x 600	62	420	0.31	80
132	145	132	198	160	**6SE7131–5HD61–3BA0**	3	1200 x 2000 x 600	62	430	0.41	80
160	171	156	233	188	**6SE7131–7HD61–3BA0**	3.8	1200 x 2000 x 600	62	450	0.41	80
200	208	189	284	229	**6SE7132–1HD61–3BA0**	4.5	1200 x 2000 x 600	62	500	0.41	80
250	297	270	404	327	**6SE7133–0HE62–3BA0**	6.9	1500 x 2000 x 600	63	750	0.46	80
315	354	322	481	400	**6SE7133–5HE62–3BA0**	7.7	1500 x 2000 x 600	63	750	0.46	80
400	452	411	615	497	**6SE7134–5HE62–3BA0**	9.3	1500 x 2000 x 600	63	750	0.46	80
500	570	519	775	627	**6SE7135–7HG62–3BA0**	12.7	2100 x 2000 x 600	64	1420	1.35	85
630	650	592	884	715	**6SE7136–5HG62–3BA0**	15.1	2100 x 2000 x 600	64	1420	1.35	85
800	860	783	1170	946	**6SE7138–6HG62–3BA0**	18.6	2100 x 2000 x 600	64	1420	1.45	85
1000	1080	983	1469	1188	**6SE7141–1HJ62–3BA0**	23.3	2700 x 2000 x 600	66	1800	1.9	85
1200	1230	1119	1673	1353	**6SE7141–2HJ62–3BA0**	29.6	2700 x 2000 x 600	66	1800	1.9	85
					without interphase transformer chassis						
1300	1400	1274	1904	1540	**6SE7141–4HL62–3BA0**	29.9	3300 x 2000 x 600	67	2300	2.7	88
1500	1580	1438	2149	1738	**6SE7141–6HL62–3BA0**	33.9	3300 x 2000 x 600	67	2300	2.7	88
					with interphase transformer chassis						
1300	1400	1274	1904	1540	**6SE7141–4HN62–3BA0**	30.9	3900 x 2000 x 600	68	2500	2.7	88
1500	1580	1438	2149	1738	**6SE7141–6HN62–3BA0**	34.9	3900 x 2000 x 600	68	2500	2.7	88

Supply connection (connecting lugs, bottom)							Motor connection (connecting lugs, bottom)					
Recommended cross-section		Maximum cable cross-section		Terminal screws		Recommended supply-cable fuses	Recommended cross-section		Maximum cable cross-section		Terminal screws	
DIN VDE	AWG/ MCM	Standard	Option	Standard	Option	gL NH	DIN VDE	AWG/ MCM	Standard	Option	Standard	Option
mm^2		mm^2				Type	mm^2		mm^2			
25	2	70	2 x 240	M 6	M 12	3NA3 824–6 (80)	25	2	2 x 70	2 x 240	M 10	M 12
35	0	70	2 x 240	M 6	M 12	3NA3 830–6 (100)	35	0	2 x 70	2 x 240	M 10	M 12
50	(00)	70	2 x 240	M 6	M 12	3NA3 132–6 (125)	50	(00)	2 x 150	2 x 240	M 12	–
70	(000)	150	2 x 240	M 10	M 12	3NA3 136–6 (160)	70	(000)	2 x 150	2 x 240	M 12	–
70	(000)	150	2 x 240	M 10	M 12	3NA3 136–6 (160)	70	(000)	2 x 150	2 x 240	M 12	–
95	(4/0)	150	2 x 240	M 10	M 12	3NA3 240–6 (200)	95	(4/0)	2 x 150	2 x 240	M 12	–
120	(300)	150	2 x 240	M 10	M 12	3NA3 244–6 (250)	120	(300)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 360–6 (400)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 365–6 (500)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 120	2 x (300)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 120	2 x (300)	4 x 240	–	M 12/16	–
2 x 185	2 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 185	2 x (500)	4 x 240	–	M 12/16	–
2 x 240	2 x 600	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 240	2 x 600	4 x 240	–	M 12/16	–
3 x 185	3 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	–	M 12/16	–
4 x 185	4 x (500)	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 185	4 x (500)	6 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	2 x 4 x 300	–	M 12/16	–
4 x 300	4 x 800	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 300	4 x 800	2 x 4 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	8 x 300	–	M 12/16	–
4 x 300	4 x 800	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 300	4 x 800	8 x 300	–	M 12/16	–

Technical characteristics

The ready-to-connect converter cabinets can be connected to three-phase AC systems in the voltage ranges from 3 AC 380 V to 690 V, 50/60 Hz.

Due to their modular design, the base version of the units can be expanded to include additional functions.

The base version consists of

- System cabinet
- Main switch with fuses for cable protection/semiconductor protection
- Line commutating reactors 2 %
- Rectifier units with inverters
- PMU parameterizing unit mounted in the door.

The additional items (options) for expanding the base version consist of mechanical and electrical system components which – depending on the respective application – can be ordered additionally. (Options are listed from page 4/26 onwards).

Examples of options:

- Supply connecting panel
- Main contactor
- Control current supply
- Control terminal strips
- Motor connecting panel
- User-friendly OP1S operator control panel
- Increased degree of protection.

Output ratings higher than those indicated in the following selection tables, can be supplied on request.

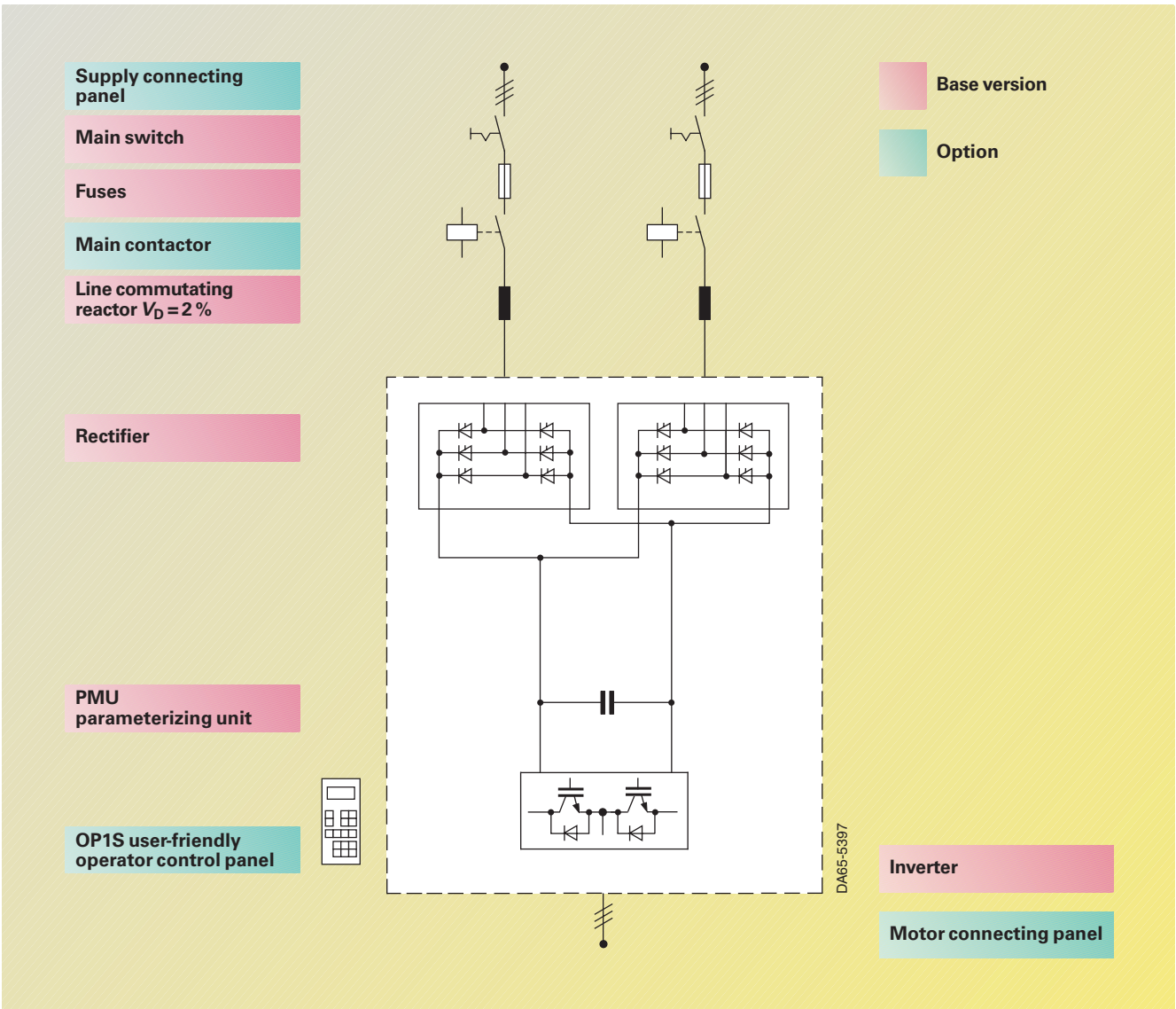


Fig. 4/3
Block diagram

Cabinet units

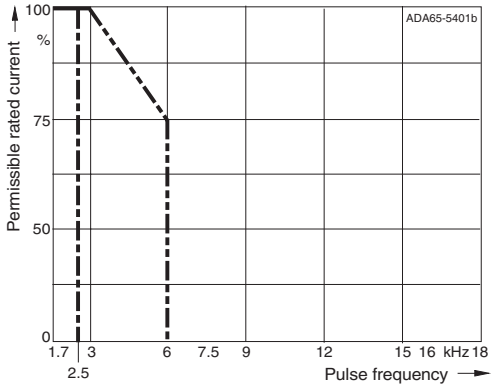
Converters 200 kW to 1500 kW for single-quadrant operation, 12-pulse system

Technical data

Rated voltage			
Supply voltage	2 x 3 AC 380 V – 15 % to 480 V +10 %	2 x 3 AC 500 V – 15 % to 600 V +10 %	2 x 3 AC 660 V – 15 % to 690 V +15 %
Output voltage Converter	3 AC 0 V up to supply voltage	3 AC 0 V up to supply voltage	3 AC 0 V up to supply voltage
Rated frequency			
Supply frequency	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)
Output frequency SIMOVERT Vector Control			
– *V/f* = constant	0 Hz to 200 Hz	0 Hz to 200 Hz	0 Hz to 200 Hz
– *V* = constant	8 Hz to 300 Hz	8 Hz to 300 Hz	8 Hz to 300 Hz
Load class II to EN 60 146-1-1	See also Engineering Information, Section 6		
Base load current	0.91 x rated output current		
Short-time current	1.36 x rated output current during 60 s		
Cycle time	300 s		
Overload duration	60 s (20 % of the cycle time)		
Power factor • fundamental • overall	≥ 0.98 0.93 to 0.96		
Efficiency	0.97 to 0.98		

For reduction factors due to different installation conditions (installation altitude, temperature), see Engineering Information, Section 6.

Reduction curves



Maximum adjustable pulse frequency as a function of output:

6 kHz
for 250 kW; 380 V to 480 V
for 200 kW; 660 V to 690 V

2.5 kHz
for 315 kW to 710 kW; 380 V to 480 V
for 200 kW to 1100 kW; 500 V to 600 V
for 250 kW to 1500 kW; 660 V to 690 V

6SE71 Converter Cabinet Units

Converters 200 kW to 1500 kW for single-quadrant operation, 12-pulse system

Cabinet units

Selection and ordering data

Nominal power rating	Rated output current I_{UN}	Base load current I_G	Short-time current $I_{max.}$	Input current[1]	Converter	Power loss at 2.5 kHz	Dimensions Frame measurements W x H x D	Dimension drawing, see Section 7	Weight approx.	Cooling-air requirement	Sound pressure level L_{pA} (1 m)
kW	A	A	A	A	Order No.	kW	mm	No.	kg	m³/s	dB
Supply voltage 2 x 3 AC 380 V to 480 V											
400 V											
250	510	464	694	281	**6SE7135–1KJ62–3BA0**	7.8	2700 x 2000 x 600	69	1100	0.86	80
400	690	628	938	380	**6SE7137–0KJ62–3BA1**	11.4	2700 x 2000 x 600	69	1150	1	80
500	860	782	1170	473	**6SE7138–6KJ62–3BA0**	15.9	2700 x 2000 x 600	70	1440	1.15	80
630	1100	1000	1496	595	**6SE7141–1KL62–3BA0**	19.3	3300 x 2000 x 600	71	2190	2	85
710	1300	1183	1768	715	**6SE7141–3KM62–3BA0**	21.1	3600 x 2000 x 600	72	2400	2	85
Supply voltage 2 x 3 AC 500 V to 600 V											
500 V											
200	297	270	404	164	**6SE7133–1LJ62–3BA0**	6.8	2700 x 2000 x 600	69	1100	0.86	80
250	354	322	481	200	**6SE7133–5LJ62–3BA0**	7.8	2700 x 2000 x 600	69	1100	0.86	80
315	452	411	615	249	**6SE7134–5LJ62–3BA0**	9.4	2700 x 2000 x 600	69	1290	0.86	80
400	570	519	775	314	**6SE7135–7LJ62–3BA0**	12	2700 x 2000 x 600	70	1290	1.15	80
450	650	592	884	358	**6SE7136–5LJ62–3BA0**	13.7	2700 x 2000 x 600	70	1290	1.15	80
630	860	783	1170	473	**6SE7138–6LJ62–3BA0**	16.1	2700 x 2000 x 600	70	1410	1.3	82
800	1080	983	1469	594	**6SE7141–1LM62–3BA0**	20.8	3600 x 2000 x 600	72	2400	2	85
900	1230	1119	1673	677	**6SE7141–2LM62–3BA0**	24.1	3600 x 2000 x 600	72	2400	2	85
1100	1580	1438	2149	868	without interphase transformer chassis **6SE7141–6LP62–3BA0**	29.9	4200 x 2000 x 600	73	2890	2.8	86
1100	1580	1438	2149	868	with interphase transformer chassis **6SE7141–6LR62–3BA0**	30.9	4800 x 2000 x 600	74	3140	2.8	86
Supply voltage 2 x 3 AC 660 V to 690 V											
690 V											
250	297	270	404	164	**6SE7133–0NJ62–3BA0**	7.8	2700 x 2000 x 600	69	1100	0.86	80
315	354	322	481	200	**6SE7133–5NJ62–3BA0**	8.9	2700 x 2000 x 600	69	1100	0.86	80
400	452	411	615	249	**6SE7134–5NJ62–3BA0**	10.5	2700 x 2000 x 600	69	1290	0.86	80
500	570	519	775	314	**6SE7135–7NJ62–3BA0**	12.6	2700 x 2000 x 600	70	1290	1.2	80
630	650	592	884	358	**6SE7136–5NJ62–3BA0**	14.8	2700 x 2000 x 600	70	1290	1.2	80
800	860	783	1170	473	**6SE7138–6NJ62–3BA0**	18.7	2700 x 2000 x 600	70	1410	1.3	82
1000	1080	983	1469	594	**6SE7141–1NM62–3BA0**	23.3	3600 x 2000 x 600	72	2400	2	85
1200	1230	1119	1673	677	**6SE7141–2NM62–3BA0**	30.7	3600 x 2000 x 600	72	2400	2	85
1500	1580	1438	2149	868	without interphase transformer chassis **6SE7141–6NP62–3BA0**	34.3	4200 x 2000 x 600	73	2890	2.8	86
1500	1580	1438	2149	868	with interphase transformer chassis **6SE7141–6NR62–3BA0**	35.3	4800 x 2000 x 600	74	3140	2.8	86

1) Current per sub-rectifier.

Supply connection (connecting lugs, bottom)							Motor connection (connecting lugs, bottom)			
Recommended cross-section		Maximum cable cross-section		Terminal screws		Recommended supply-cable fuses	Recommended cross-section		Maximum cable cross-section	Terminal screws
DIN VDE mm²	AWG/ MCM	Standard mm²	Option	Standard	Option	gL NH Type	DIN VDE mm²	AWG/ MCM	Standard mm²	Standard
2 x 2 x 95	2 x 2 x (4/0)	2 x 2 x 150	2 x 2 x 240	M 10	M 12	3NA3 260 (400)	2 x 150	2 x (400)	4 x 240	M 12/16
2 x 2 x 95	2 x (4/0)	2 x 2 x 150	2 x 2 x 240	M 10	M 12	3NA3 260 (400)	2 x 240	2 x 600	4 x 240	M 12/16
2 x 2 x 150	2 x (400)	2 x 2 x 240	2 x 4 x 240	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	M 12/16
2 x 2 x 240	2 x 2 x 600	2 x 4 x 240	–	M 12	–	Protective circuit-breaker	4 x 185	4 x (500)	4 x 300	M 12/16
2 x 2 x 240	2 x 2 x 600	2 x 4 x 240	–	M 12	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	M 12/16
2 x 120	2 x (300)	2 x 150	2 x 240	M 10	M 12	3NA3 144 (250)	2 x 95	2 x (4/0)	4 x 240	M 12/16
2 x 120	2 x (300)	2 x 150	2 x 240	M 10	M 12	3NA3 144 (250)	2 x 95	2 x (4/0)	4 x 240	M 12/16
2 x 2 x 95	2 x 2 x (4/0)	2 x 2 x 150	2 x 2 x 240	M 10	M 12	3NA3 260 (400)	2 x 120	2 x (300)	4 x 240	M 12/16
2 x 2 x 95	2 x 2 x (4/0)	2 x 2 x 150	2 x 2 x 240	M 10	M 12	3NA3 260 (400)	2 x 185	2 x (500)	4 x 240	M 12/16
2 x 2 x 95	2 x 2 x (4/0)	2 x 2 x 150	2 x 2 x 240	M 10	M 12	3NA3 360 (500)	2 x 240	2 x 600	4 x 240	M 12/16
2 x 2 x 120	2 x 2 x (300)	2 x 2 x 240	2 x 4 x 240	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	M 12/16
2 x 2 x 240	2 x 2 x 600	2 x 4 x 240	–	M 12	–	Protective circuit-breaker	4 x 185	4 x (500)	6 x 300	M 12/16
2 x 2 x 240	2 x 2 x 600	2 x 4 x 240	–	M 12	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	M 12/16
2 x 3 x 185	3 x (500)	2 x 4 x 240	–	M 12	–	Protective circuit-breaker	4 x 300	4 x 800	8 x 300	M 12/16
2 x 3 x 185	3 x (500)	2 x 4 x 240	–	M 12	–	Protective circuit-breaker	4 x 300	4 x 800	8 x 300	M 12/16
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 240–6 (200)	2 x 95	2 x (4/0)	4 x 240	M 12/16
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 240–6 (200)	2 x 95	2 x (4/0)	4 x 240	M 12/16
2 x 2 x 95	2 x 2 x (4/0)	2 x 2 x 150	2 x 2 x 240	M 10	M 12	3NA3 360–6 (400)	2 x 120	2 x (300)	4 x 240	M 12/16
2 x 2 x 95	2 x 2 x (4/0)	2 x 2 x 150	2 x 2 x 240	M 10	M 12	3NA3 360–6 (400)	2 x 185	2 x (500)	4 x 240	M 12/16
2 x 2 x 95	2 x 2 x (4/0)	2 x 2 x 150	2 x 2 x 240	M 10	M 12	3NA3 365–6 (500)	2 x 240	2 x 600	4 x 240	M 12/16
2 x 2 x 120	2 x 2 x (300)	2 x 2 x 240	2 x 4 x 240	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	M 12/16
2 x 2 x 240	2 x 2 x 600	2 x 4 x 240	–	M 12	–	Protective circuit-breaker	4 x 185	4 x (500)	6 x 300	M 12/16
2 x 2 x 240	2 x 2 x 600	2 x 4 x 240	–	M 12	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	M 12/16
2 x 3 x 185	2 x 3 x (500)	2 x 4 x 240	–	M 12	–	Protective circuit-breaker	4 x 300	4 x 800	8 x 300	M 12/16
2 x 3 x 185	2 x 3 x (500)	2 x 4 x 240	–	M 12	–	Protective circuit-breaker	4 x 300	4 x 800	8 x 300	M 12/16

Technical characteristics

The ready to connect converter cabinets can be connected to three-phase AC systems 380 V to 690 V, 50/60 Hz.

Due to a modular design, the base version of the units can be considerably expanded to include additional functions.

The base version of the unit consists of:

- System cabinet
- Main switch with fuses for cable protection/semiconductor protection
- Line commutating reactor 4 %
- Rectifier/regenerative units with inverter
- PMU parameterizing unit mounted in the door.

The additional items (options) for expanding the base version consist of mechanical and electrical system components which – depending on the respective application – can be ordered additionally (Options are listed from page 4/26 onwards).

Examples of options:

- Supply connecting panel
- Main contactor (not if 3WN6 circuit-breakers are used)
- Control current supply
- Control terminal strips
- Motor connecting panel
- Autotransformer
- User-friendly OP1S operator control panel
- Increased degree of protection.

Output ratings higher than those indicated in the following selection tables, can be supplied on request.

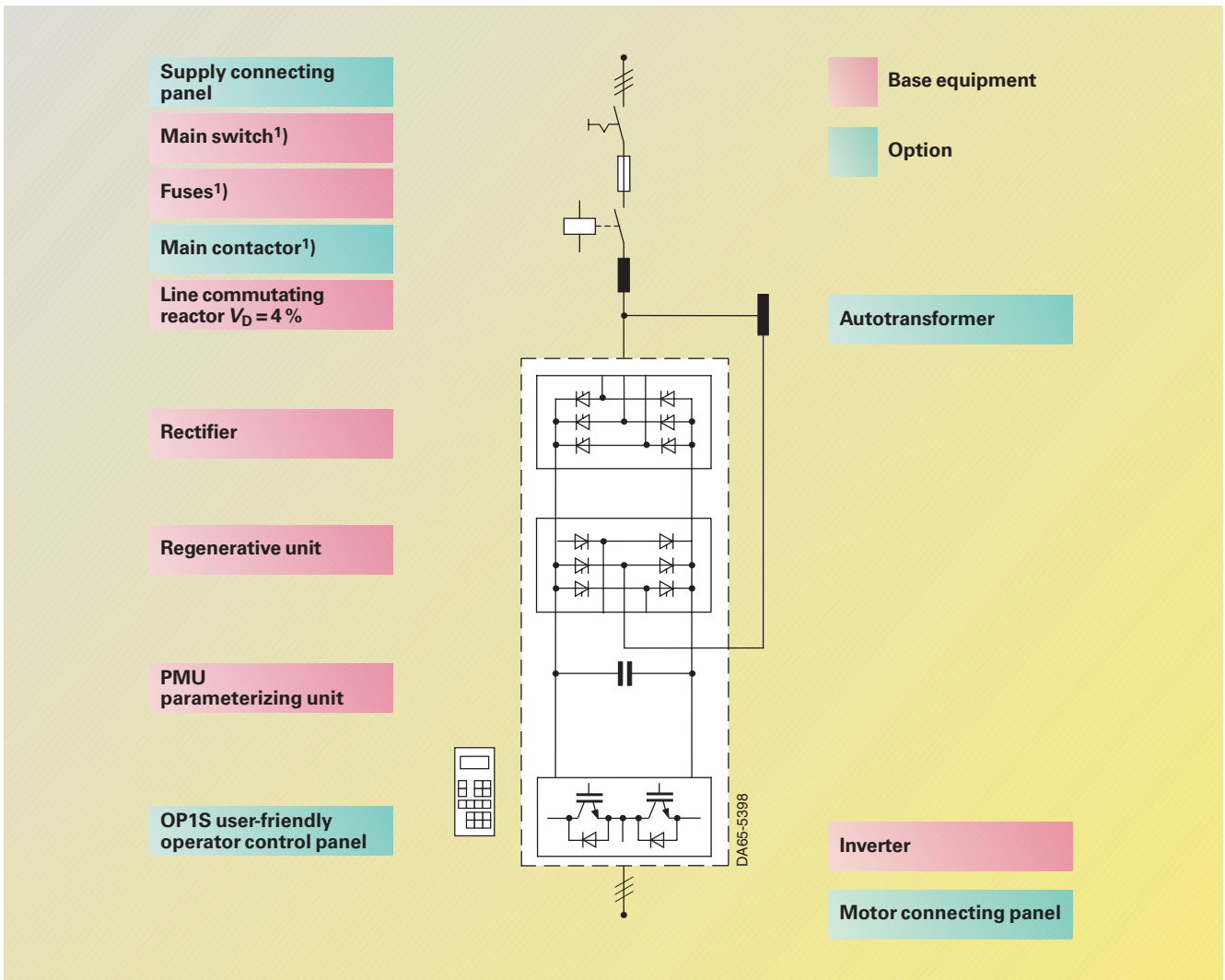


Fig. 4/4
Block diagram

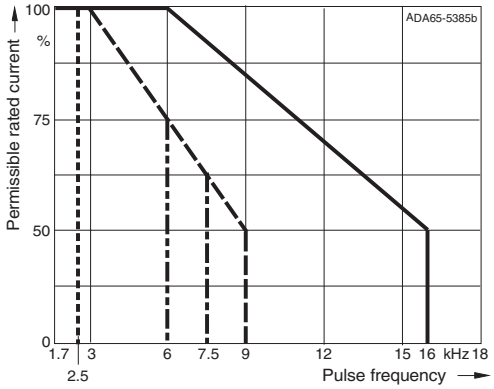
1) The functions of main switch, fuses and main contactor are implemented as standard with a circuit breaker 3WN6 and additional control voltage switch for:
630 kW, 710 kW at 380 V to 480 V,
800 kW to 1100 kW at 500 V to 600 V,
1000 kW to 1500 kW at 660 V to 690 V

Technical data

Rated voltage			
Supply voltage	3 AC 380 V – 15 % to 480 V +10 %	3 AC 500 V – 15 % to 600 V +10 %	3 AC 660 V – 15 % to 690 V +15 %
Output voltage Converter	3 AC 0 V up to supply voltage	3 AC 0 V up to supply voltage	3 AC 0 V up to supply voltage
Rated frequency			
Supply frequency	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)	50/60 Hz (± 6 %)
Output frequency SIMOVERT Vector Control			
– *V/f* = constant	0 Hz to 200 Hz (textile to 500 Hz)	0 Hz to 200 Hz	0 Hz to 200 Hz
– *V* = constant	8 Hz to 300 Hz	8 Hz to 300 Hz	8 Hz to 300 Hz
Load class II to EN 60 146-1-1	See also Engineering Information, Section 6		
Base load current	0.91 x rated output current		
Short-time current	1.36 x rated output current during 60 s or 1.60 x rated output current during 30 s for units up to cabinet size E and a supply connection voltage of max. 600 V		
Cycle time	300 s		
Overload duration	60 s (20 % of the cycle time)		
Power factor[1]) • fundamental • overall	≥ 0.98 0.93 to 0.96		
Efficiency	0.97 to 0.98		

For reduction factors due to different installation conditions (installation altitude, temperature), see Engineering Information, Section 6.

Reduction curves



Maximum adjustable pulse frequency as a function of output:

16 kHz
for 45 kW; 55 kW; 380 V to 480 V
for 37 kW; 45 kW; 500 V to 600 V

9 kHz
for 75 kW; 90 kW; 380 V to 480 V
for 55 kW; 500 V to 600 V

7.5 kHz
for 110 kW; 132 kW; 380 V to 480 V
for 75 kW; 90 kW; 500 V to 600 V
for 55 kW to 110 kW; 660 V to 690 V

6 kHz
for 160 kW to 250 kW; 380 V to 480 V
for 110 kW to 160 kW; 500 V to 600 V
for 132 kW to 200 kW; 660 V to 690 V

2.5 kHz
for 315 kW to 710 kW; 380 V to 480 V
for 200 kW to 1100 kW; 500 V to 600 V
for 250 kW to 1500 kW; 660 V to 690 V

1) The values given for power factor apply to motor operation. In the case of regenerative operation they must be multiplied by factor 0.8.

6SE71 Converter Cabinet Units

Converter 37 kW to 1500 kW for four-quadrant operation, 6-pulse system

Cabinet units

Selection and ordering data

Nominal power rating	Rated output current	Base load current	Short-time current	Input current	Converter	Power loss at 2.5 kHz	Dimensions Frame measurements W x H x D	Dimension drawing, see Section 7	Weight approx.	Cooling-air requirement	Sound pressure level L_{pA} (1 m)
	I_{UN}	I_G	$I_{max.}$								
kW	A	A	A	A	Order No.	kW	mm	No.	kg	m³/s	dB
Supply voltage 3 AC 380 V to 480 V											
400 V											
45	92	84	126	101	**6SE7131–0EC61–4BA0**	1.6	900 x 2000 x 600	75	250	0.3	70
55	124	113	169	136	**6SE7131–2ED61–4BA0**	2.2	1200 x 2000 x 600	76	300	0.34	70
75	146	133	199	160	**6SE7131–5ED61–4BA0**	2.6	1200 x 2000 x 600	76	310	0.34	70
90	186	169	254	205	**6SE7131–8ED61–4BA0**	2.9	1200 x 2000 x 600	76	320	0.34	70
110	210	191	287	231	**6SE7 132–1EE61–4BA0**	3.3	1500 x 2000 x 600	77	420	0.51	80
132	260	237	355	286	**6SE7132–6EE61–4BA0**	4.1	1500 x 2000 x 600	77	430	0.51	80
160	315	287	430	346	**6SE7133–2EE61–4BA0**	5	1500 x 2000 x 600	77	450	0.51	80
200	370	337	503	407	**6SE7133–7EE61–4BA0**	5.9	1500 x 2000 x 600	77	500	0.51	80
250	510	464	694	561	**6SE7135–1EF62–4BA0**	8	2100 x 2000 x 600[3]	79	750	0.66	80
315	590	537	802	649	**6SE7136–0EG62–4BA0**	9.7	2100 x 2000 x 600[1]	80	750	0.66	85
400	690	628	938	759	**6SE7137–0EG62–4BA1**	12.1	2100 x 2000 x 600[1]	80	1280	1.15	85
500	860	782	1170	946	**6SE7138–6EG62–4BA0**	16.3	2100 x 2000 x 600[2]	81	1420	1.3	85
630	1100	1000	1496	1190	**6SE7141–1EH62–4BA0**	19	2400 x 2000 x 600[2]	82	1650	1.9	85
710	1300	1183	1768	1430	**6SE7141–3EJ62–4BA0**	21.3	2700 x 2000 x 600[2]	83	1850	1.9	85
Supply voltage 3 AC 500 V to 600 V											
500 V											
37	61	55	83	67	**6SE7126–1FC61–4BA0**	1.2	900 x 2000 x 600	75	250	0.3	70
45	66	60	90	73	**6SE7126–6FC61–4BA0**	1.3	900 x 2000 x 600	75	250	0.3	70
55	79	72	108	87	**6SE7128–0FD61–4BA0**	1.5	1200 x 2000 x 600	76	310	0.34	70
75	108	98	147	119	**6SE7131–1FD61–4BA0**	2.4	1200 x 2000 x 600	76	310	0.34	70
90	128	117	174	141	**6SE7131–3FE61–4BA0**	2.7	1500 x 2000 x 600	77	420	0.51	80
110	156	142	213	172	**6SE7131–6FE61–4BA0**	3.4	1500 x 2000 x 600	77	450	0.51	80
132	192	174	262	211	**6SE7132–0FE61–4BA0**	4.2	1500 x 2000 x 600	77	450	0.51	80
160	225	205	307	248	**6SE7132–3FE61–4BA0**	4.9	1500 x 2000 x 600	77	500	0.51	80
200	297	270	404	327	**6SE7133–0FF62–4BA0**	6.7	1800 x 2000 x 600	78	750	0.66	80
250	354	322	481	400	**6SE7133–5FF62–4BA0**	7.4	1800 x 2000 x 600	78	750	0.66	80
315	452	411	615	497	**6SE7134–5FF62–4BA0**	9.5	2100 x 2000 x 600[3]	79	750	0.66	80
400	570	519	775	627	**6SE7135–7FG62–4BA0**	12.6	2100 x 2000 x 600[2]	81	1420	1.3	85
450	650	592	884	715	**6SE7136–5FG62–4BA0**	13.9	2100 x 2000 x 600[2]	81	1420	1.3	85
630	860	783	1170	946	**6SE7138–6FG62–4BA0**	16.3	2100 x 2000 x 600[2]	81	1420	1.45	85
800	1080	983	1469	1188	**6SE7141–1FJ62–4BA0**	20.4	2700 x 2000 x 600[2]	83	1900	1.9	85
900	1230	1119	1673	1353	**6SE7141–2FJ62–4BA0**	23.4	2700 x 2000 x 600[2]	83	1900	1.9	85
					without interphase transformer chassis						
1000	1400	1274	1904	1540	**6SE7141–4FL62–4BA0**	26.8	3300 x 2000 x 600[2]	84	2400	2.7	88
1100	1580	1438	2149	1738	**6SE7141–6FL62–4BA0**	30.6	3300 x 2000 x 600[2]	84	2400	2.7	88
					with interphase transformer chassis						
1000	1400	1274	1904	1540	**6SE7141–4FN62–4BA0**	27.8	3900 x 2000 x 600[2]	85	2600	2.7	88
1100	1580	1438	2149	1738	**6SE7141–6FN62–4BA0**	31.6	3900 x 2000 x 600[2]	85	2600	2.7	88

1) Dimensions for optional cabinet with autotransformer (25 % power-on duration): width 600 mm.

2) Dimensions for optional cabinet with autotransformer (25 % power-on duration): width 900 mm.

3) Dimensions for optional cabinet expansion with autotransformer (25 % power-on duration): width plus 300 mm.

Cabinet units

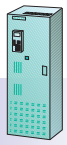
Converter 37 kW to 1500 kW for four-quadrant operation, 6-pulse system

Supply connection (connecting lugs, bottom)							Motor connection (connecting lugs, bottom)					
Recommended cross-section		Maximum cable cross-section		Terminal screws		Recommended supply-cable fuses	Recommended cross-section		Maximum cable cross-section		Terminal screws	
DIN VDE mm²	AWG/ MCM	Standard mm²	Option	Standard	Option	gL NH Type	DIN VDE mm²	AWG/ MCM	Standard mm²	Option	Standard	Option
35	0	150	2 x 240	M 10	M 12	3NA3 830 (100)	35	0	2 x 70	2 x 240	M 10	M 12
70	(000)	150	2 x 240	M 10	M 12	3NA3 136 (160)	70	(000)	2 x 70	2 x 240	M 10	M 12
70	(000)	150	2 x 240	M 10	M 12	3NA3 136 (160)	70	(000)	2 x 70	2 x 240	M 10	M 12
95	(4/0)	150	2 x 240	M 10	M 12	3NA3 140 (200)	95	(4/0)	2 x 70	2 x 240	M 10	M 12
120	(300)	150	2 x 240	M 10	M 12	3NA3 144 (250)	120	(300)	2 x 150	2 x 240	M 12	–
2 x 70	2 x (000)	2 x 150	2 x 240	M 10	M 12	3NA3 252 (315)	2 x 70	2 x (000)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 260 (400)	2 x 95	2 x (4/0)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 260 (400)	2 x 95	2 x (4/0)	2 x 150	2 x 240	M 12	–
2 x 150	2 x (400)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 150	2 x (400)	4 x 240	–	M 12/16	–
2 x 185	2 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 185	2 x (500)	4 x 240	–	M 12/16	–
2 x 240	2 x 600	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 240	2 x 600	4 x 240	–	M 12/16	–
3 x 185	3 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	–	M 12/16	–
4 x 185	4 x (500)	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 185	4 x (500)	4 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	–	M 12/16	–
25	2	150	2 x 240	M 10	M 12	3NA3 824 (80)	25	2	2 x 70	2 x 240	M 10	M 12
35	0	150	2 x 240	M 10	M 12	3NA3 830 (100)	35	0	2 x 70	2 x 240	M 10	M 12
35	0	150	2 x 240	M 10	M 12	3NA3 830 (100)	35	0	2 x 70	2 x 240	M 10	M 12
50	(00)	150	2 x 240	M 10	M 12	3NA3 132 (125)	50	(00)	2 x 70	2 x 240	M 10	M 12
70	(000)	150	2 x 240	M 10	M 12	3NA3 136 (160)	70	(000)	2 x 150	2 x 240	M 12	–
95	(4/0)	150	2 x 240	M 10	M 12	3NA3 140 (200)	95	(4/0)	2 x 150	2 x 240	M 12	–
120	(300)	150	2 x 240	M 10	M 12	3NA3 144 (250)	120	(300)	2 x 150	2 x 240	M 12	–
120	(300)	150	2 x 240	M 10	M 12	3NA3 144 (250)	120	(300)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 260 (400)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 360 (500)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 120	2 x (300)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 120	2 x (300)	4 x 240	–	M 12/16	–
2 x 185	2 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 185	2 x (500)	4 x 240	–	M 12/16	–
2 x 240	2 x 600	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 240	2 x 600	4 x 240	–	M 12/16	–
3 x 185	3 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	–	M 12/16	–
4 x 185	4 x (500)	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 185	4 x (500)	6 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	2 x 4 x 300	–	M 12/16	–
4 x 300	4 x 800	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 300	4 x 800	2 x 4 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	8 x 300	–	M 12/16	–
4 x 300	4 x 800	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 300	4 x 800	8 x 300	–	M 12/16	–

4

6SE71 Converter Cabinet Units

Converter 37 kW to 1500 kW for four-quadrant operation, 6-pulse system



Cabinet units

Selection and ordering data

Nominal power rating	Rated output current	Base load current	Short-time current	Input current	Converter	Power loss at 2.5 kHz	Dimensions Frame measurements W x H x D	Dimension drawing, see Section 7	Weight approx.	Cooling-air requirement	Sound pressure level L_{pA} (1 m)
	I_{UN}	I_G	$I_{max.}$								
kW	A	A	A	A	Order No.	kW	mm	No.	kg	m³/s	dB
Supply voltage 3 AC 660 V to 690 V											
690 V											
55	60	55	82	66	**6SE7126–0HD61–4BA0**	1.4	1200 x 2000 x 600	76	300	0.34	70
75	82	75	112	90	**6SE7128–2HD61–4BA0**	2	1200 x 2000 x 600	76	310	0.34	70
90	97	88	132	107	**6SE7131–0HE61–4BA0**	2.5	1500 x 2000 x 600	77	420	0.51	80
110	118	107	161	130	**6SE7131–2HE61–4BA0**	3.1	1500 x 2000 x 600	77	420	0.51	80
132	145	132	198	160	**6SE7131–5HE61–4BA0**	3.8	1500 x 2000 x 600	77	430	0.51	80
160	171	156	233	188	**6SE7131–7HE61–4BA0**	4.7	1500 x 2000 x 600	77	450	0.51	80
200	208	189	284	229	**6SE7132–1HE61–4BA0**	5.3	1500 x 2000 x 600	77	500	0.51	80
250	297	270	404	327	**6SE7133–0HF62–4BA0**	7.5	2100 x 2000 x 600[2]	79	750	0.66	80
315	354	322	481	400	**6SE7133–5HF62–4BA0**	8.4	2100 x 2000 x 600[2]	79	750	0.66	80
400	452	411	615	497	**6SE7134–5HF62–4BA0**	10.3	2100 x 2000 x 600[2]	79	750	0.66	80
500	570	519	775	627	**6SE7135–7HG62–4BA0**	12.8	2100 x 2000 x 600[1]	81	1420	1.45	85
630	650	592	884	715	**6SE7136–5HG62–4BA0**	15.3	2100 x 2000 x 600[1]	81	1420	1.45	85
800	860	783	1170	946	**6SE7138–5HG62–4BA0**	18.9	2100 x 2000 x 600[1]	81	1420	1.45	85
1000	1080	983	1469	1188	**6SE7141–1HJ62–4BA0**	23.7	2700 x 2000 x 600[1]	83	1900	1.9	85
1200	1230	1119	1673	1353	**6SE7141–2HJ62–4BA0**	30	2700 x 2000 x 600[1]	83	1900	1.9	85
					without interphase transformer chassis						
1300	1400	1274	1904	1540	**6SE7141–4HL62–4BA0**	30.3	3300 x 2000 x 600[1]	84	2400	3.1	88
1500	1580	1438	2149	1738	**6SE7141–6HL62–4BA0**	34.4	3300 x 2000 x 600[1]	84	2400	3.1	88
					with interphase transformer chassis						
1300	1400	1274	1904	1540	**6SE7141–4HN62–4BA0**	31.3	3900 x 2000 x 600[1]	85	2600	3.1	88
1500	1580	1438	2149	1738	**6SE7141–6HN62–4BA0**	35.4	3900 x 2000 x 600[1]	85	2600	3.1	88

1) Dimensions for optional cabinet with autotransformer (25 % power-on duration): width 900 mm.

2) Dimensions for optional cabinet expansion with autotransformer (25 % power-on duration): width plus 300 mm.

Cabinet units

Converter 37 kW to 1500 kW for four-quadrant operation, 6-pulse system

Supply connection (connecting lugs, bottom)							Motor connection (connecting lugs, bottom)					
Recommended cross-section		Maximum cable cross-section		Terminal screws		Recommended supply-cable fuses	Recommended cross-section		Maximum cable cross-section		Terminal screws	
DIN VDE mm²	AWG/ MCM	Standard mm²	Option	Standard	Option	gL NH Type	DIN VDE mm²	AWG/ MCM	Standard mm²	Option	Standard	Option
25	2	150	2 x 240	M 10	M 12	3NA3 824–6 (80)	25	2	2 x 70	2 x 240	M 10	M 12
35	0	150	2 x 240	M 10	M 12	3NA3 830–6 (100)	35	0	2 x 70	2 x 240	M 10	M 12
50	(00)	150	2 x 240	M 10	M 12	3NA3 132–6 (125)	50	(00)	2 x 150	2 x 240	M 12	–
70	(000)	150	2 x 240	M 10	M 12	3NA3 136–6 (160)	70	(000)	2 x 150	2 x 240	M 12	–
70	(000)	150	2 x 240	M 10	M 12	3NA3 136–6 (160)	70	(000)	2 x 150	2 x 240	M 12	–
95	(4/0)	150	2 x 240	M 10	M 12	3NA3 240–6 (200)	95	(4/0)	2 x 150	2 x 240	M 12	–
120	(300)	150	2 x 240	M 10	M 12	3NA3 244–6 (250)	120	(300)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 360–6 (400)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 365–6 (500)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 120	2 x (300)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 120	2 x (300)	4 x 240	–	M 12/16	–
2 x 185	2 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 185	2 x (500)	4 x 240	–	M 12/16	–
2 x 240	2 x 600	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 240	2 x 600	4 x 240	–	M 12/16	–
3 x 185	3 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	–	M 12/16	–
4 x 185	4 x (500)	10 x 300	–	M 12	–	Protective circuit-breaker	4 x 185	4 x (500)	6 x 300	–	M 12/16	–
4 x 240	4 x 600	10 x 300	–	M 12	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	2 x 4 x 300	–	M 12/16	–
4 x 300	4 x 800	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 300	4 x 800	2 x 4 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	8 x 300	–	M 12/16	–
4 x 300	4 x 800	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 300	4 x 800	8 x 300	–	M 12/16	–

Technical characteristics

The ready-to-connect converters with pulsed rectifier/regenerative units can be connected to three-phase AC systems in voltage ranges from 3 AC 380V to 690 V, 50/60 Hz. The output range is from 37 kW to 1200 kW.

Due to a modular design, the base version of the units can be expanded to include additional functions.

The base version consists of:

- System cabinet
- Main switch with fuses for cable protection/semiconductor protection
- Main contactor
- Precharge circuit
- Clean Power Filter
- Control power supply
- Supply-side inverter
- Motor-side inverter
- PMU parameterizing unit mounted in the door.

The additional items (options) for expanding the base version consist of mechanical and electrical system components which – depending on the respective application – can be ordered additionally. Options are listed from page 4/26 onwards.

Examples of options:

- Supply connecting panel
- Control terminal strips
- Motor connecting panel
- User-friendly OP1S operator control panel
- Increased type of protection.

Output ratings higher than those indicated in the following selection tables, can be supplied on request.

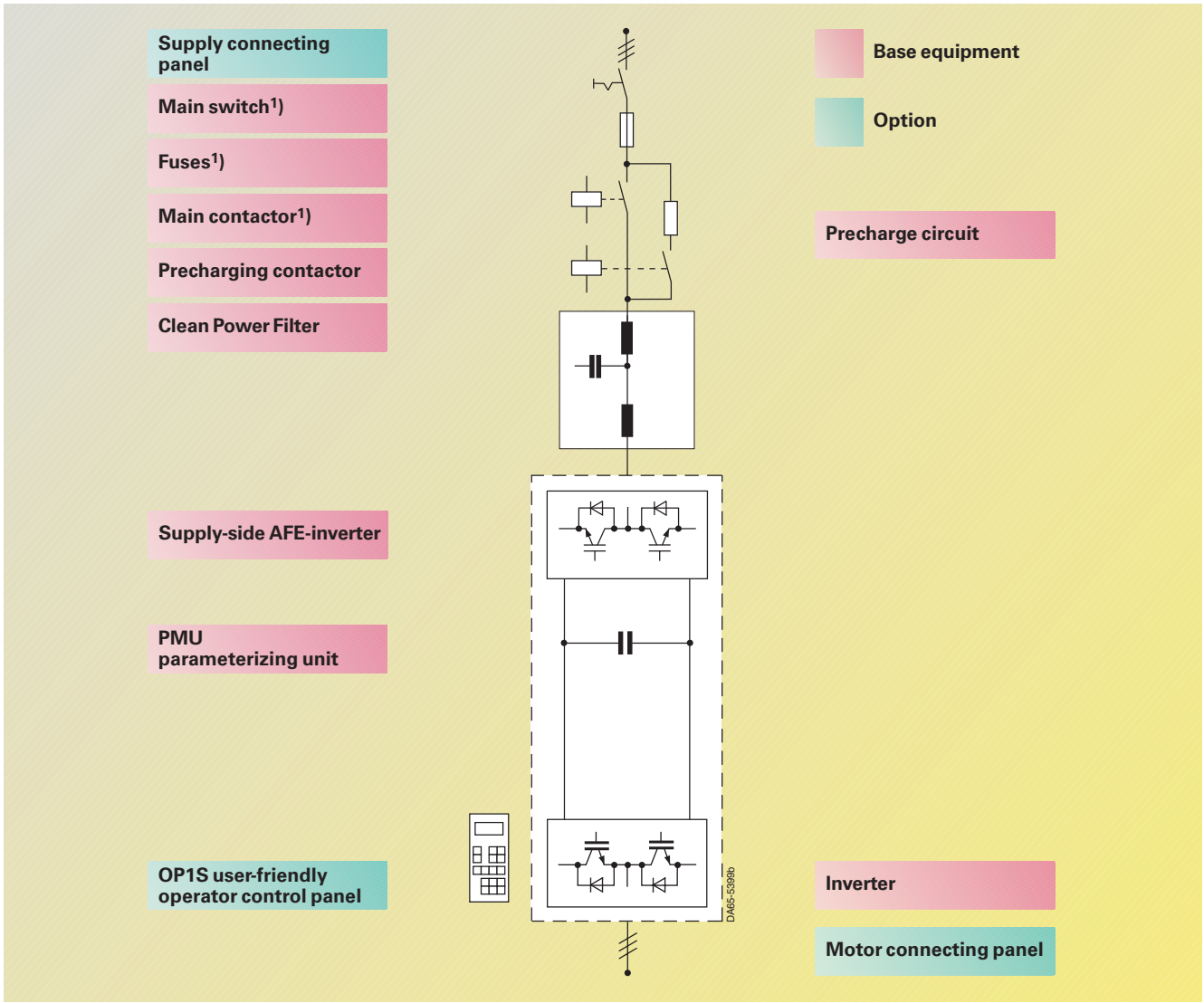


Fig. 4/5
Block diagram

1) The functions of main switch, fuses and main contactor are implemented as standard with a circuit breaker 3WN6 and additional control voltage switch for:
630 kW, 710 kW at 380 V to 460 V,
800 kW to 900 kW at 480 V to 575 V,
1000 kW to 1200 kW at 660 V to 690 V

Cabinet units

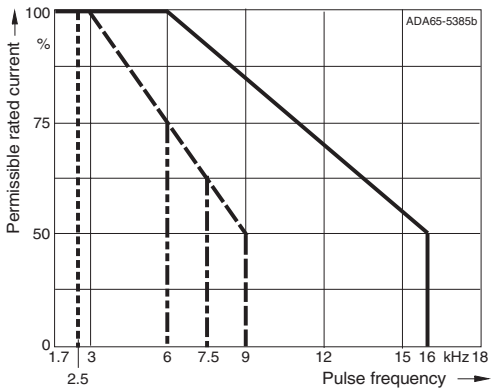
Converter 37 kW to 1200 kW, with AFE self-commutated, pulsed rectifier/regenerative unit

Technical data

Rated voltage			
Supply voltage[1)]	3 AC 380 V – 15 % to 460 V +5 %	3 AC 480 V – 15 % to 575 V +5 %	3 AC 660 V – 15 % to 690 V +5 %
Output voltage	3 AC 0 V up to supply voltage	3 AC 0 V up to supply voltage	3 AC 0 V up to supply voltage
Rated frequency			
Supply frequency	50/60 Hz (± 10 %)	50/60 Hz (± 10 %)	50/60 Hz (± 10 %)
Output frequency SIMOVERT Vector Control			
– V/f = constant	0 Hz to 200 Hz (textile to 500 Hz)	0 Hz to 200 Hz	0 Hz to 200 Hz
– V = constant	8 Hz to 300 Hz	8 Hz to 300 Hz	8 Hz to 300 Hz
Load class II to EN 60 146-1-1	See also Engineering Information, Section 6		
Base load current	0.91 x rated output current		
Short-time current	1.36 x rated output current during 60 s or 1.60 x rated output current during 30 s for units up to cabinet size F and supply connection voltage of max. 575 V		
Cycle time	300 s		
Overload duration	60 s (20 % of the cycle time)		
Power factor • fundamental • overall	Parameter programmable (factory setting) 0.8 ind. ≤ cos φ ≥ 0.8 cap.		
Efficiency	0.97 to 0.98		

For reduction factors due to different installation conditions (installation altitude, temperature), see Engineering Information, Section 6.

Reduction curves for the motor-side inverter



Maximum adjustable pulse frequency as a function of output:

16 kHz
for 45 kW; 55 kW; 380 V to 480 V
for 37 kW; 45 kW; 500 V to 600 V

9 kHz
for 75 kW; 90 kW; 380 V to 480 V
for 55 kW; 500 V to 600 V

7.5 kHz
for 110 kW; 132 kW; 380 V to 480 V
for 75 kW; 90 kW; 500 V to 600 V
for 55 kW to 110 kW; 660 V to 690 V

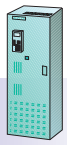
6 kHz
for 160 kW to 250 kW; 380 V to 480 V
for 110 kW to 160 kW; 500 V to 600 V
for 132 kW to 200 kW; 660 V to 690 V

2.5 kHz
for 315 kW to 710 kW; 380 V to 480 V
for 200 kW to 1100 kW; 500 V to 600 V
for 250 kW to 1200 kW; 660 V to 690 V

1) If, in regenerating mode, the line voltage is higher than permissible, an autotransformer should be used to adjust the rated line voltage so that the maximum line voltage occurring does not exceed the permissible tolerances.

6SE71 Converter Cabinet Units

Converter 37 kW to 1200 kW, with AFE self-commutated, pulsed rectifier/regenerative unit



Selection and ordering data

Nominal power rating	Rated output current	Base load current	Short-time current	Rated input current	Converter with AFE	Power loss at 3 kHz	Dimensions Frame measurements W x H x D	Dimension drawing see Section 7	Weight approx.	Cooling-air requirement	Sound pressure level L_{pA} (1 m)
	I_{UN}	I_G	$I_{max.}$								
kW	A	A	A	A	Order No.	kW	mm		kg	m³/s	dB
Supply voltage 3 AC 380 V to 460 V											
400 V											
45	92	84	126	92	**6SE7131–0EC61–5BA0**	2.8	900 x 2000 x 600 [1]	86	400	0.3	73
55	124	113	169	124	**6SE7131–2EE61–5BA0**	3.5	1500 x 2000 x 600	87	600	0.51	73
75	146	133	199	146	**6SE7131–5EE61–5BA0**	4.1	1500 x 2000 x 600	87	600	0.51	73
90	186	169	254	186	**6SE7131–8EE61–5BA0**	4.4	1500 x 2000 x 600 [2]	87	620	0.51	73
110	210	191	287	210	**6SE7 132–1EF61–5BA0**	5.7	1800 x 2000 x 600	88	900	0.66	83
132	260	237	355	260	**6SE7132–6EF61–5BA0**	7.1	1800 x 2000 x 600	88	920	0.66	83
160	315	287	430	315	**6SE7133–2EF61–5BA0**	8.7	1800 x 2000 x 600	88	940	0.82	83
200	370	337	503	370	**6SE7133–7EF61–5BA0**	10.3	1800 x 2000 x 600 [1]	88	950	0.82	83
250	510	464	694	510	**6SE7135–1EH62–5BA0**	14.3	2400 x 2000 x 600 [1]	89	1500	1.15	83
315	590	537	802	560	**6SE7136–0EK62–5BA0**	16	3000 x 2000 x 600	90	1600	1.3	88
400	690	628	938	655	**6SE7137–0EK62–5BA0**	20	3000 x 2000 x 600	90	1700	1.45	88
500	860	782	1170	817	**6SE7138–6EK62–5BA0**	28.4	3000 x 2000 x 600 [2]	92	2300	1.9	88
630	1100	1000	1496	1045	**6SE7141–1EL62–5BA0**	31.7	3300 x 2000 x 600 [1]	91	2400	2.7	88
710	1300	1183	1768	1235	**6SE7141–3EM62–5BA0**	34.5	3600 x 2000 x 600	93	3300	2.7	88
Supply voltage 3 AC 480 V to 575 V											
500 V											
37	61	55	83	61	**6SE7126–1FC61–5BA0**	1.9	900 x 2000 x 600	86	380	0.3	73
45	66	60	90	66	**6SE7126–6FC61–5BA0**	2.2	900 x 2000 x 600 [1]	86	390	0.34	73
55	79	72	108	79	**6SE7128–0FE61–5BA0**	2.6	1500 x 2000 x 600	87	580	0.51	73
75	108	98	147	108	**6SE7131–1FE61–5BA0**	3.7	1500 x 2000 x 600 [2]	87	590	0.51	73
90	128	117	174	128	**6SE7131–3FF61–5BA0**	4.4	1800 x 2000 x 600	88	900	0.66	83
110	156	142	213	156	**6SE7131–6FF61–5BA0**	5.4	1800 x 2000 x 600	88	910	0.66	83
132	192	174	262	192	**6SE7132–0FF61–5BA0**	6.8	1800 x 2000 x 600	88	910	0.66	83
160	225	205	307	225	**6SE7132–3FF61–5BA0**	8.2	1800 x 2000 x 600 [1]	88	920	0.82	83
200	297	270	404	297	**6SE7133–0FH62–5BA0**	11.9	2400 x 2000 x 600 [1]	89	1300	1.15	83
250	354	322	481	354	**6SE7133–5FK62–5BA0**	13.3	3000 x 2000 x 600	90	1450	1.15	83
315	452	411	615	429	**6SE7134–5FK62–5BA0**	16.5	3000 x 2000 x 600	90	1500	1.3	83
400	570	519	775	541	**6SE7135–7FK62–5BA0**	21	3000 x 2000 x 600	92	2150	1.45	88
450	650	592	884	617	**6SE7136–5FK62–5BA0**	23.6	3000 x 2000 x 600	92	2200	1.9	88
630	860	783	1170	817	**6SE7138–6FK62–5BA0**	27.5	3000 x 2000 x 600 [1]	92	2300	1.9	88
800	1080	983	1469	1026	**6SE7141–1FM62–5BA0**	33.3	3600 x 2000 x 600	93	3300	2.7	88
900	1230	1119	1673	1168	**6SE7141–2FM62–5BA0**	39.1	3600 x 2000 x 600	93	3350	2.7	88

1) Achieved reduction of cabinet width with option X39: 600 mm (see page 4/43).

2) Achieved reduction of cabinet width with option X39: 300 mm (see page 4/43).

Supply connection (connecting lugs, bottom)							Motor connection (connecting lugs, bottom)					
Recommended cross-section		Maximum cable cross-section		Terminal screws		Recommended supply-cable fuses	Recommended cross-section		Maximum cable cross-section		Terminal screws	
DIN VDE mm²	AWG/ MCM	Standard mm²	Option	Standard	Option	gL NH Type	DIN VDE mm²	AWG/ MCM	Standard mm²	Option	Standard	Option
35	0	70	2 x 240	M 6	M 12	3NA3 830 (100)	35	0	2 x 70	2 x 240	M 10	M 12
70	(000)	150	2 x 240	M 10	M 12	3NA3 136 (160)	70	(000)	2 x 70	2 x 240	M 10	M 12
70	(000)	150	2 x 240	M 10	M 12	3NA3 136 (160)	70	(000)	2 x 70	2 x 240	M 10	M 12
95	(4/0)	150	2 x 240	M 10	M 12	3NA3 140 (200)	95	(4/0)	2 x 70	2 x 240	M 10	M 12
120	(300)	150	2 x 240	M 10	M 12	3NA3 144 (250)	120	(300)	2 x 150	2 x 240	M 12	–
2 x 70	2 x (000)	2 x 150	2 x 240	M 10	M 12	3NA3 252 (315)	2 x 70	2 x (000)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 260 (400)	2 x 95	2 x (4/0)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 260 (400)	2 x 95	2 x (4/0)	2 x 150	2 x 240	M 12	–
2 x 150	2 x (400)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 150	2 x (400)	4 x 240	–	M 12/16	–
2 x 185	2 x (500)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 185	2 x (500)	4 x 240	–	M 12/16	–
2 x 240	2 x 600	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 240	2 x 600	4 x 240	–	M 12/16	–
3 x 185	3 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	–	M 12/16	–
4 x 185	4 x (500)	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 185	4 x (500)	4 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	–	M 12/16	–
25	2	70	2 x 240	M 6	M 12	3NA3 824 (80)	25	2	2 x 70	2 x 240	M 10	M 12
35	0	70	2 x 240	M 6	M 12	3NA3 830 (100)	35	0	2 x 70	2 x 240	M 10	M 12
35	0	70	2 x 240	M 6	M 12	3NA3 830 (100)	35	0	2 x 70	2 x 240	M 10	M 12
50	(00)	70	2 x 240	M 6	M 12	3NA3 132 (125)	50	(00)	2 x 70	2 x 240	M 10	M 12
70	(000)	150	2 x 240	M 10	M 12	3NA3 136 (160)	70	(000)	2 x 150	2 x 240	M 12	–
95	(4/0)	150	2 x 240	M 10	M 12	3NA3 140 (200)	95	(4/0)	2 x 150	2 x 240	M 12	–
120	(300)	150	2 x 240	M 10	M 12	3NA3 144 (250)	120	(300)	2 x 150	2 x 240	M 12	–
120	(300)	150	2 x 240	M 10	M 12	3NA3 144 (250)	120	(300)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 260 (400)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 360 (500)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 120	2 x (300)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 120	2 x (300)	4 x 240	–	M 12/16	–
2 x 185	2 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 185	2 x (500)	4 x 240	–	M 12/16	–
2 x 240	2 x 600	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 240	2 x 600	4 x 240	–	M 12/16	–
3 x 185	3 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	–	M 12/16	–
4 x 185	4 x (500)	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 185	4 x (500)	6 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	–	M 12/16	–

6SE71 Converter Cabinet Units

Converter 37 kW to 1200 kW, with AFE self-commutated, pulsed rectifier/regenerative unit

Selection and ordering data

Nominal power rating	Rated output current	Base load current	Short-time current	Rated input current	Converter with AFE	Power loss at 3 kHz	Dimensions Frame measurements W x H x D	Dimension drawing see Section 7	Weight approx.	Cooling-air requirement	Sound pressure level L_{pA} (1 m)
	I_{UN}	I_G	$I_{max.}$								
kW	A	A	A	A	Order No.	kW	mm		kg	m^3/s	dB
Supply voltage 3 AC 660 V to 690 V											
690 V											
55	60	55	82	60	**6SE7126–0HE61–5BA0**	2.3	1500 x 2000 x 600	87	380	0.34	73
75	82	75	112	82	**6SE7128–2HE61–5BA0**	3.1	1500 x 2000 x 600	87	380	0.51	73
90	97	88	132	97	**6SE7131–0HF61–5BA0**	4.1	1800 x 2000 x 600 [2]	88	800	0.66	83
110	118	107	161	118	**6SE7131–2HF61–5BA0**	4.9	1800 x 2000 x 600	88	810	0.66	83
132	145	132	198	145	**6SE7131–5HF61–5BA0**	5.9	1800 x 2000 x 600	88	880	0.66	83
160	171	156	233	171	**6SE7131–7HF61–5BA0**	7.3	1800 x 2000 x 600	88	900	0.82	83
200	208	189	284	208	**6SE7132–1HF61–5BA0**	8.9	1800 x 2000 x 600 [1]	88	1200	0.82	83
250	297	270	404	267	**6SE7133–0HH62–5BA0**	14.1	2400 x 2000 x 600 [1]	89	1250	1.15	83
315	354	322	481	319	**6SE7133–5HK62–5BA0**	15.3	3000 x 2000 x 600	90	1450	1.3	83
400	452	411	615	407	**6SE7134–5HK62–5BA0**	18.8	3000 x 2000 x 600	90	1600	1.45	83
500	570	519	775	513	**6SE7135–7HK62–5BA0**	22.9	3000 x 2000 x 600	92	2300	1.9	88
630	650	592	884	585	**6SE7136–5HK62–5BA0**	26.4	3000 x 2000 x 600	92	2400	1.9	88
800	860	783	1170	774	**6SE7138–6HK62–5BA0**	32.8	3000 x 2000 x 600 [1]	92	2450	2.7	88
1000	1080	983	1469	972	**6SE7141–1HM62–5BA0**	40.4	3600 x 2000 x 600	93	3400	2.7	88
1200	1230	1119	1673	1107	**6SE7141–2HM62–5BA0**	52.5	3600 x 2000 x 600	93	3450	2.7	88

1) Achieved reduction of cabinet width with option X39: 600 mm (see page 4/43).

2) Achieved reduction of cabinet width with option X39: 300 mm (see page 4/43).

Supply connection (connecting lugs, bottom)							Motor connection (connecting lugs, bottom)					
Recommended cross-section		Maximum cable cross-section		Terminal screws		Recommended supply-cable fuses	Recommended cross-section		Maximum cable cross-section		Terminal screws	
DIN VDE	AWG/ MCM	Standard	Option	Standard	Option	gL NH	DIN VDE	AWG/ MCM	Standard	Option	Standard	Option
mm^2		mm^2				Type	mm^2		mm^2			
25	2	70	2 x 240	M 6	M 12	3NA3 824–6 (80)	25	2	2 x 70	2 x 240	M 10	M 12
35	0	70	2 x 240	M 6	M 12	3NA3 830–6 (100)	35	0	2 x 70	2 x 240	M 10	M 12
50	(00)	70	2 x 240	M 6	M 12	3NA3 132–6 (125)	50	(00)	2 x 150	2 x 240	M 12	–
70	(000)	150	2 x 240	M 10	M 12	3NA3 136–6 (160)	70	(000)	2 x 150	2 x 240	M 12	–
70	(000)	150	2 x 240	M 10	M 12	3NA3 136–6 (160)	70	(000)	2 x 150	2 x 240	M 12	–
95	(4/0)	150	2 x 240	M 10	M 12	3NA3 240–6 (200)	95	(4/0)	2 x 150	2 x 240	M 12	–
120	(300)	150	2 x 240	M 10	M 12	3NA3 244–6 (250)	120	(300)	2 x 150	2 x 240	M 12	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 360–6 (400)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 95	2 x (4/0)	2 x 150	2 x 240	M 10	M 12	3NA3 365–6 (500)	2 x 95	2 x (4/0)	4 x 240	–	M 12/16	–
2 x 120	2 x (300)	2 x 240	4 x 240	M 12	–	Protective circuit-breaker	2 x 120	2 x (300)	4 x 240	–	M 12/16	–
2 x 185	2 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 185	2 x (500)	4 x 240	–	M 12/16	–
2 x 240	2 x 600	4 x 240	–	M 12	–	Protective circuit-breaker	2 x 240	2 x 600	4 x 240	–	M 12/16	–
3 x 185	3 x (500)	4 x 240	–	M 12	–	Protective circuit-breaker	3 x 185	3 x (500)	4 x 240	–	M 12/16	–
4 x 185	4 x (500)	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 185	4 x (500)	6 x 300	–	M 12/16	–
4 x 240	4 x 600	8 x 300	–	M 16	–	Protective circuit-breaker	4 x 240	4 x 600	6 x 300	–	M 12/16	–

Options for the cabinet units

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements[1]	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Operator control panels + adapter boards							
K08	With OP1S operator control panel mounted in cabinet door	–	●	●	●	●	
S72	Display on the OP1S operator control panel in Italian	K08	●	●	●	●	
S76	Display on the OP1S operator control panel in English	K08	●	●	●	●	
S77	Display on the OP1S operator control panel in French	K08	●	●	●	●	
S78	Display on the OP1S operator control panel in Spanish	K08	●	●	●	●	
K11	Local bus adapter (LBA) for the electronics box	–	●	●	●	●	
K01	Adapter board Plugged into position 2 (slots D – E)	K11	●	●	●	●	
K02	Adapter board Plugged into position 3 (slots F – G)	K11	●	●	●	●	
Technology boards							
K12	Technology board T300	K11 + K13	●	●	●	■[3]	
K16	Technology board T100	K11 + B10	●	●	●	■[3]	
K13	SE300 terminal block for T300 technology board, with SC58 cable (40-pole, for analog and pulse encoder signals) and SC60 cable (34-pole)	K11 + K12 + K73[2]	●	●	●	■[3]	
K30	TSY digital tachometer and synchronizing board	K11	●	●	●	■[3]	
Software modules for technology boards							
B10	Standard software package for universal drive on MS100 memory module, for T100 technology board	K16	●	●	●	●	
B30	Empty MS300 memory module for T300 technology board; 2 kByte EEPROM	K12	●	●	●	●	
B32	Standard software package for axial winder on MS320 memory module, for T300 technology board	K12	●	●	●	●	
B34	Standard software package for angular synchronous control on MS340 memory module, for T300 technology board	K12	●	●	●	●	
B36	Standard software package for multi-motor drive on MS360 memory module, for T300 technology board	K12	●	●	●	●	
B38	Standard software package for closed-loop positioning control on MS380 memory module, for T300 technology board	K12	●	●	●	●	

● Option available ■ On request

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1) The supplementary order codes indicated in this column must be specified for the selected option. Each option only needs to be ordered once even if it is specified several times in the table.

2) Options required in the case of converters for single-quadrant operation, 6-pulse;
45 kW to 400 kW, 380 V to 480 V
37 kW to 315 kW, 500 V to 600 V
55 kW to 400 kW, 660 V to 690 V.

3) Option for AFE converters available upon request.

Cabinet units

Options for the cabinet units

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements[1]	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Incremental encoder board							
C11	SBP incremental encoder board Plugged into slot A	–	●	●	●	●	
C13	SBP incremental encoder board Plugged into slot C	–	●	●	●	●	
C14	SBP incremental encoder board Plugged into slot D	K11 + K01	●	●	●	●	
C15	SBP incremental encoder board Plugged into slot E	K11 + K01	●	●	●	●	
C16	SBP incremental encoder board Plugged into slot F	K11 + K02	●	●	●	●	
C17	SBP incremental encoder board Plugged into slot G	K11 + K02	●	●	●	●	
Expansion boards							
G61	EB1 expansion board Plugged into slot A	–	●	●	●	■[2]	
G63	EB1 expansion board Plugged into slot C	–	●	●	●	■[2]	
G64	EB1 expansion board Plugged into slot D	K11 + K01	●	●	●	■[2]	
G65	EB1 expansion board Plugged into slot E	K11 + K01	●	●	●	■[2]	
G66	EB1 expansion board Plugged into slot F	K11 + K02	●	●	●	■[2]	
G67	EB1 expansion board Plugged into slot G	K11 + K02	●	●	●	■[2]	
G71	EB2 expansion board Plugged into slot A	–	●	●	●	■[2]	
G73	EB2 expansion board Plugged into slot C	–	●	●	●	■[2]	
G74	EB2 expansion board Plugged into slot D	K11 + K01	●	●	●	■[2]	
G75	EB2 expansion board Plugged into slot E	K11 + K01	●	●	●	■[2]	
G76	EB2 expansion board Plugged into slot F	K11 + K02	●	●	●	■[2]	
G77	EB2 expansion board Plugged into slot G	K11 + K02	●	●	●	■[2]	

● Option available ■ On request

1) The supplementary order codes indicated in this column must be specified for the selected option. Each option only needs to be ordered once even if it is specified several times in the table.

2) Option for AFE converters available upon request.

Options for the cabinet units

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements[1]	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Interface boards and auxiliary power supply units							
K20	SCB1 serial interface board for peer-to-peer protocol via fiber-optic cables or for connecting SCI1 or SCI2 interface boards	K11	●	●	●	■[4]	
K21	SCB2 serial interface board for peer-to-peer protocol or USS protocol, max. baud rate 187.5 Kbit/s, for RS485 interface	K11	●	●	●	■[4]	
K41	SC11 serial input/output board (1 x) for analog and binary signals with a 24 V DC power supply and protective separation from the base unit electronics	K11 + K20 + ext. 230 V AC or K74[2]	●	●	●	■[4]	
K42	SC11 serial input/output board (2 x) for analog and binary signals with a 24 V DC power supply and protective separation from the base unit electronics	K11 + K20 + ext. 230 V AC or K74[2]	●	●	●	■[4]	
K50	DTI digital tachometer interface board	K73[2]	●	●	●	●	
K51	DTI digital tachometer interface board for T300 technology board	K11 + K12 + K73[2]	●	●	●	●	
K60	ATI analog tachometer interface board	L42	●	●	●	●	
K73	Auxiliary power supply unit for the electronics and options Input: 230 V AC, Output: 24 V DC	ext. 230 V AC or K74[2]	●[3]	Standard	Standard	Standard	
K74	Auxiliary power supply unit Input: 3 AC 380 V to 690 V, 50/60 Hz derived from main supply Output: 230 V AC, 50/60 Hz	–	●[3]	Standard	Standard	Standard	

● Option available ■ On request

1) The supplementary order codes indicated in this column must be specified for the selected option. Each option only needs to be ordered once even if it is specified several times in the table.

2) Options required in the case of converters for single-quadrant operation, 6-pulse;
45 kW to 400 kW, 380 V to 480 V
37 kW to 315 kW, 500 V to 600 V
55 kW to 400 kW, 660 V to 690 V.

3) Option possible only in the case of converters for single-quadrant operation, 6-pulse,
45 kW to 400 kW, 380 V to 480 V
37 kW to 315 kW, 500 V to 600 V
55 kW to 400 kW, 660 V to 690 V.
For other outputs: standard.

4) Option for AFE converters available upon request.

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements[1]	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Communication boards							
G21	CBC communication board for CAN bus Plugged into slot A	–	●	●	●	■[2]	
G23	CBC communication board for CAN bus Plugged into slot C	–	●	●	●	■[2]	
G24	CBC communication board for CAN bus Plugged into slot D	K11 + K01	●	●	●	■[2]	
G25	CBC communication board for CAN bus Plugged into slot E	K11 + K01	●	●	●	■[2]	
G26	CBC communication board for CAN bus Plugged into slot F	K11 + K01	●	●	●	■[2]	
G27	CBC communication board for CAN bus Plugged into slot G	K11 + K02	●	●	●	■[2]	
G41	SLB communication board for SIMOLINK Plugged into slot A	–	●	●	●	■[2]	
G43	SLB communication board for SIMOLINK Plugged into slot C	–	●	●	●	■[2]	
G44	SLB communication board for SIMOLINK Plugged into slot D	K11 + K01	●	●	●	■[2]	
G45	SLB communication board for SIMOLINK Plugged into slot E	K11 + K01	●	●	●	■[2]	
G46	SLB communication board for SIMOLINK Plugged into slot F	K11 + K02	●	●	●	■[2]	
G47	SLB communication board for SIMOLINK Plugged into slot G	K11 + K02	●	●	●	■[2]	
G91	CBP2 communication board for PROFIBUS DP Plugged into slot A	–	●	●	●	■[2]	
G93	CBP2 communication board for PROFIBUS DP Plugged into slot C	–	●	●	●	■[2]	
G94	CBP2 communication board for PROFIBUS DP Plugged into slot D	K11 + K01	●	●	●	■[2]	
G95	CBP2 communication board for PROFIBUS DP Plugged into slot E	K11 + K02	●	●	●	■[2]	
G96	CBP2 communication board for PROFIBUS DP Plugged into slot F	K11 + K01	●	●	●	■[2]	
G97	CBP2 communication board for PROFIBUS DP Plugged into slot G	K11 + K02	●	●	●	■[2]	

● Option available ■ On request

1) The supplementary order codes indicated in this column must be specified for the selected option. Each option only needs to be ordered once even if it is specified several times in the table.

2) Option for AFE converters available upon request.

Options for the cabinet units

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements[1]	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Isolation amplifiers for analog inputs and outputs							
E06	Output isolating amplifier for analog output 1 Input: –10 V to +10 V, Output: –10 V to +10 V	L42 + K73[2]) + M76[2])	●	●	●	●	
E07	Output isolating amplifier for analog output 2 Input: –10 V to +10 V, Output: –10 V to +10 V	L42 + K73[2]) + M76[2])	●	●	●	●	
E16	Output isolating amplifier for analog output 1 Input: –10 V to +10 V, Output: –20 mA to +20 mA	L42 + K73[2]) + M76[2])	●	●	●	●	
E17	Output isolating amplifier for analog output 2 Input: –10 V to +10 V, Output: –20 mA to +20 mA	L42 + K73[2]) + M76[2])	●	●	●	●	
E26	Output isolating amplifier for analog output 1 Input: 0 V to 10 V, Output: 4 mA to 20 mA	L42 + K73[2]) + M76[2])	●	●	●	●	
E27	Output isolating amplifier for analog output 2 Input: 0 V to 10 V, Output: 4 mA to 20 mA	L42 + K73[2]) + M76[2])	●	●	●	●	
E46	Input isolating amplifier for analog input 1 Input: 0 (4) mA to 20 mA, Output: 0 (4) mA to 20 mA The range can be parameterized	L42 + K73[2]) + M76[2])	●	●	●	●	
E47	Input isolating amplifier for analog input 2 Input: 0 (4) mA to 20 mA, Output: 0 (4) mA to 20 mA The range can be parameterized	L42 + K73[2]) + M76[2])	●	●	●	●	
E56	Input isolating amplifier for analog input 1 Input: –10 V to +10 V, Output: –10 V to +10 V	L42 + K73[2]) + M76[2])	●	●	●	●	
E57	Input isolating amplifier for analog input 2 Input: –10 V to +10 V, Output: –10 V to +10 V	L42 + K73[2]) + M76[2])	●	●	●	●	
E66	Input isolating amplifier for analog input 1 Input: –20 mA to +20 mA, Output: –10 V to +10 V	L42 + K73[2]) + M76[2])	●	●	●	●	
E67	Input isolating amplifier for analog input 2 Input: –20 mA to +20 mA, Output: –10 V to +10 V	L42 + K73[2]) + M76[2])	●	●	●	●	

● Option available

4

1) The supplementary order codes indicated in this column must be specified for the selected option. Each option only needs to be ordered once even if it is specified several times in the table.

2) Options required in the case of converters for single-quadrant operation, 6-pulse;
45 kW to 400 kW, 380 V to 480 V
37 kW to 315 kW, 500 V to 600 V
55 kW to 400 kW, 660 V to 690 V.
Standard for higher output ratings.

Cabinet units

Options for the cabinet units

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements[1]	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Line filters, line commutating reactors and protective devices							
L00	Radio-interference suppression filter to EN 55 011, class A1, for supply voltage: 3 AC 380 V to 690 V, 50/60 Hz and operation from earthed systems (TT and TN system) with shield bus (option M 70)	–	●[2]	●[2]	●[2]	■	Not with L20 and/or L22
L20	Operation on non-earthed system (IT system)	–	●[3]	Standard	Standard	■	
L21	Overvoltage protection board	–	●[4]	●[5]	●[6]	■	
L22	Without line commutating reactor, however relative impedance voltage of the system V_s > 6 %	–	●	●	●	–	
L23	Line commutating reactor, relative impedance voltage V_s = 2 %	–	Standard	Standard	●	–	
L24	Without main switch, with terminal for supply-side power connection	–	●	●	●	■	
L87	Insulation monitor for non-earthed systems (IT system)	L20 + ext. 230 V AC or K74[7]) + M76[7])	●	●	●	■	
L88	Earth-leakage monitor for earthed systems (TT and TN systems) with terminal for supply-side power connection (option M76)	ext. 230 V AC or K74[7]) + M76[7])	●[8]	–	●[8]	■	
L89	Line commutating reactor, relative impedance voltage V_s = 4 % (standard 2 %)	–	●	●	Standard	–	
Motor-side filters and output reactors							
L08	Output reactor (iron-core) for motor frequency ≤ 120 Hz with connecting lugs for output-side power connection (option M 77)	–	●[2]	●[2]	●[2]	■	
L09	Output reactor (ferrite-core) for motor frequency ≥ 120 Hz with connecting lugs for output-side power connection (option M 77)	–	■[9]	■[9]	■[9]	■	
L10	Voltage-limiting filter (d*v*/d*t*) with connecting lugs for output-side power connection (option M 77)	–	●[2]	●[2]	●[2]	■	≤ 860 A
L15	Sinusoidal filter	–	■	–	■	■	

● Option available ■ On request – Not available

1) The supplementary order codes indicated in this column must be specified for the selected option. Each option only needs to be ordered once even if it is specified several times in the table.

2) A supplementary cabinet may be necessary, depending on the output rating. For dimensions, see Page 4/45.

3) Option standard in the case of converters for single-quadrant operation, 6-pulse; 400 kW to 710 kW, 380 V to 480 V 400 kW to 1100 kW, 500 V to 600 V 500 kW to 1500 kW, 660 V to 690 V.

4) Option only possible in the case of converters for single-quadrant operation, 6-pulse; 500 kW to 1500 kW, 660 V to 690 V.

5) Option only possible in the case of converters for single-quadrant operation, 12-pulse; 1000 kW to 1500 kW, 660 V to 690 V.

6) Option only possible in the case of converters for four-quadrant operation, 6-pulse; 500 kW to 1500 kW, 660 V to 690 V.

7) Option required in the case of converters for single-quadrant operation, 6-pulse; 45 kW to 400 kW, 380 V to 480 V 37 kW to 315 kW, 500 V to 600 V 55 kW to 400 kW, 660 V to 690 V.

8) Option L24 not possible for converters for single-quadrant operation, 6-pulse and four-quadrant operation, 6-pulse; 630 kW, 710 kW, 380 V to 480 V 800 kW to 1100 kW, 500 V to 600 V, 1000 kW to 1500 kW, 660 V to 690 V (Monitoring electronics for earth-leakage monitor is built into the circuit-breaker).

9) Option for the following power ratings, available on request: 1000 kW; 1100 kW at 500 V to 600 V and 1300 kW, 1500 kW at 660 V to 690 V.

Options for the cabinet units

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements[1]	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Additional control functions							
L13	Main contactor, with internal 24 V DC auxiliary power supply unit	ext. 230 V AC or K74[2]	●[3]	●	●[3]	Standard	
L41	Terminal strips for binary inputs and outputs of the CUVC control board	–	●[4]	Standard	Standard	Standard	
L42	Terminal strips for analog inputs and outputs of the CUVC control board	M76[2]	●	●	●	●	
L45	Pushbutton for EMERGENCY OFF/STOP function integrated in the door, contacts wired to terminals, in the case of STOP function without EMERGENCY OFF marking (yellow plate)	–	●	●	●	●	
L46	STOP function class 0, 230 V AC circuit, non-controlled shutdown	L13[5] + L41[2] + M76[2]	●[6]	●	●[6]	●	
L47	STOP function class 1, 230 V AC circuit, controlled shutdown	L13[5] + L41[2] + M76[2]	●[6]	●	●[6]	●	
L48	STOP function class 0, 24 V DC circuit, non-controlled shutdown	L13[5] + L41[2] + M76[2]	●[6]	●	●[6]	●	
L49	STOP function class 1, 24 V DC circuit, controlled shutdown	L13[5] + L41[2] + M76[2]	●[6]	●	●[6]	●	
L57	EMERGENCY OFF class 0, EN 60 204, 230 V AC circuit, non-controlled shutdown	L13[5] + L41[2] + M76[2]	●[6]	●	●[6]	●	
L58	EMERGENCY OFF class 0, EN 60 204, 24 V DC circuit, non-controlled shutdown	L13[5] + L41[2] + M76[2]	●[6]	●	●[6]	●	
L59	EMERGENCY OFF class 1, EN 60 204, 230 V AC circuit, controlled shutdown	L13[5] + L41[2] + M76[2]	●[6]	●	●[6]	●	
L60	EMERGENCY OFF class 1, EN 60 204, 24 V DC circuit, controlled shutdown	L13[5] + L41[2] + M76[2]	●[6]	●	●[6]	●	
K80	"SAFE Stop" function	–	●	●	●	●	
P01	Changeover of the parameter data set Basic/reserve with key-operated switch	–	●	●	●	●	
X06	Terminal strip in accordance with NAMUR guidelines with functional extra-low voltage and protective separation (PELV)	M76[2]	■	■	■	■	
X07	Terminal strip as in option X06, but expanded to include two analog outputs (one output for active power and one output for use as required) and an additional motor thermistor evaluator for alarm purposes	M76[2]	■	■	■	■	
X08	Power outgoing section for external auxiliaries (3 AC supply voltage protected by protective circuit-breaker), Protection: Σ = max. 10 A with NAMUR terminal designation	–	■	■	■	■	

● Option available ■ On request

1) The supplementary order codes indicated in this column must be specified for the selected option. Each option only needs to be ordered once even if it is specified several times in the table.

2) Option required in the case of converters for single-quadrant operation, 6-pulse;
45 kW to 400 kW, 380 V to 480 V
37 kW to 315 kW, 500 V to 600 V
55 kW to 400 kW, 660 V to 690 V.

3) Option only possible in the case of converters for single-quadrant operation, 6-pulse and four-quadrant operation, 6-pulse;
45 kW to 500 kW, 380 V to 480 V
37 kW to 630 kW, 500 V to 600 V
55 kW to 800 KW, 660 V to 690 V
(otherwise 3WN6 circuit-breaker).

4) Option standard in the case of converters for single-quadrant operation, 6-pulse;
500 kW to 710 kW, 380 V to 480 V
400 kW to 1100 kW, 500 V to 600 V
500 kW to 1500 kW, 660 V to 690 V.

5) Option required for converters for single-quadrant operation, 6-pulse and four-quadrant operation, 6-pulse;
45 kW to 500 kW, 380 V to 480 V
37 kW to 630 kW, 500 V to 600 V
55 kW to 800 kW, 660 V to 690 V.

6) Option L24 not possible for converters for single-quadrant operation, 6-pulse and four-quadrant operation, 6-pulse;
630 kW, 710 kW, 380 V to 480 V
800 kW to 1100 kW, 500 V to 600 V
1000 kW to 1500 kW, 660 V to 690 V.

Cabinet units

Options for the cabinet units

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements[1]	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Additional cabinet installations							
L55	Anti-condensation heater, output dependent on cabinet size (multiple of 90 W)	ext. 230 V AC	●	●	●	●	
L18	Power outgoing section for external auxiliaries (3 AC supply voltage protected by circuit-breaker), Protection: Σ (L18 + L19) = max. 10 A	–	●	●	●	●	
L19	Power outgoing section for external auxiliaries (3 AC supply voltage protected by circuit-breaker and by an externally operable contactor), Protection: Σ (L18 + L19) = max. 10 A	–	●	●	●	●	
X33	Cabinet light and power socket, 230 V ext. required	ext. 230 V AC	■	■	■	■	
Braking units (integrated in cabinet), without external braking resistor							
L64	Braking unit P_{20} = 10 kW; 15.8 A 380 V to 480 V; 510 V to 650 V DC	M76[2]	●	●	–	–	
L65	Braking unit P_{20} = 10 kW; 12.7 A 500 V to 600 V; 675 V to 810 V DC	M76[2]	●	●	–	–	
L67	Braking unit P_{20} = 20 kW; 31.6 A 380 V to 480 V; 510 V to 650 V DC	M76[2]	●	●	–	–	
L71	Braking unit P_{20} = 50 kW; 79 A 380 V to 480 V; 510 V to 650 V DC	M76[2]	●	●	–	–	
L72	Braking unit P_{20} = 50 kW; 64 A 500 V to 600 V; 675 V to 810 V DC	M76[2]	●	●	–	–	
L73	Braking unit P_{20} = 50 kW; 53 A 660 V to 690 V; 890 V to 930 V DC	M76[2]	●	●	–	–	
L74	Braking unit P_{20} = 100 kW; 158 A 380 V to 480 V; 510 V to 650 V DC	M76[2]	●	●	–	–	
L75	Braking unit P_{20} = 100 kW; 127 A 500 V to 600 V; 675 V to 810 V DC	M76[2]	●	●	–	–	
L77	Braking unit P_{20} = 170 kW; 316 A 380 V to 480 V; 510 V to 650 V DC	M76[2]	●	●	–	–	
L78	Braking unit P_{20} = 200 kW; 254 A 500 V to 600 V; 675 V to 810 V DC	M76[2]	●	●	–	–	
L79	Braking unit P_{20} = 200 kW; 212 A 660 V to 690 V; 890 V to 930 V DC	M76[2]	●	●	–	–	
External braking resistors (supplied loose)							
C64	Braking resistor P_{20} = 10 kW; 40 Ω 380 V to 480 V; 510 V to 650 V DC	–	●	●	–	–	
C65	Braking resistor P_{20} = 10 kW; 62 Ω 500 V to 600 V; 675 V to 810 V DC	–	●	●	–	–	
C67	Braking resistor P_{20} = 20 kW; 20 Ω 380 V to 480 V; 510 V to 650 V DC	–	●	●	–	–	
C71	Braking resistor P_{20} = 50 kW; 8 Ω 380 V to 480 V; 510 V to 650 V DC	–	●	●	–	–	
C72	Braking resistor P_{20} = 50 kW; 12.4 Ω 500 V to 600 V; 675 V to 810 V DC	–	●	●	–	–	
C73	Braking resistor P_{20} = 50 kW; 17.8 Ω 660 V to 690 V; 890 V to 930 V DC	–	●	●	–	–	
C74	Braking resistor P_{20} = 100 kW; 4 Ω 380 V to 480 V; 510 V to 650 V DC	–	●	●	–	–	
C75	Braking resistor P_{20} = 100 kW; 6.2 Ω 500 V to 600 V; 675 V to 810 V DC	–	●	●	–	–	
C77	Braking resistor P_{20} = 170 kW; 2.35 Ω 380 V to 480 V; 510 V to 650 V DC	–	●	●	–	–	
C78	Braking resistor P_{20} = 200 kW; 3.1 Ω 500 V to 600 V; 675 V to 810 V DC	–	●	●	–	–	
C79	Braking resistor P_{20} = 200 kW; 4.45 Ω 660 V to 690 V; 890 V to 930 V DC	–	●	●	–	–	

● Option available ■ On request – Not available

1) The supplementary order codes indicated in this column must be specified for the selected option. Each option only needs to be ordered once even if it is specified several times in the table.

2) Option required for single-quadrant operation, 6-pulse converters;
45 kW to 400 kW, 380 V to 480 V
37 kW to 315 kW, 500 V to 600 V
55 kW to 400 kW, 660 V to 690 V.
Standard for higher power ratings.

Options for the cabinet units

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements[1]	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Thermistor motor protection devices, PT 100 evaluation unit and automatic restart function							
L81	Motor thermistor motor protection device for tripping Control voltage: 24 V DC, output contacts looped into internal switch-off circuit of the unit	K73[2]) + L41[2]) + M76[2])	●	●	●	●	Not with L84
L82	Motor thermistor motor protection device for alarm Control voltage: 24 V DC, output contacts looped into internal alarm circuit of the unit	K73[2]) + L41[2]) + M76[2])	●	●	●	●	Not with L83
L83	Explosion-proof motor thermistor motor protection device with PTB (German regulatory body) approval for alarm via the main contactors Control voltage: 230 V AC, output contacts looped into internal switch-off circuit of the unit	L41[2]) + (ext. 230 V AC or K74)[2]) + M76[2])	●	●	●	●	Not with L82
L84	Explosion-proof motor thermistor motor protection device with PTB (German regulatory body) approval for direct tripping purposes Control voltage: 230 V AC, output contacts looped into internal alarm circuit of the device – Only in conjunction with STOP or EMERGENCY OFF function (options: L46 to L49, L57 to L60)	L41[2]) + (ext. 230 V AC or K74)[2]) + M76[2]) + L13	●	●	●	●	Not with L81
L85	Automatic restart, hardware requirement in conjunction with STOP or EMERGENCY OFF (no restart)	–	■	■	■	■	
L86	PT100 evaluation unit, 6-channel	K73[2]) + L41[2]) + M76[2])	●	●	●	●	
Autotransformers for regenerative feedback (integrated in cabinet) with 25 % power-on duration							
L90	Autotransformer; supply voltage 3 AC 380 V to 415 V, 50/60 Hz	–	–	–	●[3])	–	
L91	Autotransformer; supply voltage 3 AC 440 V to 480 V, 50/60 Hz	–	–	–	●[3])	–	
L92	Autotransformer; supply voltage 3 AC 500 V, 50/60 Hz	–	–	–	●[3])	–	
L93	Autotransformer; supply voltage 3 AC 600 V, 50/60 Hz	–	–	–	●[3])	–	
L94	Autotransformer; supply voltage 3 AC 660 V to 690 V, 50/60 Hz	–	–	–	●[3])	–	
Autotransformers for regenerative feedback (integrated in cabinet) with 100 % power-on duration							
L95	Autotransformer; supply voltage 3 AC 380 V to 415 V, 50/60 Hz	–	–	–	●[3])	–	
L96	Autotransformer; supply voltage 3 AC 440 V to 480 V, 50/60 Hz	–	–	–	●[3])	–	
L97	Autotransformer; supply voltage 3 AC 500 V, 50/60 Hz	–	–	–	●[3])	–	
L98	Autotransformer; supply voltage 3 AC 600 V, 50/60 Hz	–	–	–	●[3])	–	
L99	Autotransformer; supply voltage 3 AC 660 V to 690 V, 50/60 Hz	–	–	–	●[3])	–	

● Option available ■ On request – Not available

1) The supplementary order codes indicated in this column must be specified for the selected option. Each option only needs to be ordered once even if it is specified several times in the table.

2) Option required in the case of converters for single-quadrant operation, 6-pulse;
45 kW to 400 kW, 380 V to 480 V
37 kW to 315 kW, 500 V to 600 V
50 kW to 400 kW, 660 V to 690 V.

3) An additional cabinet unit may be necessary or a different cabinet width, depending on the output rating. For dimensions, see from Page 4/45 on.

Cabinet units

Options for the cabinet units

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements[1]	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Mechanical components and options							
M04	Siemens 8MF cabinet instead of RITTAL	–	●	●	●	●	
M05	Cabinet sealed with baseplate at the bottom	–	●	●	●	●	Not with M54 or M59
M06	Pedestal, 100 mm high	–	●	●	●	●	
M07	Pedestal, 200 mm high	–	●	●	●	●	
M09	Special paint finish for cabinet	–	●	●	●	●	
M11	Dust protection (filter mat in door, panels sealed)	M23 or M43	●	●	●	●	
M12	Altered mounting height for PMU and OP1S operator control panel in the cabinet door	–	■	■	■	■	
M14	Power supply from above (main switch top, except for 3WN6)	–	■	■	■	■	
M21	Degree of protection IP21, with venting roof, without baseplate	–	●	●	●	●	
M23	Degree of protection IP23, with roof section, without baseplate (replacement for IP22)	K73[2]) + (ext. 230 V AC or K74)[2])	●	●	●	●	
M25	Partition only mounted on the right, for side-by-side installation, with mounting screws	–	●	●	●	●	
M26	Side panel only mounted on the right, for side-by-side installation	–	●	●	●	●	
M27	Side panel only mounted on the left, for side-by-side installation	–	●	●	●	●	
M43	Degree of protection IP43, with roof section, without baseplate (replacement for IP42)	K73[2]) + (ext. 230 V AC or K74)[2])	●	●	●	●	
M54	Degree of protection IP54 (prepared), cabinet with closed door, without roof panel and baseplate	–	●	●	●	●	
M59	Cabinet with closed door, air enters from below through opening in the base	–	●	●	●	●	
M70	EMC shield bus for converter output	–	●	●	●	●	
M75	Reinforced PE busbars	–	●	●	●	●	
M76	Connecting lugs for supply-side power connection	–	●[3])	●[4])	●[5])	●[3])	
M77	Connecting lugs for output-side power connection	–	●[6])	Standard	●[6])	●[6])	
M90	Transport device for cranes, for cabinet units, mounted on top	–	●	●	●	●	
M91	Transport rail for cabinet units, mounted at the bottom	–	■[7])	■[7])	■[7])	■[7])	
M92	Noise damping	M23 or M43	■	■	■	■	
X54	Degree of protection IP54b (application-specific)	–	●	●	●	●	

● Option available ■ On request

1) The supplementary order codes indicated in this column must be specified for the selected option. Each option only needs to be ordered once even if it is specified several times in the table.

2) Option required in the case of converters for single-quadrant operation, 6-pulse;
45 kW to 200 kW, 380 V to 480 V
37 kW to 160 kW, 500 V to 600 V
55 kW to 200 kW, 660 V to 690 V.

3) Standard in the case of converters for single-quadrant operation, 6-pulse and AFE;
400 kW to 710 kW, 380 V to 480 V
400 kW to 1100 kW, 500 V to 600 V
500 kW to 1500 kW, 660 V to 690 V.

4) Option standard in the case of converters for single-quadrant operation, 12-pulse;
630 kW, 710 kW, 380 V to 480 V
800 kW, 1100 kW, 500 V to 600 V
1000 kW to 1500 kW, 660 V to 690 V.

5) Option standard in the case of converters for four-quadrant operation, 6-pulse;
315 kW to 710 kW, 380 V to 480 V
400 kW to 1100 kW, 500 V to 600 V
500 kW to 1500 kW, 660 V to 690 V.

6) Option standard in the case of converters for single-quadrant operation, 6-pulse and four-quadrant operation, 6-pulse and AFE;
110 kW to 710 kW, 380 V to 480 V
90 kW to 1100 kW, 500 V to 600 V
90 kW to 1500 kW, 660 V to 690 V.

7) M90 is preferable where possible.

Options for the cabinet units

Supplementary order code	Description of option The electronics options listed relate solely to inverters. Corresponding options for rectifier units on request.	Remarks Additional necessary options or advance requirements	For use in SIMOVERT MASTERDRIVES cabinet units with Converter single-quadrant operation 6-pulse	Converter single-quadrant operation 12-pulse	Converter four-quadrant operation 6-pulse	Converter with self-commutated, pulsed AFE rectifier/regenerative unit	Restrictions
Configuration option for AFE converters							
X39	AFE dimensioned one rating class lower	–	–	–	–	●	
Documentation[1]							
D10	Circuit diagrams	–	●	●	●	●	
D12	Cabinet dimensional drawing	–	●	●	●	●	
D72	Cabinet documentation Italian/English	–	●	●	●	●	
D77	Cabinet documentation French/English	–	●	●	●	●	
D78	Cabinet documentation Spanish/English	–	●	●	●	●	
Rating plate in other languages							
T72	Italian	–	●	●	●	●	
T77	French	–	●	●	●	●	
T78	Spanish	–	●	●	●	●	
Converter acceptance test in the presence of the customer							
F03	Visual acceptance inspection	–	●	●	●	●	
F71	Functional test of the converter without a connected motor. The scope of the acceptance inspection includes visual inspection (option F03).	F77 not included	●	●	●	●	
F75	Functional test of the converter with test-bay motor idling. The scope of the acceptance inspection includes visual inspection (option F03).	F77 not included	●	●	●	●	
F77	Insulation test of the converter	Only in combination with F71 or F75	●	●	●	●	Cannot be ordered separately
F97	Customer-specific acceptance inspections of converters	When ordering, the scope of testing must be indicated in text.	■	■	■	■	
Types of packaging[2]							
–	Road freight within Europe	Standard (without extra charge)					
P20	Air freight	–	●	●	●	●	
P21	Sea freight	M90 necessary	●	●	●	●	

● Option available ■ On request

1) For more information, see Section 5.

2) SIMOVERT MASTERDRIVES cabinet units are packed according to the selected method of dispatch.

If packaging that deviates from the standard packaging is required, this must be indicated when the order is submitted and will be invoiced separately. In particular, any types of packaging different from the types mentioned above are to be agreed on separately.

For deliveries to China and Australia, country-specific regulations that affect all types of packaging must be complied with. Types of packaging for transport to these countries must be clearly indicated when the order is submitted and will be invoiced separately.

Cabinet units

Description of the options

Operator control panel and adapter boards

K08	OP1S operator control panel	Cabinet units are supplied as standard with the PMU operator control and parameterizing unit mounted in the cabinet door. The OP1S operator control panel can be ordered as an option. It is then plugged onto the existing PMU operator control and parameterizing unit.	With the codes S72, S76, S77, S78, the display unit is parameterized and the requested language is set in the factory before delivery.
K11, K01, K02	LBA bus adapter and ADB adapter board	In the electronics box of the converters, there are two additional positions (2 and 3) for installing additional boards or adapter boards (ADB) with the codes K01, K02.	If these mounting positions are to be used, a bus adapter (LBA) with the code K11 is necessary.

Technology boards

K16, K12, K30	T100 technology board T300 technology board TSY synchronizing board	Only one of the technology boards can be built into the electronics box alongside the CUVC control board.	In order to enable mounting of a board in the electronics box, an LBA bus adapter (code K11) is necessary.

Expansion boards

G61 to G67 **G71 to G77**	EB1 expansion board EB2 expansion board	The expansion boards (EB1 and EB2) can be used to expand the number of digital and analog inputs and outputs.	For further information, see engineering information, Section 6.

Communication boards

G21 to G27 **G41 to G47** **G91 to G97**	CBC communication board SLB communication board CBP2 communication board	In the electronics box of the converter or inverters, there are up to six slots for installing additional communication and expansion boards. The communication and the expansion boards can be mounted directly on the CUVC control board in slot A or C.	There are four additional places for mounting these boards, namely slots D and E and F and G, codes K01 and K02, on the adapter boards. Only slots E and G can be additionally used on the CBP2 and CBC communication boards. In order to enable mounting of these boards in the electronics box, an LBA bus adapter (code K11) is necessary depending on the engineering plans and, if need be, one or two ADB adapter boards (codes K01, K02). For further information, see engineering information, Section 6.

Pulse generator board

C11 to C17	SBP incremental encoder board	SBP enables the connection of an incremental encoder or frequency generator for applying setpoints to the converters and inverters.	For further information, see engineering information, Section 6.

Interface boards and auxiliary power supply units

K20 **K21**	SCB1 serial interface board SCB2 serial interface board	The SCB1 or SCB2 interface boards can be installed in the electronics box, next to the CUVC control board. In order to enable mounting of the boards in the electronics box, an LBA bus adapter (code K11) is necessary.	The DTI, ATI, SCI1 and SCI2 interface boards are mounted on a mounting together with a 24 V DC power supply if required. The SCI1 and SCI2 serial input/output boards can only be used in combination with the SCB1 interface board.
K41, **K42**	SCI1 serial input/output board		
K50, **K51**	DTI digital tachometer interface board		
K60	ATI analog tachometer interface board		
K73	Auxiliary power supply for the electronics and options, 24 DC	The auxiliary power supply provides 24 V DC power for the electronics and inverter options. The auxiliary power supply is also required when 24 V DC is required but the dc-link is not charged or when the internal standard power supply unit is insufficient to supply the connected options. The auxiliary power supply is fed via the 230 V AC control voltage, which is provided as standard for the cooling fans or depending on the output power rating available using the option code K74.	
K74	230 V AC auxiliary power supply	The auxiliary power supply is via the mains supply by means of a control transformer. It has to be provided if options required for this auxiliary voltage are necessary (e.g. with L13, M23, M43, L83, L84, L46, L47, L57, L59).	Converters for single-quadrant operation and four-quadrant operation are in part, depending on their performance, already equipped with a control transformer as a standard feature.

Isolation amplifiers

E06 to E67	Isolation amplifiers for analog inputs and outputs	Isolation amplifiers for analog outputs are required when cables longer than 4 m are used. Isolation amplifiers for analog inputs isolate the different reference potentials of the signals between the unit electronics and the higher-level controller and also increase electrical immunity to interference.	The code, L42, necessary for this option must always be specified; option code K73 depends on the size of the unit and the converter version.

Line filters, line commutating reactors and protective devices

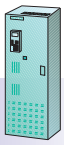
L00	Radio-interference suppression filter	Radio-interference suppression filters to EN 55 011 Class A1 (for industrial applications) are available for the cabinet units in the power range 37 kW to 1500 kW.	In order to enable connection of the shield for the radio-interference suppression filter, an EMC shield bus (code M70) is integrated at the converter output.	The radio-interference suppression filters under option L00 can be used for earthed systems. Radio-interference suppression filters for non-earthed systems are available on request.
L20	Operation from non-earthed system	The option, operation from a non-earthed system (IT systems, code L20), must be ordered separately in the case of converters for single-quadrant operation, 6-pulse, in the power range from	45 kW to 315 kW/ 380 V to 480 V; 37 kW to 315 kW/ 500 V to 600 V; 55 kW to 400 kW/ 660 V to 690 V.	This option is standard in the case of all other cabinet units.
L21	Overvoltage protection board	The overvoltage protection board protects the semiconductors of the supply-side converter against overvoltages, such as can occur when the converter trans-	former is tripped on the primary side of the system. The 7YY30 overvoltage protection boards are equipped with varistors and protective thyristors. If an excessively	high overvoltage occurs in the input circuit, an appropriate signal is generated at the terminal.
L22, L23, L89	Line commutating reactor	In the case of converters with single-quadrant operation, a line commutating reactor with a relative impedance voltage of 2 % is built in and, in the case of converters for four-quadrant operation, with a relative impedance voltage of 4 %. Operation without a line commutating reactor (code L22) for single-quadrant and	four-quadrant operation is only permissible if the relative impedance voltage of the supply system is greater than 6 %. In the case of 12-pulse supply, at least one line commutating reactor with 2 % relative impedance voltage is necessary per system or a converter transformer in the form of a three-winding transformer	must be used (see Engineering Information Section 6). The difference between the two output voltages should be less than 0.5 %. In the case of converters with self-commutated, pulsed rectifier/regenerative units, the line commutating reactor is already integrated in the line filter.
L87	Insulation monitor, non-earthed systems	The insulation monitor detects the insulation resistance in non-earthed systems (IT systems). In addition, it detects all insulation faults in the DC link and on the motor-side of the converter. If the insulation resistance falls below a minimum value, a signal is output to the terminal.	**N.B.:** The insulation monitor detects the insulation resistance of all parts of the system connected on the secondary side of the converter transformer and only needs to be used once per branch. Depending on the supply voltage, the insulation monitor on the branch functions as follows: • If the insulation monitor is supplied with the option K74, the insulation monitor	monitors the converter and the preceding branch only when the converter has been switched on. • In the case of external supply to the insulation monitor with 230 V AC, the insulation monitor only monitors the preceding branch when the converter has been switched off. If the converter has been switched on, it is also monitored.
L88	Earth-leakage monitor, earthed systems	The earth-leakage monitor is designed as a summation current transformer and monitors the earth-fault cur-	rent of an earth fault in earthed systems (TN and TT systems). If the earth-fault current exceeds a maximum	value, a signal is output to the terminal.

Motor-side filters and output reactors

L08, L09	Output reactors	Output reactors limit the capacitive charge/discharge currents of motor supply cables, thus enabling the operation of motors connected via long cable lengths. (Cable lengths of 50 m to max. approx.	1000 m, depending on the power rating). Iron-core output reactors (code L08) for output frequencies of ≤ 120 Hz and pulse frequencies of ≤ 3 kHz.	Ferrite-core output reactors (code L09) for output frequencies of ≥ 120 Hz and pulse frequencies of ≥ 3 kHz to max. 6 kHz.
L10	Voltage-limiting filter (d*v*/d*t*)	Voltage limiting filters can be provided to protect the motor insulation systems,	preferably with supply voltage > 500 V and in the case of inadequate, or unknown	insulation systems of non-Siemens motors.
L15	Sinusoidal filter	Sinusoidal filters at the converter output supply almost sinusoidal voltages to the motor. The use of sinusoidal filters is always recommended when the sum of the motor supply cables is extremely long (e.g. textile applications). The maximum converter output voltage is only 85 % of the supply voltage (380 V to 480 V) or 90 % of the supply voltage (500 V to 600 V).	If the presently available sinusoidal filters are used for a rated voltage of 380 V to 480 V, the maximum possible output current is to be reduced to 75 % of its rated level due to the pulse frequency of 6 kHz which has to be set in the power range from 75 kW to 200 kW.	**N.B.:** When ordering, units with a correspondingly larger nominal power rating are therefore to be selected. In the case of operation with a rated voltage of 500 V to 600 V, the rated output current is not to be reduced when the pulse frequency in the power range from 37 kW to 110 kW is 2.5 kHz.

Additional control functions

L13	Main contactor	The standard converters for single-quadrant operation, 6-pulse and for four-quadrant operation, 6-pulse do not have a line contactor in the power range	45 kW to 500 kW, 380 V to 480 V; 37 kW to 630 kW, 500V to 600 V; 55 kW to 800 kW, 660 V to 690 V.	This also applies to cabinet units for single-quadrant operation, 12-pulse. If a main contactor is to be obtained for these cabinet units, the option (code L13) is to be provided for this purpose. K73 is integrated in L13.
L41	Terminal strip for binary inputs and outputs	Additional terminal strip for binary inputs and outputs of the CUVC control board,	mounted on a DIN mounting rail.	
L42	Terminal strip for analog inputs and outputs	Additional terminal strip for analog inputs and outputs of the CUVC control board,	mounted on a DIN mounting rail.	
L45	Pushbutton for the EMERGENCY OFF/STOP function	The pushbutton for the EMERGENCY OFF/STOP function is integrated in the cabinet door and its contacts (two NC contacts) are con-	nected to the terminal strip. The functions of L46 to L49 and L57 to L60 can be activated by means of this pushbutton.	
L46, L48	STOP function class 0	Involves disconnection of the voltage via the line contactor (3WN6 circuit-breaker), with the electronics being bypassed. The motor	coasts. In order to ensure that the line contactor is not switched under load, a pulse inhibit is triggered by means of an "external fault" signal at	the same time. The unit can only be restarted after the fault has been acknowledged.
L47, L49	STOP function class 1	Involves stopping of the drive via the 'fast stop' function with a back-stop ramp which has to be parameterized by the user. The unit is	then disconnected by means of the line contactor (3WN6 circuit-breaker) as described under STOP function 0.	
L57, L58	EMERGENCY OFF class 0	Involves disconnection by means of the line contactor (3WN6 circuit-breaker), with the electronics being bypassed by means of a contactor safety combination	to EN 60 204. The motor coasts. In order to ensure that the line contactor is not switched under load, a pulse inhibit is triggered by means of an external fault signal at	the same time. The unit can only be restarted after the fault has been acknowledged.
L59, L60	EMERGENCY OFF class 1	Involves stopping of the drive by means of the 'fast stop' function with a deceleration ramp which has to be parameterized by the user.	The unit is then deenergized by means of the line contactor as described under EMERGENCY OFF 0.	The contactor safety combination to EN 60 204 is used here as well.
X06	NAMUR terminal strip, standard version	The terminal strip is designed in accordance with the requirements and guidelines of the standards association for instrumentation and control in the chemical industry, i.e. certain func-	tions performed by the units are assigned to defined terminals. The inputs and outputs which are connected to the terminals fulfil the requirements regarding functional extra-low voltage	and protective separation (PELV). The necessary option codes have not yet been specified (must be requested).
X07	NAMUR terminal strip, expanded version	Similar to the NAMUR terminal strip with option code X06, but expanded to include two analog outputs (one output for active power, one to	be used as required) and an additional motor thermistor evaluation unit for alarm purposes.	The necessary option codes have not yet been specified (must be requested).
K80	"Safe Stop"	The "Safe Stop" function (also known as a starting lockout) prevents a hazardous movement of the drive after a shutdown, and prevents an	unexpected start. When the function is activated, the control signals of the inverter IGBTs are interrupted (see also Section 6). Code K80 is	available for converters and inverters of the chassis units from size E onwards.



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Braking units and braking resistors

L64 to L79	Braking units	The braking units can be connected in parallel in order to increase the braking power. Each braking unit needs its own external braking resistor.	The following condition must be fulfilled in order to dimension the braking units to the converter or inverter. $\Sigma P_{20} \leq 2.4 \cdot P_{conv.}$ or $\Sigma P_{20} \leq 2.4 \cdot P_{inv.}$	The width of the additional cabinet which is necessary depends on the size of the braking units and the number of braking units connected in parallel.
C64 to C79	Braking resistors	The braking resistor is supplied loose and matches the rating of the braking unit.	The braking resistor must be mounted outside the cabinet. The degree of protection is IP20.	

Thermistor motor protection devices and PT100 evaluator, automatic restart

L81 to L84	Thermistor motor protection devices	Thermistor motor protection devices for PTC thermistors are available with a control voltage of 24 V DC for alarm and tripping purposes for	standard motors and with PTB approval for alarm and tripping purposes for explosion-proof motors.	The signals from the thermistor motor protection devices are looped into the internal trip and alarm circuits of the control unit.
L85	Automatic restart	This option enables automatic restarting of the motor to be prevented in the case of an enabled automatic restart	in conjunction with the STOP function L46 to L49 or the EMERGENCY STOP function L57 to L60 when STOP or	EMERGENCY STOP is triggered. The drive thus remains switched off.
L86	PT100 evaluation unit	The PT100 evaluation unit is equipped with two groups of three measuring channels in a two-wire circuit with automatic line compensation when the unit is switched	on. Each measuring channel can be parameterized separately and integrated in the internal trip and alarm circuits. The unit can also be integrated in higher-level	controllers by means of a centralized alarm (change-over contact) and two analog outputs (+10 V, parameterizable), which are each connected to terminals.

Autotransformers for regenerative feedback

L90 to L99	Autotransformers for converters with regenerative feedback	The autotransformers for regenerative feedback for converters for four-quadrant operation, 6-pulse, are built into the cabinet. Depending on the power rating, an additional cabinet is necessary.	For notes on autotransformers with 25 % and 100 % power-on durations as well as on the use of units without autotransformers, see Engineering Information, Section 6.	

Mechanical components and options

M21	Degree of protection IP21	Cabinet version with degree of protection IP20, but with offset roof cover.		
M23, M43	Degree of protection IP23, Degree of protection IP43	The converter cabinets with degree of protection IP23 and IP43 are equipped with an additional roof section (400 m). The roof sections are delivered separately to make transportation easier	and have to be mounted on site. The connecting cables of the fans also have to be plugged in on site. In the case of special paint finish cabinets (M09), the roof sections are delivered,	as standard feature, in the RAL 7032 color (pebble-gray). If the roof sections are required in the same color as the cabinets, this has to be indicated separately in the order (plain text).
M54	Degree of protection IP54 (prepared)	With this option, the doors and the side walls are sealed. The doors are sealed and do not have any air inlets.	The units are open at the top and bottom. Facilities for the supply and removal of air must be provided on site. The air flows from the bottom to the top of the cabinet.	**Note:** The converter cabinet is not delivered from the factory with degree of protection IP54.

Mechanical components and options (continued)

X54 Degree of protection IP54b

With this option, degree of protection IP54 is provided for use according to the regulations. The cabinet has degree of protection IP43 (door mesh for air inlet and 400 mm roof cover for air outlet). In addition, dust filters (option M11) are fitted for air inlet and outlet. The cabinet with this degree of protection is not absolutely dust-tight and can be used in the event of occasional splashing water.

Bottom plates (option M05) must be ordered separately for this degree of protection. The degree of protection IP54b (b= according to the regulations) is printed on the rating plate.

M70 EMC shield bus

The EMC shield bus is for connecting the shields of four-wire, shielded power cables for line and motor outputs as well as the shields of control cables. The PE bus option (code M75) is additionally recommended.

M75 PE bus

The PE bus is for connecting the protective conductors of power and motor supply cables. In the case of units with larger ratings and units for system configurations, the PE bus option is recommended for connecting the protective conductor.

M76, M77 Connecting lugs

For standard converter cabinets, the connecting lugs for supply-side and output-side power connection are already included, depending on the converter version and the nominal power rating. For certain nominal power ratings, the power is connected directly to the units earth mounted in the cabinet. For these cabinet versions, the connecting lugs can be ordered as an option (code M76, M77).

M25 Partition wall, only on the right for side-by-side-mounted cabinets

M26 Side wall only on the right for side-by-side-mounted cabinets

M27 Side wall only on the left for side-by-side-mounted cabinets

In the case of cabinets which are to be mounted side-by-side from left to right, the cabinets can be prepared in the factory for on-site mounting.

Documentation

D10 Circuit diagrams

A block diagram and terminal diagram are included in the standard scope of delivery. In connection with an order for a cabinet or circuit manual with this option, detailed circuit diagrams are additionally supplied.

D12 Cabinet dimension drawing

The dimension drawings of individual cabinet transport units are included in the standard scope of delivery. In connection with an order for a cabinet or circuit manual, the dimension drawings of the individual cabinet units (with this option) are shown in a common view.

Configuration option for AFE converters

X39 AFE dimensioned with one rating class lower

Option X39 is a specific option of the standard converters with an AFE rectifier unit (6SE71..-.....-5BA0) for applications where it is sufficient to select a line-side inverter of one rating class lower than the one at the motor side.

This is the case, for example, when the AFE inverter is operated with a power factor of $\cos \varphi = 1$ and only the active power has to be obtained from the power supply. In addition, if the full power does not have to be provided at the output in the event of undervoltage, a smaller and less expensive rectifier unit can be selected.

In the case of AFE converters with option X39, the line-side inverter is always one rating class lower than the one at the motor side. This selection procedure applies to the whole series of AFEs, except when the smallest unit of a voltage series is used.

Whether this variant can actually be selected depends on the power factor of the selected motor as well as on those aspects described. It is always necessary to exactly calculate the active power that is obtained from or fed back into the power supply system. In addition, the losses must also be taken into consideration.

It must be noted that the version with option X39 leads in some cases to a reduction of the dimensions (see pages 4/22 and 4/24).

Converter acceptance inspection in the presence of the customer

F03	Visual inspection	The checks and tests are carried out with the converter isolated from the power supply. The acceptance inspection includes the following:	• Check of degree of protection • Check of components • Check of equipment code • Check of air gap and creepage distance	• Cable check • Check of customer's documentation • Handover of the acceptance report
F71	Functional test of the converter without connected motor	After the visual inspection with the converter switched off, the converter is connected to rated voltage. No current flows at the converter's output. The acceptance inspection includes the following:	• Visual inspection as described for option F03 • Check of power supply • Check of protective and monitoring devices (simulation)	• Check of fans • Precharging test • Functional test without connected motor • Handover of the acceptance report
F75	Functional test of the converter with test-bay motor idling	The acceptance inspection includes the following: • Visual inspection as described for option F03 • Check of power supply • Check of protective and monitoring devices (simulation)	• Check of fans • Precharging test • Functional test with test-bay motor idling • Handover of the acceptance report	After the visual inspection with the converter off, the converter is connected to rated voltage. A small current flows at the converter's output in order to operate the test-bay motor.
F77	Insulation test of the converter	The acceptance inspection includes the following:	• High-voltage test	• Measurement of insulation resistance
F97	Customer-specific converter acceptance tests	If converter acceptance tests that are not covered by the options F03, F71, F75 and F77 are desired, customer-specific	acceptance inspections/additional tests are possible upon request and after technical clarification. The code F97	must be quoted when ordering and the scope of the acceptance inspection must be described in text.

Note:
As a standard measure, the converter chassis are subjected to a heat run in the course of testing. A test certificate for this, however, is not provided.

Types of packaging

–	Road freight within Europe	Standard packaging (no extra charge)	Features: • Cabinets mounted on wooden pallets that can be lifted using fork-lift trucks	• Protective dust hood over the upper part of the cabinet • Edges protected by corrugated cardboard in the upper region of the cabinet
P20	Air freight	Features: • Cabinets mounted on wooden pallets that can be lifted using fork-lift trucks	• Protective dust hood over the whole cabinet	• Edges protected by corrugated cardboard in the upper region of the cabinet
P21	Sea freight	Features: • Completely closed wooden crate • The cabinet, with a dehumidifying agent, is vacuum sealed inside an air-tight plastic cover. This dehumid-	ifying agent is designed for a transport and storage period of up to 6 months. It is also possible to order dehumidifying agent that will last for a storage period of 12 or 24 months.	• Edges protected by corrugated cardboard in the upper part of the cabinet

The options listed below are, depending on size, supplied in a supplementary cabinet. If a combination of options with supplementary cabinets is required, it may be possible, if there is adequate vacant space in the standard cabinet or in the optional supplementary cabinets, to combine options using fewer supplementary cabinets.

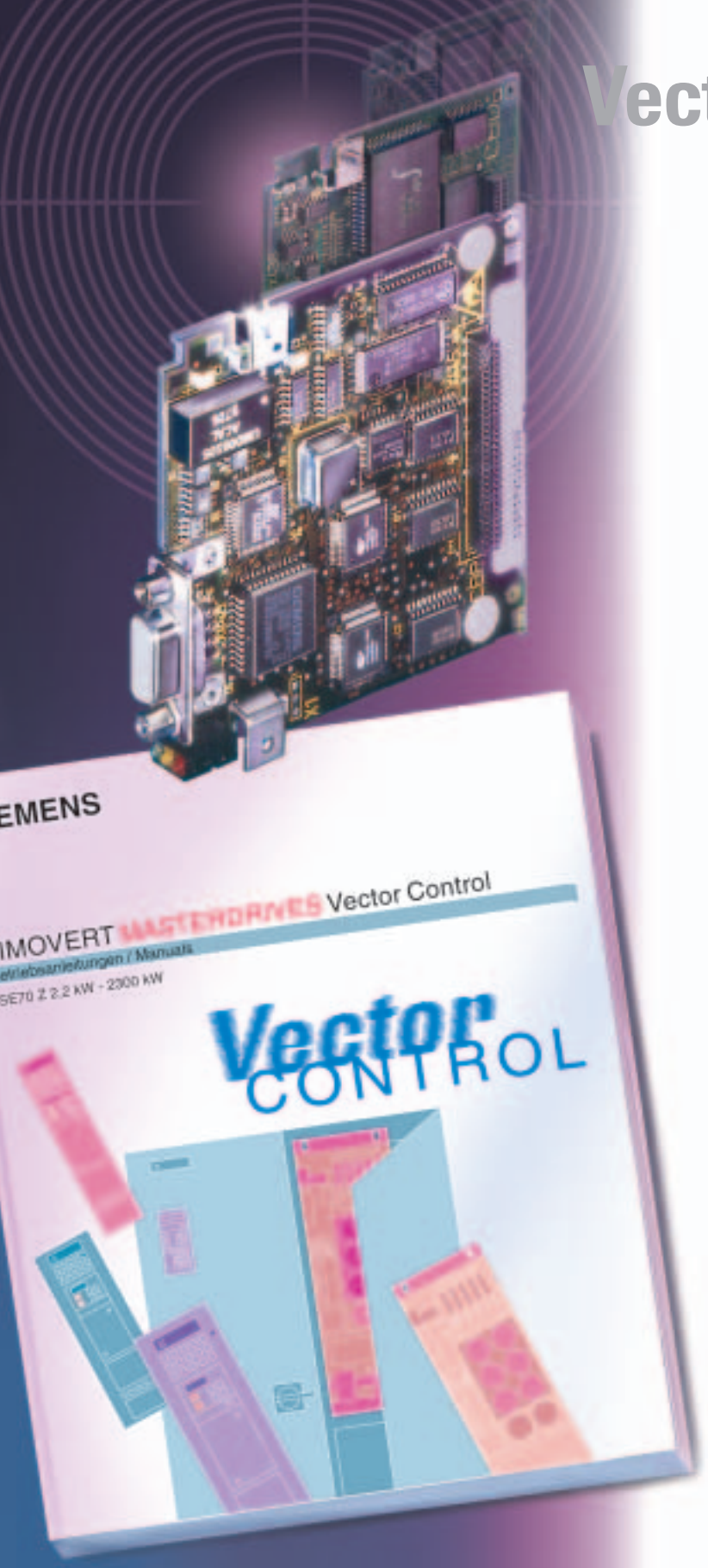
Supplementary order code	Description of option	Nominal power rating of converter	Cabinet width	Page
L00	Radio-interference suppression filter Converter for single-quadrant operation, 6-pulse	45 kW to 400 kW / 380 V to 480 V 37 kW to 315 kW / 500 V to 600 V 55 kW to 400 kW / 660 V to 690 V	1) 1) 1)	4/31
		500 kW to 710 kW / 380 V to 480 V 400 kW to 1100 kW / 500 V to 600 V 500 kW to 1500 kW / 660 V to 690 V	600 mm 600 mm 600 mm	
L00	Radio-interference suppression filter Converter for single-quadrant operation, 12-pulse	250 kW to 500 kW / 380 V to 480 V 200 kW to 630 kW / 500 V to 600 V 250 kW to 800 kW / 660 V to 690 V	1) 1) 1)	4/31
		630 kW to 710 kW / 380 V to 480 V 800 kW to 1100 kW / 500 V to 600 V 1000 kW to 1500 kW / 660 V to 690 V	2 x 600 mm 2 x 600 mm 2 x 600 mm	
L00	Radio-interference suppression filter Converter for single-quadrant operation, 6-pulse	45 kW to 250 kW / 380 V to 480 V 37 kW to 315 kW / 500 V to 600 V 55 kW to 400 kW / 660 V to 690 V	1) 1) 1)	4/31
		315 kW to 710 kW / 380 V to 480 V 400 kW to 1100 kW / 500 V to 600 V 500 kW to 1500 kW / 660 V to 690 V	600 mm 600 mm 600 mm	
L08	Output reactor (iron-core) for converter, single-quadrant operation, 6-pulse	45 kW to 200 kW / 380 V to 480 V 37 kW to 160 kW / 500 V to 600 V 55 kW to 200 kW / 660 V to 690 V	1) 1) 1)	4/31
		250 kW to 630 kW / 380 V to 480 V 200 kW to 450 kW / 500 V to 600 V 250 kW to 630 kW / 660 V to 690 V	600 mm 600 mm 600 mm	
		710 kW / 380 V to 480 V 630 kW to 900 kW / 500 V to 600 V 800 kW to 1200 kW / 660 V to 690 V	900 mm 900 mm 900 mm	
		1000 kW to 1100 kW / 500 V to 600 V 1300 kW to 1500 kW / 660 V to 690 V	on request on request	
L08	Output reactor (iron-core) for converter, single-quadrant operation, 12-pulse	250 kW / 380 V to 480 V 200 kW to 315 kW / 500 V to 600 V 250 kW to 400 kW / 660 V to 690 V	1) 1) 1)	4/31
		400 kW to 630 kW / 380 V to 480 V 400 kW to 450 kW / 500 V to 600 V 500 kW to 630 kW / 660 V to 690 V	600 mm 600 mm 600 mm	
		710 kW / 380 V to 480 V 630 kW to 900 kW / 500 V to 600 V 800 kW to 1200 kW / 660 V to 690 V	900 mm 900 mm 900 mm	
		1000 kW to 1100 kW / 500 V to 600 V 1300 kW to 1500 kW / 660 V to 690 V	on request on request	
L08	Output reactor (iron-core) for converter, four-quadrant operation, 6-pulse	45 kW to 400 kW / 380 V to 480 V 37 kW to 315 kW / 500 V to 600 V 55 kW to 400 kW / 660 V to 690 V	1) 1) 1)	4/31
		500 kW to 630 kW / 380 V to 480 V 400 kW to 630 kW / 500 V to 600 V 500 kW to 800 kW / 660 V to 690 V	600 mm 600 mm 600 mm	
		710 kW / 380 V to 480 V 800 kW to 900 kW / 500 V to 600 V 1000 kW to 1200 kW / 660 V to 690 V	900 mm 900 mm 900 mm	
		1000 kW to 1100 kW / 500 V to 600 V 1300 kW to 1500 kW / 660 V to 690 V	on request on request	

1) Supplementary cabinets not necessary.

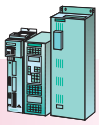
Supplementary cabinets for options

Supplementary order code	Description of option	Nominal power rating of converter		Cabinet width	Page
L10	Voltage limiting filter (d*v*/d*t*) at converter for single-quadrant operation, 6-pulse	45 kW to 90 kW / 380 V to 480 V 37 kW to 160 kW / 500 V to 600 V 55 kW to 200 kW / 660 V to 690 V		[1] [1] [1]	4/31
		110 kW to 315 kW / 380 V to 480 V 200 kW to 450 kW / 500 V to 600 V 250 kW to 630 kW / 660 V to 690 V		600 mm 600 mm 600 mm	
		400 kW to 500 kW / 380 V to 480 V 630 kW / 500 V to 600 V 800 kW / 660 V to 690 V		900 mm 900 mm 900 mm	
		630 kW to 710 kW / 380 V to 480 V 800 kW to 1100 kW / 500 V to 600 V 1000 kW to 1500 kW / 660 V to 690 V	without autotransformer	[1] [1] [1]	
L10	Voltage limiting filter (d*v*/d*t*) at converter for single-quadrant operation, 12-pulse	250 kW / 380 V to 480 V 200 kW to 450 kW / 500 V to 600 V 250 kW to 630 kW / 660 V to 690 V		600 mm 600 mm 600 mm	4/31
		400 kW to 500 kW / 380 V to 480 V 630 kW / 500 V to 600 V 800 kW / 660 V to 690 V		900 mm 900 mm 900 mm	
		630 kW to 710 kW / 380 V to 480 V 800 kW to 1100 kW / 500 V to 600 V 1000 kW to 1500 kW / 660 V to 690 V	without autotransformer	[1] [1] [1]	
L10	Voltage limiting filter (d*v*/d*t*) at converter for four-quadrant operation, 6-pulse	45 kW to 90 kW / 380 V to 480 V 37 kW to 160 kW / 500 V to 600 V 55 kW to 200 kW / 660 V to 690 V		[1] [1] [1]	4/31
		90 kW to 160 kW / 380 V to 480 V 90 kW to 200 kW / 500 V to 600 V		[1] [1]	
		90 kW to 160 kW / 500 V to 600 V 90 kW to 200 kW / 660 V to 690 V	with 25 % power-on duration, autotransformer	converter cabinet + 300 mm	
		110 kW to 315 kW / 380 V to 480 V 200 kW to 450 kW / 500 V to 600 V 250 kW to 630 kW / 660 V to 690 V		600 mm 600 mm 600 mm	
		400 kW to 500 kW / 380 V to 480 V 630 kW / 500 V to 600 V 800 kW / 660 V to 690 V		900 mm 900 mm 900 mm	
		630 kW to 710 kW / 380 V to 480 V 800 kW to 1100 kW / 500 V to 600 V 1000 kW to 1500 kW / 660 V to 690 V	without autotransformer	[1] [1] [1]	
L90 to L94	Autotransformer for regenerative feedback with 25 % power-on duration for four-quadrant duty, 6-pulse	45 kW to 200 kW / 380 V to 480 V 37 kW to 250 kW / 500 V to 600 V 55 kW to 200 kW / 660 V to 690 V		[1] [1] [1]	4/34
		250 kW / 380 V to 480 V 315 kW / 500 V to 600 V 250 kW to 400 kW / 660 V to 690 V		converter cabinet + 300 mm	
		315 kW to 400 kW / 380 V to 480 V		600 mm	
		500 kW to 710 kW / 380 V to 480 V 400 kW to 1100 kW / 500 V to 600 V 500 kW to 1500 kW / 660 V to 690 V		900 mm 900 mm 900 mm	
L95 to L99	Autotransformer for regenerative feedback with 100 % power-on duration for four-quadrant duty, 6-pulse	45 kW to 250 kW / 380 V to 480 V 37 kW to 315 kW / 500 V to 600 V 55 kW to 400 kW / 660 V to 690 V		on request on request on request	4/34
		315 kW to 630 kW / 380 V to 480 V 400 kW to 630 kW / 500 V to 600 V 500 kW to 800 kW / 660 V to 690 V		900 mm 900 mm 900 mm	
		710 kW / 380 V to 480 V 800 kW to 1100 kW / 500 V to 600 V 1000 kW to 1500 kW / 660 V to 690 V		1200 mm 1200 mm 1200 mm	

1) Supplementary cabinets not necessary.



Vector Control
Documentation and Training



Documentation overview

The documentation for the units (converters, inverters, rectifier units and rectifier/ regenerative units), system components and options is supplied in German/English with the ordered products.

When ordering MASTERDRIVES products, operating instructions can be ordered as an alternative in other languages as follows:

Language	Supplementary order code
French / English	D77
Spanish / English	D78
Italian / English	D72

The detailed description of the parameter list and control concepts as well as the corresponding explanations on the additionally available free function blocks which can be combined and connected as required via the BICO system, necessitate the documentation to be split up into three parts as follows:

- The **operating instructions** supplied with the units and containing the information necessary for standard drives, without parameter list and without binector/connector lists.
- The **Compendium** for converter and inverter units contains the detailed documentation for the software, including parameter list and binector/connector lists as well as block circuit diagrams for types of open-loop and closed-loop control and function blocks. The compendium as printed version (file) must be ordered separately and applies for all types of units.

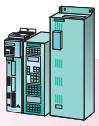
The Compendium is necessary when

- additional signals, above and beyond those of the factory settings, are to be processed, i.e. if access has to be made to the parameter list
- the full range of functions of the converter software, including communication via fieldbus systems, is to be used
- additional inputs/outputs are envisaged via the EB1 and EB2 expansion boards
- the free function blocks are to be used. See page 6/33.

- The **CD-ROM** is included in the scope of supply (exception: Option D99).

This contains:

- parameterization and diagnostics program DriveMonitor
- all operating instructions and the compendium in the form of PDF files in all available languages except Japanese.



Compact PLUS units
Compact and chassis units

Documentation for Compact PLUS and compact and chassis units – Operating instructions

Converters and inverters

Type of unit	Size	Order No.
AC/AC Compact PLUS unit	P	**6SE708☐–☐JP60**
DC/AC Compact PLUS unit	P	**6SE708☐–☐KP60**
AC/AC compact unit	A to D	**6SE708☐–☐JD60**
AC/AC chassis unit	E to K	**6SE708☐–☐JK60**
DC/AC compact unit	A to D	**6SE708☐–☐KD60**
AC/AC chassis unit	E to Q	**6SE708☐–☐KN60**

German / English	**7 6**
Italian / English	**7 2**
French/ English	**7 7**
Spanish / English	**7 8**
Japanese	**8 0**

Self-commutated, pulsed rectifier/regenerative units Active Front End AFE

Type of unit	Size	Order No.
AC/DC compact unit German/English	A to D	**6SE7087–6KD80**
AC/DC chassis unit	E to G	**6SE708☐–☐CX86–2AA0**
AC/DC cabinet units	E to L	**6SE718☐–☐AX80–2AA0**

German	**0 0**
English	**7 6**
Italian	**7 2**
French	**7 7**
Spanish	**7 8**

Rectifier units

Type of unit	Size	Order No.
Compact PLUS unit	P	**6SE708☐–☐NP85–0AA0**
Compact unit	B and C	**6SE708☐–☐AC85–0AA0**
Chassis unit	E	**6SE708☐–☐AE85–0AA0**
Chassis unit	H and K	**6SE708☐–☐AK85–0AA0**

German / English	**7 6**
Italian	**7 2**
French	**7 7**
Spanish	**7 8**
Japanese	**8 0**

Rectifier / regenerative units

Type of unit	Size	Order No.
Compact and chassis units	C to K	**6SE708☐–☐AK85–1AA0**

German	**0 0**
English	**7 6**
Italian	**7 2**
French	**7 7**
Spanish	**7 8**
Japanese	**8 0**

System components

Components	Size	Order No.
Braking units	all	**6SE708☐–☐CX87–2DA0**
Radio-interference suppression filters	all	**6SE708☐–☐CX87–0FB0**
Sinusoidal filters	all	**6SE708☐–☐CX87–1FC0**
d*v*/d*t* filters	all	**6SE708☐–☐CX87–1FD0**

German / English	**7 6**
Italian	**7 2**
French	**7 7**
Spanish	**7 8**
Japanese	**8 0**

Electronics options

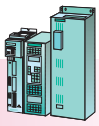
Electronics options	Language	Order No.
CBP2 communication board		**6SE708☐–☐NX84–0FF0**
CBC communication board		**6SE708☐–☐NX84–0FG0**
SLB communication board		**6SE708☐–☐NX84–0FJ0**
EB1 expansion board 1		**6SE708☐–☐NX84–0KB0**
EB2 expansion board 2		**6SE708☐–☐NX84–0KC0**
SBP incremental encoder board		**6SE708☐–☐NX84–0FA0**
VSB voltage sensing board		**6SE708☐–☐NX84–1GA0**

German / English	**7 6**
Italian / English	**7 2**
French / English	**7 7**
Spanish / English	**7 8**
Japanese	**8 0**

T100 technology board – Hardware description	Ge/En/It/Fr/Sp	**6SE7080–0CX87–0BB0**
T300 technology board – Hardware description	German / English French	**6SE7087–6CX84–0AH1** **6SE7087–7CX84–0AH1**
MS320 software module axial winder, for T300	German English	**6SE7080–0CX84–2AH1** **6SE7087–6CX84–2AH1**
Software module MS340 angular synchronous control, for T300	German English French	**6SE7080–0CX84–4AH1** **6SE7087–6CX84–4AH1** **6SE7087–7CX84–4AH1**
MS360 software module multi-motor drive, for T300	German English	**6SE7080–0CX84–6AH1** **6SE7087–6CX84–6AH1**
MS380 software module positioning control, for T300	German English	**6SE7080–0CX84–8AH1** **6SE7087–6CX84–8AH1**
MS 100 software module universal drive, for T100	German English	**6SE7080–0CX84–0BB1** **6SE7087–6CX84–0BB1**
Safe Stop Board SSB	Ge/En/It/Fr/Sp	**6SE7080–0AX87–1JB0**
SCB1, SCI1 and SCI2 interface boards		**6SE708☐–☐CX84–0BC0**
SCB2 interface board		**6SE708☐–☐CX84–0BD0**
TSY synchronizing board		**6SE708☐–☐CX84–0BA0**
DTI digital tachometer interface		**6SE708☐–☐CX84–3DB0**

German / English	**7 6**
Italian	**7 2**
French	**7 7**
Spanish	**7 8**

Documentation for Compact PLUS and compact and chassis units – Collected files · CD-ROM



Compact PLUS units
Compact and chassis units

Operating instruction library

The file is to be regarded as reference documentation and includes operating instructions for the following components:

- Converters
- Inverters
- Rectifier units[1])
- Rectifier/regenerative units
- Braking units[1])
- Output filters[1])
- Radio interference suppression filters[1])
- SCB/SCI/DTI/TSY/EB1/EB2 interface boards
- SBP incremental encoder board
- CBP/CBP2 communication boards (PROFIBUS DP)
- CBC communication board (CAN)
- SLB communication board (SIMOLINK)
- OP1S operator control panel

The operating instructions contain a description of the basic functions and installation and start-up instructions.

Language	Order No.
Collected operating instructions	
German / English	**6SE7087–6NX60**
Italian / English	**6SE7087–2NX60**
French / English	**6SE7087–7NX60**
Spanish / English	**6SE7087–8NX60**

Compendium

The Compendium contains the following:

- System description
- Configuration and connection examples
- EMC guidelines
- Function blocks and parameters
- Parameterization
- Parameterizing steps
- Functions
- Process data
- Communication
  SCOM 1/2 interfaces
  USS protocol
  PROFIBUS DP
  CAN
  SIMOLINK
- Annex
  Function diagrams
  Binector list
  Connector list
  Parameter list
  Faults and alarms list.

Language	Order No.
Compendium	
German	**6SE7080–0QX60**
English	**6SE7087–6QX60**
Italian	**6SE7087–2QX60**
French	**6SE7087–7QX60**
Spanish	**6SE7087–8QX60**

5

CD-ROM

Contents see page 5/2.

Language	Order No.
CD-ROM	
Ge/En/It/Fr/Sp	**6SX7010–0FA10**

Siemens safety engineering

Application manual "Safety Integrated"

The application manual "Safety Integrated" illustrates using technical explanations and application examples how dangers in the use of electric and electronic devices can be prevented or eliminated.

The complete CD-ROM about the safety system

The CD-ROM "Safety Integrated" offers a comprehensive overview of safety technology and the widest range of safety components, embedded at the same time in the standard world of automation.

Language	Order No.
Application manual	
German	**6ZB5000–0AA01–0BA0**
English	**6ZB5000–0AA02–0BA0**
CD-ROM Safety Integrated	
German/Englisch	**E20001–D10–M103–X–7400**

1) This documentation is available in French, Spanish and Italian only, i.e. not French/English, Spanish/English, Italian/English.

Standard documentation included in scope-of-delivery

An equipment manual in German/English is supplied with the converter cabinets.

The equipment manual contains the following documents:

- Test certificate
- Description of cabinet unit
- Operating instructions, with details of factory settings
- Operating instructions for options
- Dimension drawings
- Layout diagrams
- Schematic circuit diagram
- Terminal diagram

Additional documentation

In addition to the equipment manual, the following documents can also be supplied as an option. The supplementary order codes in the following table are to be added to the respective order number of the converter. The order number of the converter is to be supplemented with **"–Z"**.

Designation	Supplementary order code
Additional documentation	
Circuit diagrams Detailed circuit diagrams of the converter including options.	**D10**
Dimension drawings The individual cabinet units including options are combined to obtain a complete dimension drawing	**D12**
Cabinet documentation, Italian/English	**D72**
Cabinet documentation, French/English	**D77**
Cabinet documentation, Spanish/English	**D78**

Note

The compendium as printed version (file) must be ordered separately.
For Order No., see page 5/4.
The contents of the compendium is contained on the supplied CD-ROM.

Documentation which can be ordered separately

The documentation for a cabinet unit can also be ordered separately.

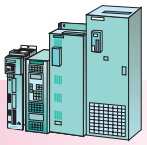
The complete order number for the cabinet unit, including the codes of all options, is to be indicated in plain text.

Cabinet-unit version	Order No.	Supplementary order code
Documentation which can be ordered separately		
Converter (single-quadrant or four-quadrant operation)	**6SE718☐–☐FX60–3BA0–Z**	**Y00**
Converter with self-commutating, pulsed rectifier/regenerative unit Active Front End AFE	**6SE718☐–☐FX60–5BA0–Z**	**Y00**

German / English	**7**	**6**
Italian	**7**	**2**
French	**7**	**7**
Spanish	**7**	**8**

Example
for documentation which can be ordered separately.

The Order No. of the cabinet unit is: **6SE7133–7ED61–3BA0.**
In this example, the documentation accompanying the cabinet is supplied in German/English.
The customer requires separate documentation in a foreign language (e.g. French).
In this example, the Order No. of the separate documentation (see Table) is then:
6SE7187–7FX60–3BA0–Z
Y00
6SE7133–7ED61–3BA0



Training Center

A&D Training Centers are located all over the world and provide a range of training courses for SIMOVERT MASTERDRIVES. The contents of the courses can be customized and the courses can also be conducted on the customer's premises.

Contact person:

Any A&D Information & Training Center in the regions and regional companies:
Tel.: ++49 18 05 23 56 11

Head Office:

Siemens AG
Automation and Drives
Training Office
P. O. Box 48 48
90327 Nuremberg
Germany
E-mail:
A&D.Kursbuero
@nbgm.siemens.de
Telephone:
++49 9 11-8 95-32 00
Fax:
++49 9 11-8 95-32 75

Fig. 5/1
Training Center

Overview of training courses

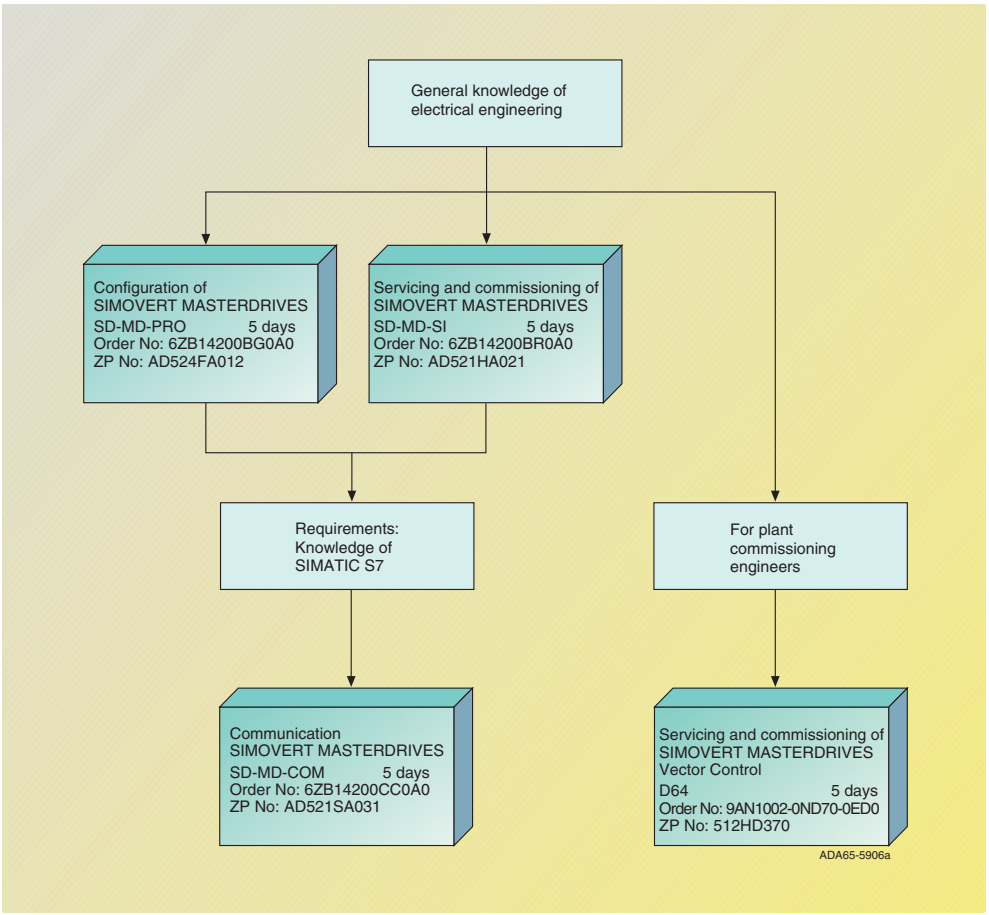


Fig. 5/2
Overview of training courses

Configuration of SIMOVERT MASTERDRIVES SD-MD-PRO

Participants are provided with the technical knowledge they require to configure the SIMOVERT MASTERDRIVES series of converters with the help of the catalog and PC tools.

The course is aimed at planning engineers, technicians and other engineers with responsibility for the „selection and calculation of variable-speed drives".

Note

Parameterization is dealt with in detail by the SD-MD-SI course.

Servicing and commissioning of SIMOVERT MASTERDRIVES SD-MD-SI Compact course for MC and VC

The course is for commissioning and service personnel. Participants are taught the technical knowledge they require for parameterizing, commissioning and servicing SIMOVERT MASTERDRIVES Motion Control and Vector Control converters.

Communication SIMOVERT MASTERDRIVES SD-MD-COM

The course is aimed at commissioning and service personnel and also at planning engineers for SIMOVERT MASTERDRIVES.

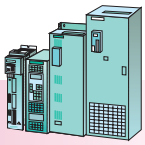
It provides participants with the knowledge they require for commissioning, configuring and programming the communication interfaces.

Further information can be found in the ITC catalog, of October 2000, or can be obtained under http://www.sitrain.com.

Servicing and commissioning of SIMOVERT MASTERDRIVES Vector Control D64

The course is intended for plant engineers responsible for commissioning SIMOVERT MASTERDRIVES Vector Control converters. The three-phase drives with these converters are started up. The extensive functions are explained in detail and applied.

The D64 course takes place at Siemens AG,
I&S IS E&C TC in Erlangen, Germany.
Telephone:
+49 91 31 72 92 62
E-mail:
sitrain@erl9.siemens.de



Demonstration case SIMOVERT MASTERDRIVES CUVC

- In a sturdy aluminium case
- Converter with PROFIBUS DP board and OP1S
- Induction motor with encoder
- Brake module
- Documentation and training examples

Order No.:
6SX7000–0AC01

Accessories:

- Control desk for operation with technology boards
  Order No.:
  6SX7006–0AA00

Transportation aid for demonstration case

Sturdy transport trolley for demonstration case consisting of an aluminium frame with a telescopic handle and roller wheels. The transport trolley is fitted with an elastic fastening strap for holding the demonstration case in place during transport. The trolley can be folded up for storage.

Dimensions (when folded up):

Height folded/open:
approx. 662/1020 mm
Width: approx. 480 mm
Weight: approx. 5 kg

Order No.:
6SX7000–0AE01

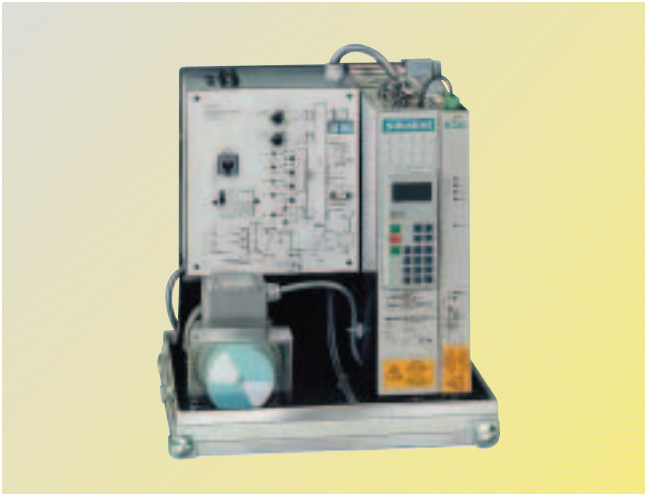


Fig. 5/3
CUVC demonstration case

VC Compact PLUS demonstration case

- Mounting frame in the Rimowa pilot trolley
- Converter with CBP2 board
- Induction motor with pulse encoder
- Braking resistor
- Start-up box
- Documentation and training examples

Weight with case:
approx. 21 kg

Dimensions of case:
H x W x D
535 x 265 x 405 mm

For connection to supply voltage 1-ph. 230 V AC (50/60 Hz)

Order No.:
6SX7000–0AC02

For connection to supply voltage 1-ph. 115 V AC (50/60 Hz)

Order No.:
6SX7000–0AC03

Fig. 5/4
VC Compact PLUS demonstration case

Start-up box for SIMOVERT MASTERDRIVES Vector Control

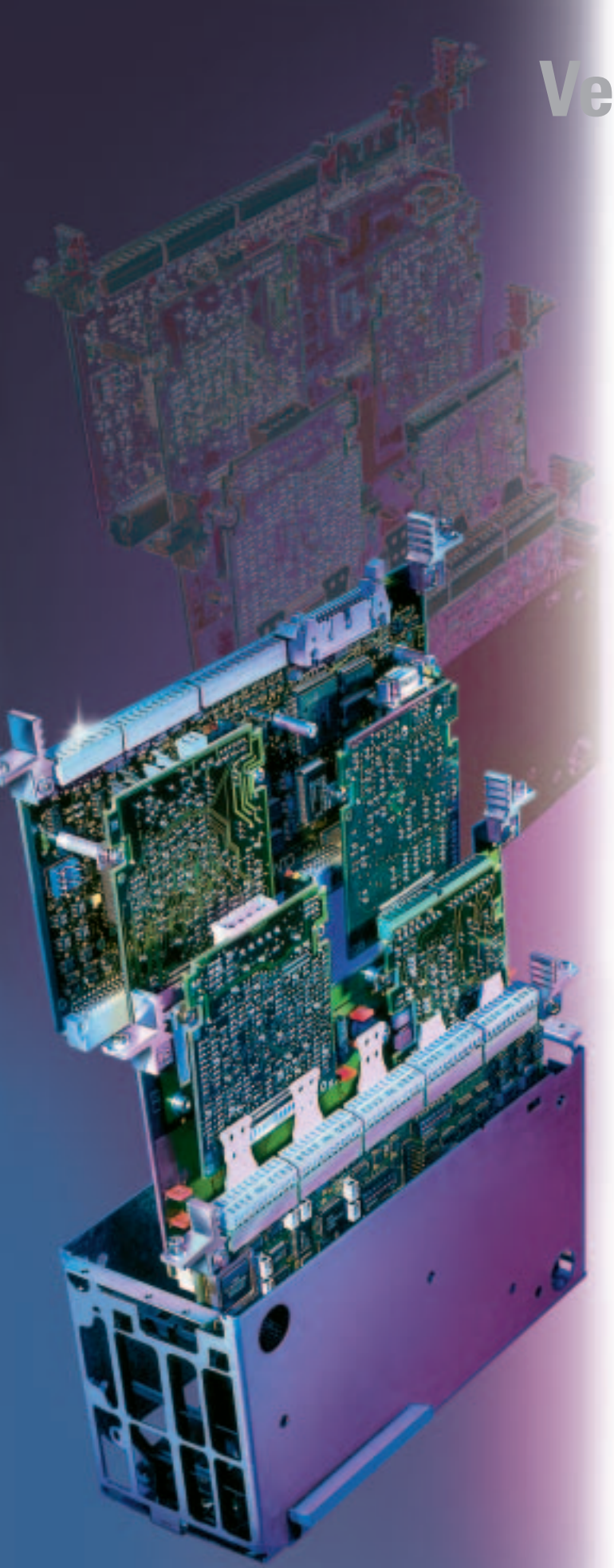
- Setting of analog setpoint ±10 V by means of two potentiometers
- $3^1/_2$-digit digital display
- 4 switches for combined digital inputs and outputs
- 3 switches for digital inputs
- connection to terminal X101 via prefabricated signal cable (1.3 m)

The start-up box uses the 24 V DC auxiliary voltage of terminal X101 for supplying the built-in digital display and for generating the supply voltage for the setting of analog setpoints.

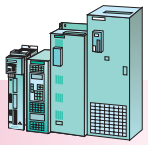
Dimensions:
H x W x D
175 x 90 x 45 mm

Order No.:
6AG1064–1AA00–0AA0

Fig. 5/5
Start-up box



Vector Control
Engineering Information



Rated data and continuous operation of the converters and inverters

Converters and inverters are designed for continuous motoring mode at the indicated supply voltage or DC link voltage. Occasional fluctuations of the supply voltage within the specified tolerances (see Section 3) have been taken into account.
The rated current I_{UN} of the converters and inverters is dimensioned based on the rated currents of Siemens 6-pole standard motors.
A nominal supply voltage of 400 V, 500 V or 690 V is used as a basis. The power section is protected against overload by an I^2t monitoring function.

The converters and inverters are designed for continuous operation with the rated output current of I_{UN}. If the rated current I_{UN} is utilized over a long period of time (> 60 s), corresponding to the 100 % value of Fig. 6/1 or Fig. 6/2, the unit reaches its maximum permissible operating temperature. Beyond this the I^2t monitoring function does not allow overloading.

Overload capability of the converters, inverters and rectifier units

The definition of overloading as shown in Fig. 6/1 applies to the converters, inverters and the rectifier units, the rectifier/regenerative units and AFE.

The maximum permissible overload current is 1.36 times the rated current for a period of 60 s, assuming that the drive has just been switched on and has not reached its maximum permissible temperature. During operation itself, overloading up to 1.36 times the rated current is only possible if, before overloading, the load current was smaller than the rated current . For this reason, a base load current < 91 % of the rated current I_{UN} is used as a basis for loading in the case of drives with overload requirements. Given this base load current, the units can be overloaded by 150 % for 60 seconds with a cycle time of 300 seconds (see Fig. 6/1). If the whole overload capability has been utilized, this is detected by the I^2t monitoring function and an alarm is output for 30 s. After this, the load current is reduced to the base load current for 240 s.

For individual converters in the power range from 2.2 kW to 200 kW, even higher overloading is possible, namely up to 1.6 times the rated current based on the load cycle shown in Fig. 6/2.

This increased overload capability can only be utilized observing the following conditions:

- Can only be used with converters / inverters

  0.55 kW to 200 kW at 380 V to 480 V AC

  2.2 kW to 160 kW at 500 V to 600 V AC
- Can only be used in vector control mode, **not** in *V/f* characteristic mode.
- The overload duration is limited to 30 s.
- Increased overload capability can only be utilized up to a motor voltage of maximum 90 % (of the supply voltage).
- The permissible lengths of the motor supply cables with or without reactors must be reduced to half of the maximum values which are otherwise possible.
- Cannot be used in conjunction with sinusoidal filters and d*v*/d*t* filters.
- In regenerative mode and with a braking unit at the upper threshold, the current limit is automatically lowered to 1.36 times the rated current (no current reduction with AFE and rectifier/regenerative unit).

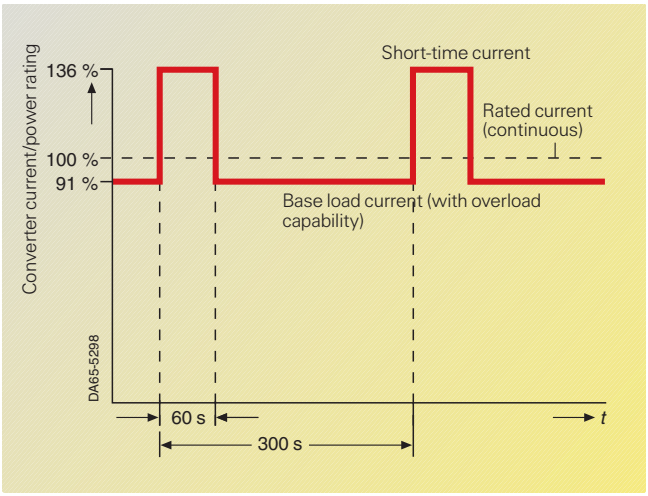


Fig. 6/1
Definition of the rated values, the overload values and the base load values of the converters and inverters

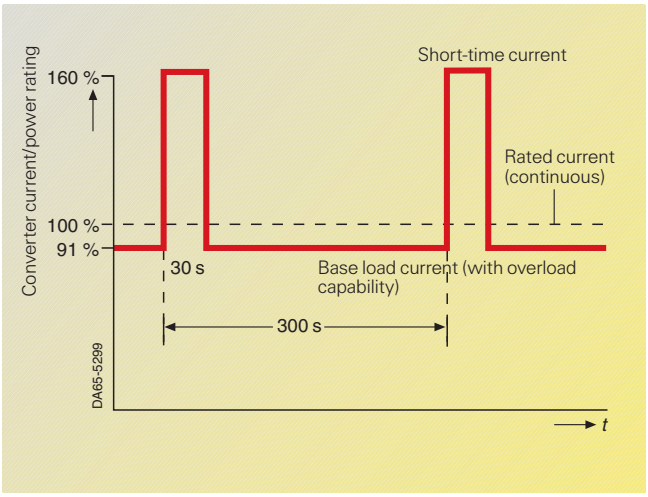


Fig. 6/2
Additional definition of the rated values, the overload values and the base load values of the converters / inverters up to 200 kW 3-ph. 380 V to 480 V AC; 510 V to 650 V DC and up to 160 kW 3-ph. 500 V to 600 V AC; 675 V to 810 V DC

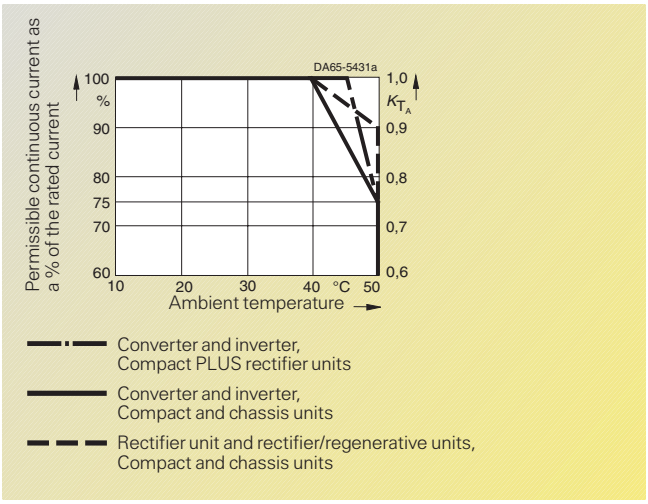


Fig. 6/3
Reduction factor k_{TA} for installation altitudes up to 1000 m above sea level and different ambient temperatures

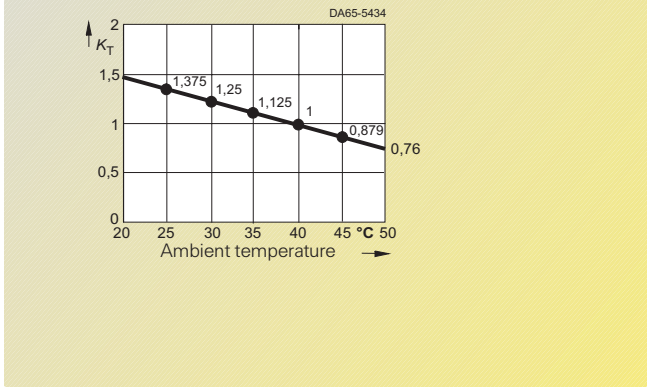


Fig. 6/4
Reduction factor k_T for installation altitudes from 1000 m to 4000 m above sea level

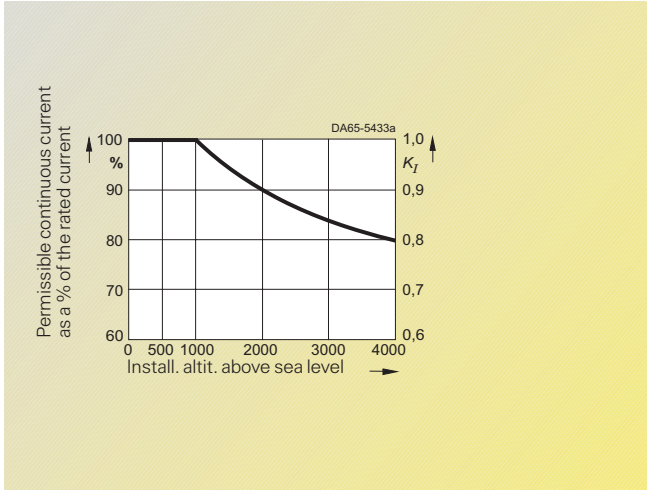


Fig. 6/5
Reduction factor k_I for installation altitudes from 1000 m to 4000 m above sea level

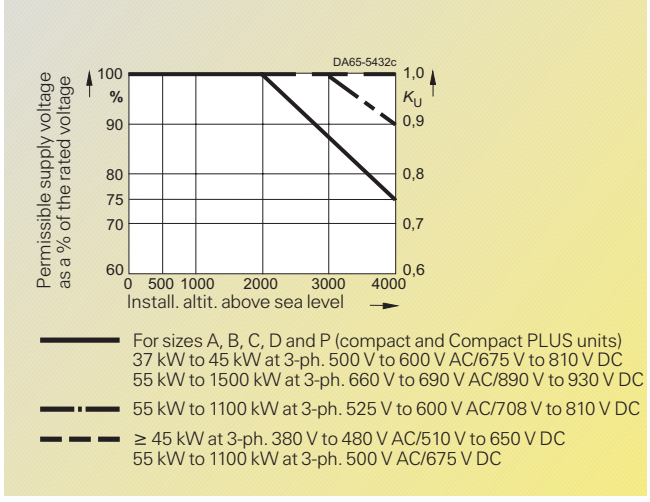


Fig. 6/6
Reduction factor k_V for installation altitudes from 1000 m to 4000 m above sea level

Installation conditions and correction factors

If the MASTERDRIVES units are operated at installation altitudes up to 1000 m above sea level and at ambient or coolant temperatures of > 40 °C, the **current reduction factors** in Fig. 6/3 are to be observed for the rated current.

Current reduction (correction factor k_I as shown in Fig. 6/5) is also necessary if the units are used at installation altitudes of between 1000 m and 4000 m. In the case of lower ambient temperatures (see Fig. 6/4), this current reduction can, if necessary, be compensated by the correction factor, k_T.

$I \leq I_{UN} \cdot k_I \cdot k_T$, $I < I_{UN}$
$I \mathrel{\widehat{=}}$ Permissible continuous current
$I_{UN} \mathrel{\widehat{=}}$ Rated current

Example:
Installation altitude: 2000 m
Max. ambient temp.: 30 °C
Correction factor $k_I = 0.9$
Correction factor $k_T = 1.25$
$I \leq I_{UN} \cdot 0.9 \cdot 1.25 = I_{UN} \cdot 1.125$
But $I \leq I_{UN}$
Result: Current reduction is not necessary in this example.

In the case of installation altitudes of > 2000 m, in addition to current derating, **voltage reduction** is necessary in accordance with IEC 60 664-1.

The voltage reduction should be carried out in accordance with the correction factor k_V in Fig. 6/6.

Example:
Unit 6SE7026-6FE60
Installation altitude: 3000 m
Max. ambient temperature: 30 °C
3-ph. 500 V to 600 V AC, 45 kW, 66 A

Correction factor $k_I = 0.84$
Correction factor $k_T = 1.25$
Correction factor $k_V = 0.88$
Result: Current reduction is not necessary. Due to the voltage reduction given in Fig. 6/6 (solid line), the converter can still be operated connected to a supply voltage of 3-ph. 500 V AC.

Large rating inverters – Output interphase transformer

The largest power ratings of the SIMOVERT MASTERDRIVES Vector Control series of converters are realised by connecting 2 inverters in parallel. In order to ensure that loading is uniformly distributed between the two inverters, an interphase transformer is used on the converter output (see Fig. 6/7).

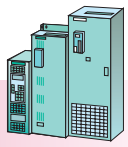
This applies to the following converter/inverter ratings:

- 900 kW at 400 V (only chassis units),
- 1000 kW and 1100 kW at 500 V,
- 1300 kW and 1500 kW at 690 V.

Operation without interphase transformer

If the motor to be connected has 2 electrically isolated winding systems which have the same voltage and the same phase position, the outputs of both inverter sections can be connected directly to the two winding systems of the motor. The two magnetically coupled windings then have the same effect as an interphase transformer. An additional interphase transformer is then no longer necessary.

1LA1 type motors for 690 V can be supplied with 2 electrically isolated winding systems. They are to be ordered with the voltage code 1 (11th position of the Order No., e.g. 1LA1 503-4PM**1**).



1 LA8 motors with 2 separate windings cannot be realized for all applications.

1LA8 motors can only be supplied with 2 separate windings on request.

Group drives, i.e. several motors connected in parallel to the converter output, may only be realized using an interphase transformer, if the motors were divided up into 2 equal groups and connected to the two inverter sections without an interphase transformer and the two motor groups had different outputs, which would normally be the case, the existing current-compensation control system for the two inverters would be overloaded and the converter would trip, indicating a fault.

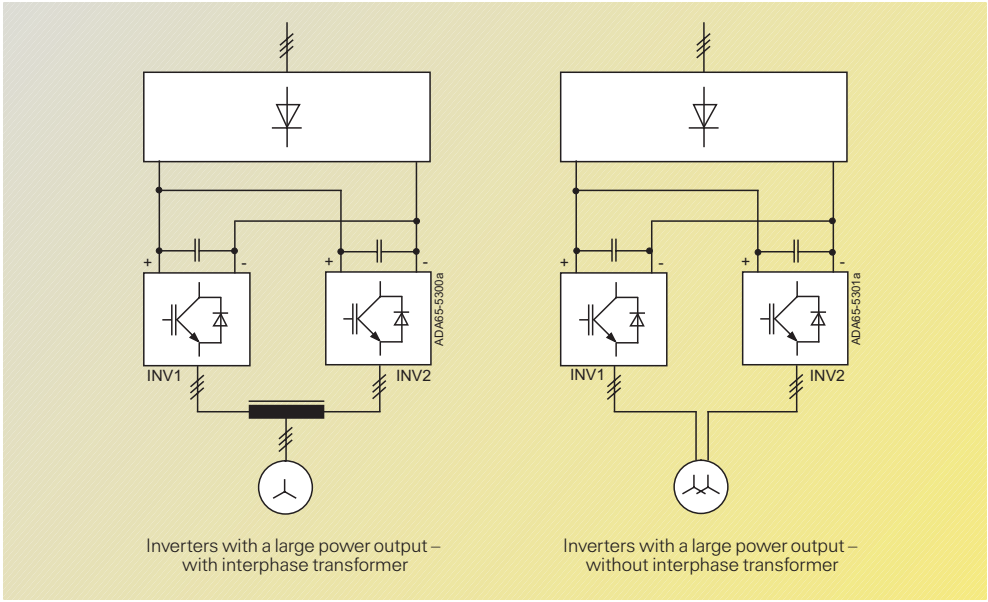


Fig. 6/7

Note

In the case of a group drive, it is recommended that the motors are divided up into 2 groups, i.e. with 2 converters or 2 inverters on a DC bus, each with half of the total output. An interphase transformer is therefore not required, providing a more cost-effective solution.

Water-cooled converters – Water-cooling circuit

If a water-cooled SIMOVERT MASTERDRIVES unit is selected, it is necessary to use water of a suitable quality for the cooling circuit. The following notes should help when engineering the cooling circuit.

Design of the cooler of the 6SE70 SIMOVERT MASTERDRIVES

The cooler consists of an aluminium base plate for the converter power semiconductors with internal cooling pipes or a cast aluminium heatsink mounted on the rear. The cooling water flows through the cooling channels.

In order to avoid mechanical distortion of this base plate and the loss involved on the IGBTs mounted on it, the max. permissible operating pressure of the cooling circuit must be < 1 bar for units of sizes A to G and ≤ 2.5 bar for units of size K. When the operating pressure is ≥ 0.5 bar the requirements of the guideline for pressure vessels are to be considered.

According to guidelines 92/23/EG for pressure vessels, the risks arising from cooling circuits are very small. Certification procedures and CE labelling according to this guideline are therefore normally not necessary.

In order to avoid galvanic corrosion and possible destruction of the heat sink, the cooling-water connections of the heat sink are made of stainless steel.

Cooling system requirements

Open cooling systems must not be used. Only **closed** cooling systems should be installed, preferably with monitoring of the water quality of the cooling water.

The electrochemical processes occurring in the cooling system must be minimized by the choice of materials. Mixed installations, i.e. a combination of different materials such as copper, brass, iron and plastics containing halogens (PVC hoses and seals) should be avoided. Examples of materials recommended for the cooling system piping are the stainless steels V2A and V4A (NIROSTA austenite) and the electrically non-conductive hoses EPDM/NBR (EPDM water side).

To suppress the electrochemical processes, equipotential bonding between the various components in the cooling system (SIMOVERT MASTERDRIVES, heat exchanger, piping system, pump, etc.) should be implemented using a copper bus bar or stranded copper conductor of suitable cross-section.

Cooling water requirements

The cooling water must satisfy the following requirements:

- Chemically neutral, clean water, free of solid matter.
- Max. particle size of any particles in water ≤ 0.1 mm
- pH value 6.0 to 8.0
- Chloride < 40 ppm
- Sulphate < 50 ppm
- Dissolved substances < 340 ppm
- Overall hardness < 170 ppm
- Use of a particle filter (100 μm).

Important!
Operating pressures above 1 bar/2.5 bar depending on the size of the unit are not permissible! The heatsinks are not resistant against sea-water (i.e. sea-water must not be used for cooling)!

If there is a danger of frost, frost-protection measures must be implemented during operation, storage and transport. For example, emptying and blowing out with air, additional heaters, etc.

Antifreeze additive

The use of Antifrogen N antifreeze (available from Clariant; http://www.clariant.com) is recommended. The mixing ratio must be within the range 20 % < antifreeze < 30 %. This ensures protection against frost down to a temperature of at least –10 °C.

Note!

If less than 20 % antifreeze is added the risk of corrosion is increased. If more than 30 % antifreeze is added the heat flow and therefore the functioning of the unit is affected. Care must always be taken to ensure that the addition of antifreeze does not alter the kinematic viscosity of the cooling water. It is necessary to adapt the pump output.

Depending on conditions at installation location and on the technical aspects, the cooling circuits described on page 6/5 can be used.

Important!
Moisture condensation on the converter due to undercooling is to be prevented. If necessary, the temperature of the cooling water must be controlled.

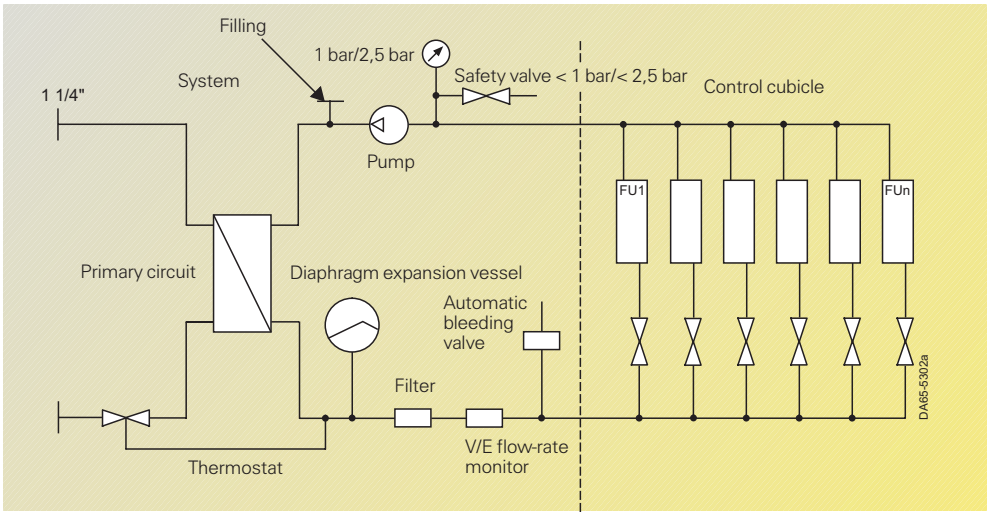


Fig. 6/8
Water-water heat exchanger

Anti-corrosion agent

For the cooling circuit, we recommend using a corrosion inhibitor, e.g. the anti-corrosion agent NALCO 00GE056 available from ONDEO Nalco (www.ondeo-nalco.com). Concentration of corrosion inhibitor in the cooling water: 0.1 to 0.14%.

The cooling water should be checked 3 months after the cooling circuit has been filled for the first time and, after this, once a year.

If the cooling water becomes detectably cloudy, discolored or contaminated with bacteria, the cooling circuit must be flushed out and re-filled.

An inspection window should be fitted in the cooling circuit to facilitate inspection of the cooling water.

Water-water heat exchangers

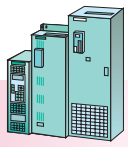
If a water supply system is already available in the plant which does not exceed temperatures above 35 °C but does not fulfil the cooling water requirements, the two cooling systems can be connected using a water-water heat exchanger.

The coolers of the frequency converters are connected via a manifold so that the necessary flow rate is ensured but the pressure does not exceed the permitted value. Factors such as height differences and distances must be taken into account.

For devices without antifreeze, we recommend using VARIDOS TOP available from Schilling Chemie. VARIDOS TOP is an organic corrosion inhibitor specially developed for semi-open and closed cooling systems. It protects metals against corrosion by forming a protective organic film on the surface of the metal.

Cabinet-unit earthing

In the case of water-cooled cabinets, special attention must be paid to earthing. All cabinets must be bolted together to ensure a good conductivity between them (e.g. cabinet brackets conductively connected to each other by screws). This is necessary to avoid differences in potential and thus to prevent the danger of electro-chemical corrosion. For this reason, a PE rail should always be mounted in all cabinets and in the re-cooling system.



Air-water heat exchangers

If there is no water supply system available but the use of water-cooled frequency converters would still be advantageous, a system using air-water coolers can be used. The surrounding air temperature must not be too high, e.g. > 35 °C, in accordance with the technical data of the air-water heat exchanger. The design is as described above. There is, however, no water circuit but a primary air cooling circuit. Here the measures to prevent undercooling must be carried out on the secondary side only by means of a temperature controller, thermostat or solenoid valve.

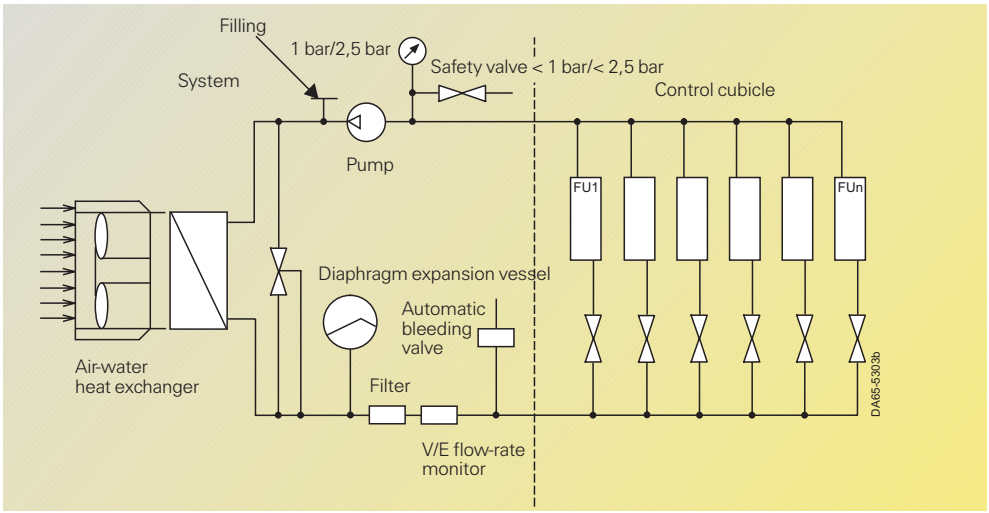


Fig. 6/9
Air-water heat exchanger

Active cooling unit

If there is no water supply system or the ambient air temperature is > 35 °C (35 °C < τ < 40 °C), the use of an active cooling unit would be suitable. This unit works according to the refrigerator principle which makes it possible to generate higher exhaust-air temperatures. The converter-side configuration of the cooling circuit is as shown in Fig. 6/10.

Suitability for use in the tropics

Due to the high humidity and high temperatures in tropical countries, moisture condensation can occur on the cooling-water pipes. This can be prevented by using heaters in the cooling circuit to control the temperature of the cooling water. The dew point temperature is no longer reached and moisture condensation is prevented.

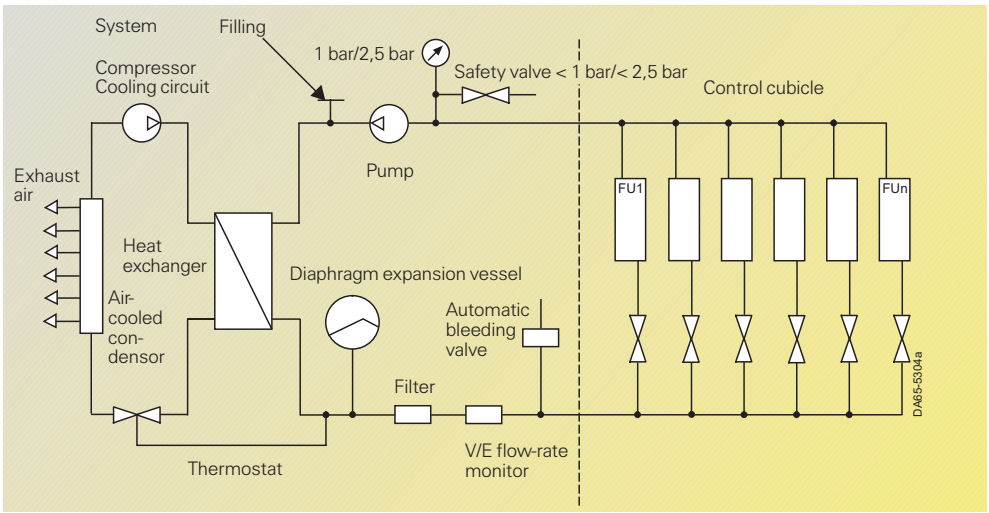


Fig. 6/10
Active cooling unit

Notes on dimensioning of drives

Quadratic load torque drives

Drives with a quadratic load torque ($M \sim n^2$), as for pumps or fans, require full torque at rated speed. Increased starting-torque levels or load surges do not normally occur. It is not therefore necessary for the converters to have an overload capability.

When a suitable converter for drives with a quadratic load torque is being selected, the rated current of the converter must be at least as high as the motor current at full torque at the required load point.

If standard motors type 1LA2, 1LA5, 1LA6, 1LA7 and 1LA8 are used, the full rated power can also be utilized during converter operation. They are then utilized according to temperature class F. If, however, it is only permissible to utilize the motors according to temperature class B, the power output of the motors is to be reduced by 10 %.

Selection of suitable motors and converters for a specific application is supported by the PATH engineering tool (for engineering frequency-converter-supplied three-phase drives).

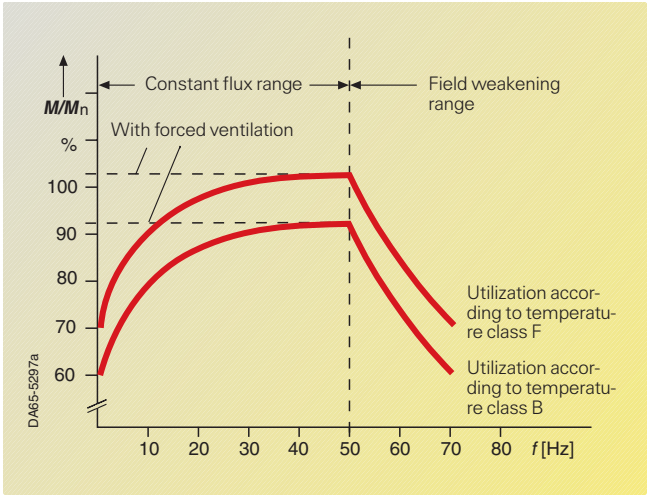


Fig. 6/11
Typical curve of permissible torque in the case of self-ventilated motors (e.g. 1LA) with a rated frequency of 50 Hz.

Drives with constant load torque

During continuous operation, the self-ventilated 1LA motors cannot generate their full rated torque over the whole speed range. The continuously permissible torque is also lowered when the speed is reduced due to the reduced cooling effect. This is illustrated in Fig. 6/11.

Depending on the speed range, a corresponding torque reduction and therefore power-output reduction has to be carried out in the case of self-ventilated motors.

In the case of forced ventilated motors, no reduction of the power output or only a relatively small one is necessary, depending on the speed range.

In the case of frequencies above the rated frequency f_n (50 Hz in Fig. 6/11), the motors are operated in field-weakening range. Here, the available torque is reduced by approximately f_n/f; the power output remains constant. A safety margin of ≥ 30 % from the stalling torque, especially in the control modes with *V/f* characteristic, is to be complied with, which reduces with $(f_n/f)^2$.

In the case of drives with a constant load torque (M = constant) motors and converters are appropriately selected so that, given the permissible torque in continuous operation (S1), an overload of 50 % is possible for 60 s. This usually provides a sufficient reserve for breakaway and accelerating torques.

The base load current of the converter should therefore be at least as high as the motor current at full torque at the required load point.

Selection of suitable motors and converters for a specific application is supported by the PATH engineering tool.

Permissible and non-permissible motor-converter combinations

Rated motor current greater than the rated converter current

If a motor is to be used whose rated current is greater than the rated current of the converter, the following limit is to be complied with, even if the motor is only to be operated under partial load:

For single-motor drives:

$$I_{n\,Motor} \leq I_{max\,Conv.} = 1.36 \times I_{n\,Conv.}$$

For multi-motor drives:

$$\sum_{v} I_{n\,Motor_v} \leq I_{max\,Conv.} = 1.36 \times I_{n\,Conv.}$$

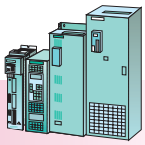
The maximum converter current must be greater or at least equal to the rated motor current of the connected motor or, in the case of multi-motor drives, the total rated motor currents of the connected motors.

If these dimensioning criteria are not complied with, higher current spikes occur due to the lower leakage-inductance levels and can cause tripping.

Lowest permissible rated motor current at the converter

If vector control mode is used, the rated motor current must be at least $^1/_8$ of the rated converter current.

If the *V/f* characteristic is used, this restriction does not apply. If motors with far lower ratings in comparison to the converter rating are used, there are, however, reductions in control quality. This is because the slip compensation, $I \times R$ compensation and I^2t calculation of the motor can no longer be carried out correctly.



Notes on motor engineering

Motor type

In addition to the standard 1LA type motors, compact induction motors, type 1PH7/1PL6, can also be used.

1PH7/1PL6 compact induction motors are to be recommended in the case of

- a high speed range with high maximum speeds
- speeds down to zero without a reduction in torque;
- restricted mounting conditions; 1PH7/1PL6 type motors are, on average, up to two shaft heights smaller than comparable standard induction motors with the same rated power output.

For further information and detailed engineering information, see Catalog DA 65.3.

Supply voltages > 500 V for 1LA1, 1LA5, 1LA6, 1LA7 and 1LA8 motors

The standard insulation of 1LA type motors is designed so that they can be operated with the converter at supply voltages of $V \leq 500$ V (or $V_d \leq 740$ V DC) without any restrictions.

At $V > 500$ V, one of the following is necessary:

- a voltage-limiting filter dv/dt,
- a sinusoidal filter,
- or a strengthened motor insulation system.

For 1LA8 type motors, a winding with a strengthened insulating system has been developed for operating the drive with the converter with a supply voltage of up to 690 V. This winding does not require a filter. These motors are identified with an **"M"** at the 10th position of the Order No., e.g. 1LA8 315-2PM.

With the strengthened insulating system, there is less room in the slots for the same number of winding turns compared to the normal version. This results in the slightly lower rated output for these motors.

Motor protection

Motor protection can be provided by the converter software with I^2t monitoring of the motor. Here, the current motor speed is also taken into account. This monitoring function, however, is not 100 % accurate because the motor temperature is only calculated and not measured. In addition to this, the ambient temperature is not taken into account.

Precise motor protection is possible using motor temperature sensors. In the case of SIMOVERT MASTERDRIVES Vector Control, it is possible to connect a KTY84 temperature sensor or a PTC thermistor directly in the base unit.

- PTC thermistors with a knee in the characteristic curve are evaluated for "Trip" or "Alarm" purposes.
- In the case of KTY84 motor-temperature sensors, the temperature of the motor is evaluated. The temperature value can be output via an analog output.
  The values for "Alarm" and "Trip" can be parameterized and, when reached, this can be output via binary outputs.

The measured temperature of the motor is also evaluated for more precise closed-loop control of the torque.

For explosion-proof, encapsulated 1MJ type motors, it is absolutely necessary that PTC thermistors and tripping units approved by the Physikalisch Technische Bundesanstalt (German regulatory body) are used.

1PH7/1PL6 type motors have a KTY84 motor-temperature sensor in the stator winding as standard. A separate evaluation unit is required for monitoring with PT100 temperature sensors.

Bearing currents

The main causes of damaging bearing currents are circulating currents in the motor as a result of converter supply. They are also caused by currents flowing through the motor bearings due to unfavorable earthing conditions.

In order to provide protection against damaging bearing currents due to circulating currents, an insulated NDE bearing is used for certain motor sizes.

For 1PH7 and 1PL6 type motors, insulated NDE bearings are available as an option for sizes 180 and above (code L27). For size 280, the insulated bearing is standard. For standard 1LG4 and 1LG6 series motors, insulated NDE bearings for sizes 225 to 315 are recommended for converter operation (supplementary order code L27). Insulated bearings are standard for all 1LA1/PQ1/1LA8/1LL8 and 1PQ8 type motors (size 315 and upwards) that are marked as suitable for converter operation.

If the machine connected to the motor shaft is earthed better than the motor itself, damaging current can flow through the motor bearings and through the bearings of the driven machine. In order to avoid this kind of bearing current, the motor housing must be well earthed, e.g. by using a shielded motor cable.

Operating explosion-proof "d" type of protection motors

Siemens 1MJ explosion-proof enclosure EEx de IIC motors can be both mains and converter-fed. For operating these motors with SIMOVERT MASTERDRIVES Vector Control, a blanket certificate of conformance has been issued by the Physikalisch-Technische Bundesanstalt (German regulatory body). Additional testing is not necessary for these drives. In accordance with the test guidelines, 1MJ type motors must be equipped with PTC thermistors.

1MJ type motors have, as standard, terminal boxes with 'increased safety EEx e II' degree of protection.

1MJ type motors can be operated connected to a converter with the rating indicated in Catalog M11 up to output frequencies of 100 Hz. For further details, see Catalog M11 "Low-Voltage Motors".

Notes on selecting power sections

Single drives are frequency converters which are fed separately from the supply system and drive a motor or motor group, group drive, with a variable-speed function.

Converters which are connected to a three-phase supply are used for single drives.

The converter operates standard in motoring mode, and can drive the connected load with clockwise and/or counter-clockwise rotation.

As a single drive, the converter operates independently of other converters or inverters, and individually controls the connected motor or motor group. In this version, single drives can be switched into and out of the process independently via the controller.

If the drive is working regeneratively, e.g. when braking a rotating mass, the energy produced must be converted into heat in a braking resistor. Compact and chassis-type converters need a braking unit for this. Compact PLUS converters already have such a braking unit, which is integrated in the converter. For regenerative mode, only the corresponding braking resistor is to be connected.

If energy recovery to the three-phase supply is required, this can be implemented with rectifier/ regenerative units or AFE.

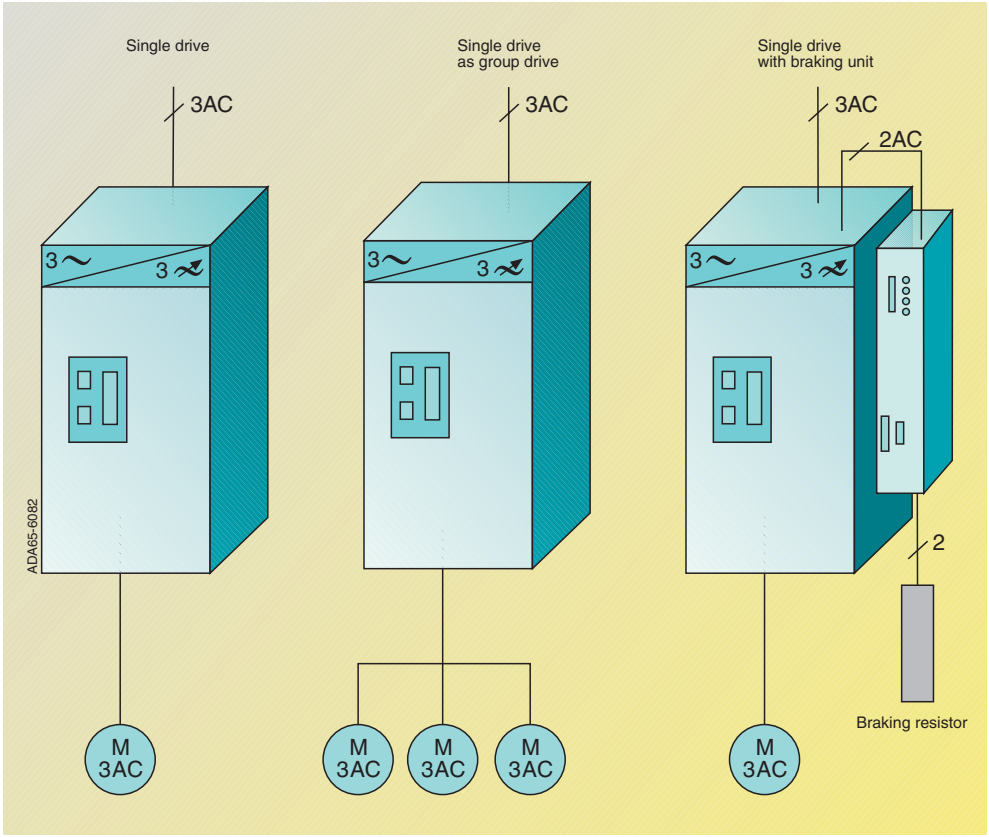


Fig. 6/12
Single drives/single drives as group drives with compact and chassis units

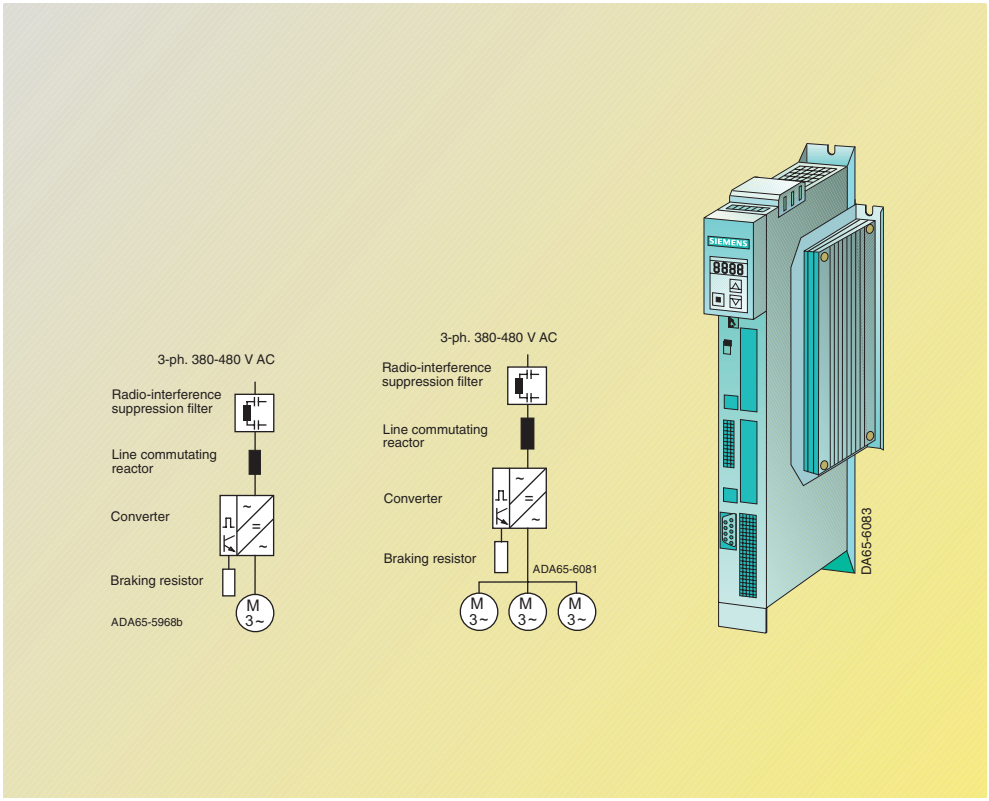
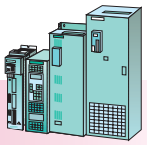


Fig. 6/13
Single drives/single drives as group drives with Compact PLUS



Notes on selecting the power sections (continued)

Converters for the individual drive can be selected according to criteria, with regard to the rated output current, as described in sections entitled "Configuring of drives".

The converters are also available as cabinet units (see Section 4) with the appropriate options.

The converters must be protected, according to requirements, with the permissible overcurrent and short-circuit-limiting components on the system supply side. Depending on customers' needs, additional switchgear may be required.

In the control cabinet, the radio-interference suppression filter should be installed as near as possible to the connecting point for the supply voltage.

Operation of a supply-side main contactor K1 is possible directly via the On function of the terminal strip and the interfaces of the SIMOVERT MASTERDRIVES electronics (external 24 V DC supply needed).

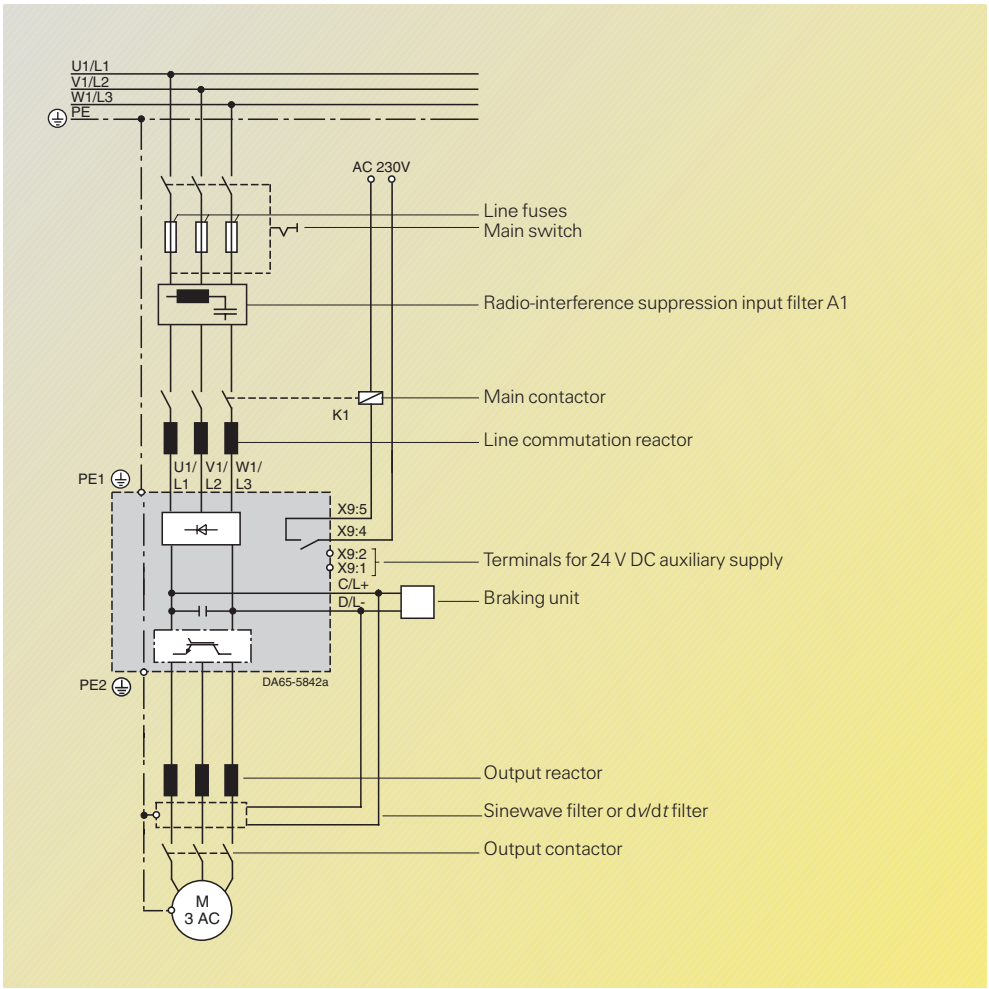


Fig. 6/14
Block diagram of a converter (sizes E to K)

6

For multi-motor drives, inverters are connected to a common DC bus. The DC supply is produced from the three-phase AC system by rectifier units, rectifier/regenerative units or AFE rectifier/regenerative units.

If this method is used with inverters connected to a DC link, the following advantages, in comparison to single converters, can be made use of:

- When individual motors are working in regenerative mode, energy is exchanged via the DC link. If regenerative output sometimes occurs, e.g. simultaneous shutdown of all drives, a central braking unit can be provided.
  The Compact PLUS rectifier units already have an integral braking unit.
- In comparison to single converters, the amount of mounting space required can be reduced. Supply-side components such as fuses, contactors and switchgear as well as line commutating reactors only have to be provided once at a central location.

In order to reduce system perturbations, the central supply rectifier can be either a 12-pulse converter or an AFE rectifier/regenerative unit.

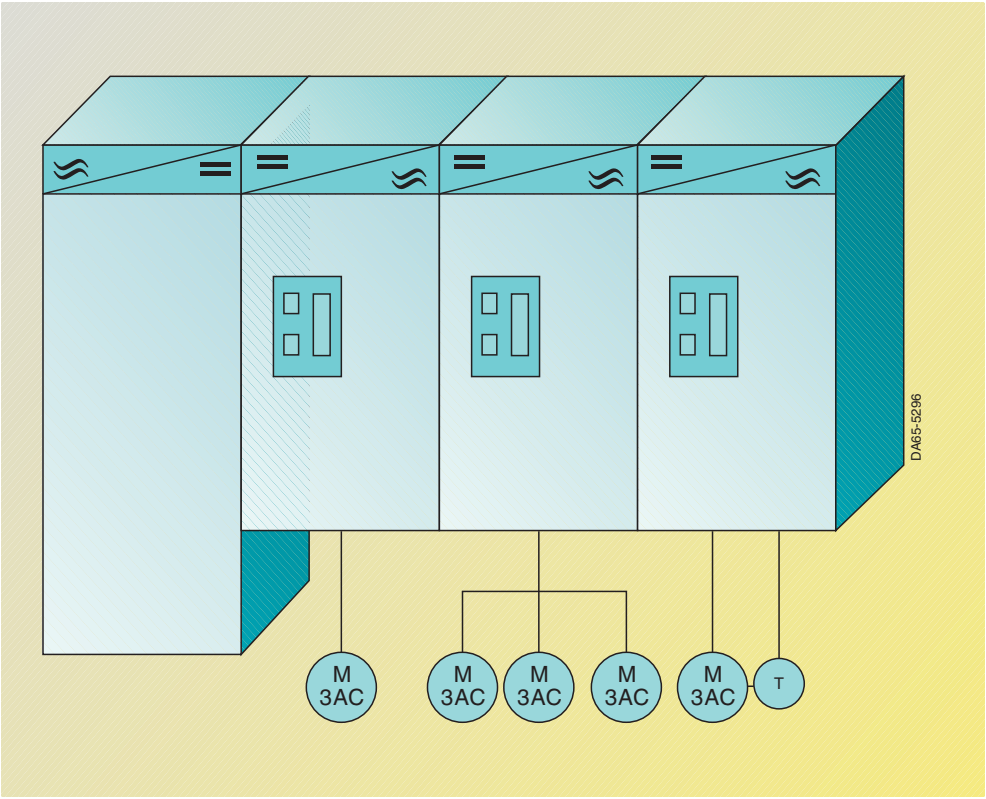


Fig. 6/15
Multi-motor drive

6

Multi-motor drives

Compact PLUS units

Multi-motor drives can be set up with inverters and rectifier units of the type Compact PLUS with a minimum amount of wiring:

They are connected to the DC link by means of tin-plated copper busbars in accordance with DIN 46 433 (E-Cu 3 x 10). The busbars are inserted from above into the terminal blocks of the units. Electrical contact is ensured by spring terminals, tedious screwing is no longer necessary. The electronics of the rectifier unit and inverter then only need to be supplied from an external 24 V power source and the multi-motor system is ready for operation.

Compact PLUS converters can supply additional inverters and are therefore ideal for setting up smaller multi-motor drives. The converter, in this case, supplies power and 24 V to the inverters.

Additional Compact PLUS inverters can be connected to the converter via the DC link busbar. The total rating of all the connected inverters can be as high as the rating of the converter, e.g. a 5.5 kW converter can supply a 4 kW inverter and two 0.75 kW inverters. With regard to the incoming power, a simultaneity factor of 0.8 must be ensured, i.e. the rectifier of the converter is thermally designed for 1.6 times the rating. A switch-mode power supply unit supplies the control electronics of the converter with power from the DC link. The control electronics can also be supplied with 24 V DC from an external source via the X9 connector strip, e.g. in order to maintain communication with a higher-level control unit when the power section is switched off (discharged DC link). The switch-mode power supply unit of a converter also provides power for supplying the control electronics of two inverters. The 6SE7011-5EP60 converter can only supply one additional inverter.

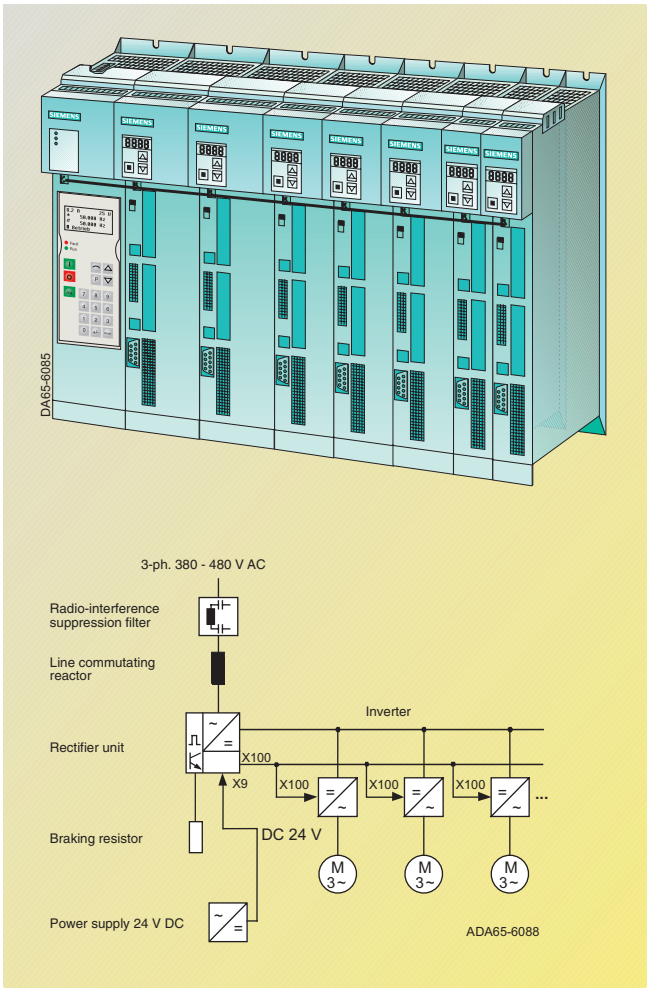


Fig. 6/16
Multi-motor drives with Compact PLUS units

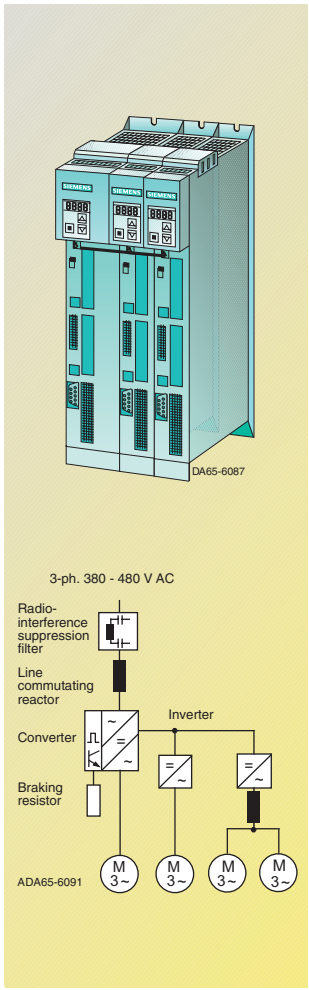


Fig. 6/17
Multi-motor drive with converters and inverters

Short-time power buffering is possible with the capacitor module. The coupling module enables transition of the wiring from the copper busbar system to cables, e.g. for connecting other types of the SIMOVERT MASTERDRIVES series such as compact-type AFE rectifier/regenerative units.

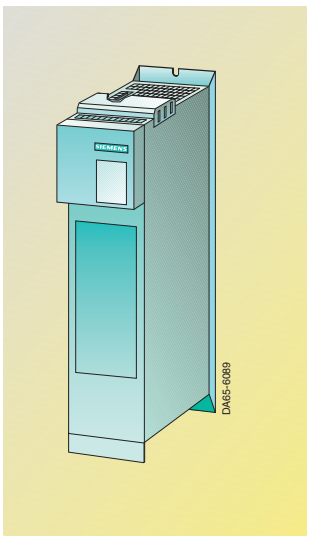


Fig. 6/18
Capacitor module

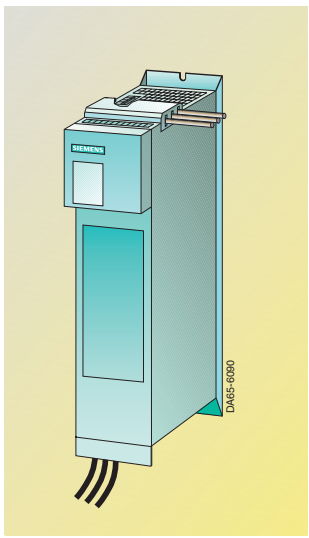


Fig. 6/19
DC link module

Notes on selecting power components

The inverters for the individual drives of multi-motor systems can be selected according to the same criteria relating to rated output current as described in "Quadratic load torque $M \sim n^2$" and "Drives with constant load torque" (page 6/7) for single-motor drives.

If a multi-motor system consisting of inverters and a rectifier unit is to be supplied as a pre-configured cabinet unit from Siemens, this is possible on request via our application workshop.

Fuses are necessary between the inverters and the DC bus. The appropriate fuses are partly integrated in the inverter.

Whether additional switching components are to be provided depends on the particular requirements of the customer.

If the customer requires that the inverter units can be connected and disconnected **during operation**, i.e. when DC link voltage is applied, a precharge circuit is to be provided for the DC link capacitors of the inverter unit (see "DC link components", page 6/48). A switch disconnector connects the inverter to the DC link via precharging resistors, a precharging contactor and a coupling contactor. The contactors needed for this can be operated using the signals, "Operate main/bypass contactor" or "Precharging active", of the rectifier unit.

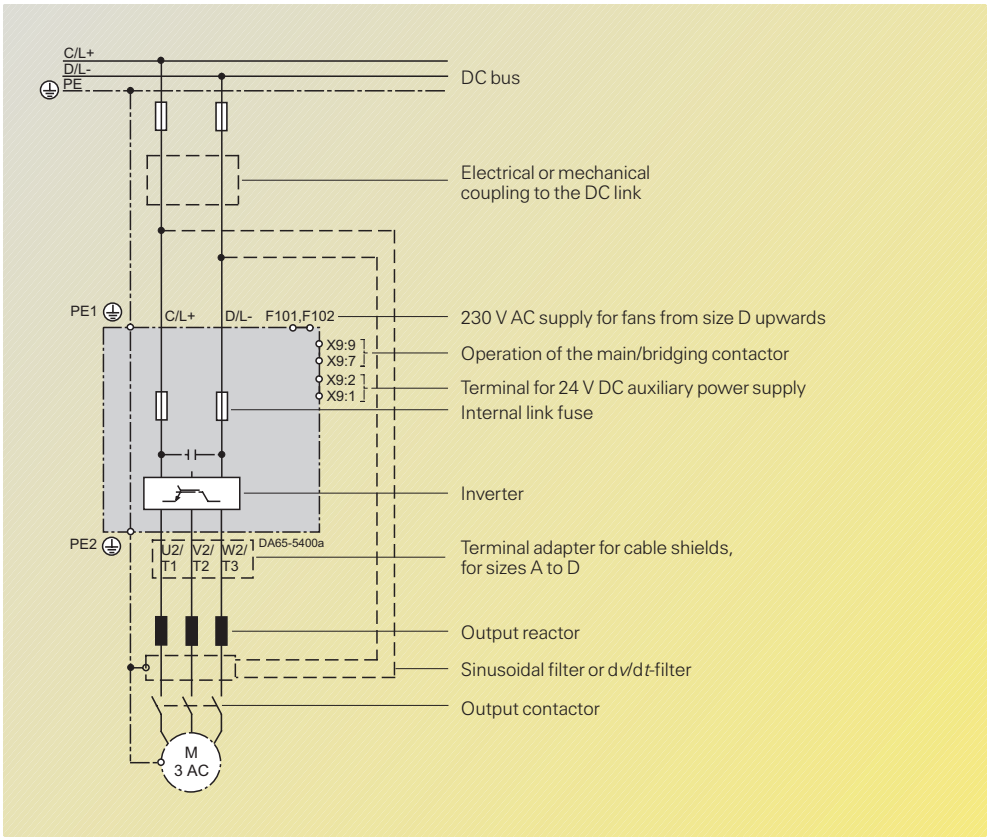
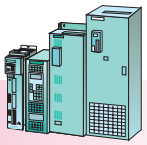


Fig. 6/20
Block diagram of an inverter (sizes A to D, DC voltage ≥ 510 V DC)

Note

The size H and K rectifier units as well as the rectifier/regenerative units determine the connected capacitor load during initialization. If individual inverters are disconnected from the common DC link bus, this must be carried out again. If fixed combinations of inverters are disconnected, the parameters for each combination are known and the control parameters of the rectifier unit or rectifier/regenerative unit can be changed over for each data set.

The self-commutated AFE rectifier/regenerative units do not require initialization. Varying inverter combinations have no effect.



Rectifier units

Rectifier units supply the DC voltage bus for inverters with motoring energy and enable operation of a multi-motor system.

If a multi-motor system consisting of inverters and rectifier unit is to be supplied by Siemens as a cabinet system, this is possible on request via our application workshop.

The supply voltage ranges from 3-ph. 380 V to 690 V AC, 50/60 Hz.

The power output of the rectifier units ranges from 15 kW to 1500 kW in sizes B, C, E and P are analog units and do not have a serial interface, e.g. they cannot be operated with PROFIBUS DP. The sizes H and K are digital units and as described on page 6/55 can be extended with the options for the electronics box.

A maximum of 3 size K units can be connected in parallel. The parallel circuit consists of a master unit and up to 2 slave units (see Section 3). In order to ensure uniform load distribution, line commutating reactors with 2 % v_k must be provided. The rated current must also be reduced by 10 %.

If two rectifier units are supplied from a three-winding transformer, 12-pulse operation is possible. In order to ensure uniform distribution of the load and thus optimum functioning of the 12-pulse supply, a line commutating reactor with at least 2 % v_k (not necessary with a double-tier transformer) is necessary in each secondary-side system.

Note

12-pulse operation with size H and size K units takes place in a master-slave configuration. Interface adapters (Order No. 6SE7090-0XX85-1TAO) and separate cable are necessary, see Fig. 6/21 and also selection and ordering data on page 3/30.

In order to operate the rectifier units, an external 24 V DC power supply is necessary. The current required depends on the size of the unit (see Section 3).

In order to electrically isolate a rectifier unit from the supply system, a main switch and/or a switch disconnector can be connected on the supply side.

The rectifier is powered-up and powered-down by means of a main contactor which, in the event of a fault, also protects the connected rectifier units against overloading (for sizes B, C, E and P).

An effective isolation from the supply and a limitation of system perturbations are achieved by means of a line commutating reactor.

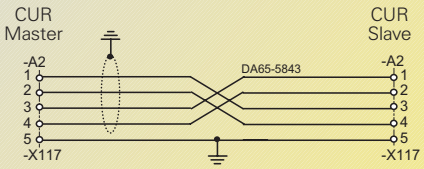


Fig. 6/21
Connection cable type LiYCY 3 x 2 x 0.5 for communication

Note

Rectifier units can only supply a certain number of inverters. The total DC link current flowing on the inverter side must not exceed the rated output DC link current the rectifier unit. When selecting of the rectifier unit, this means that the DC link currents of inverters in regenerative mode are subtracted from the DC link currents of inverters in motoring mode. It must also be noted that the rectifier unit has to precharge the whole effective DC link capacity of the drive.

This results in the following rule:

Compact PLUS rectifier units

- 15 kW

$$I_{zkb\ ee} \geq 0.5 \sum I_{zkb\ wr}$$

- 50 kW and 100 kW

$$I_{zkb\ ee} \geq (0.3...1) \sum I_{zkb\ wrb}$$

Compact sizes B and C rectifier units

$$I_{zkb\ ee} \geq 0.9 \sum I_{zkb\ wr}$$

Chassis sizes E, H and K rectifier units

$$I_{zkb\ ee} \geq (0.3...1) \sum I_{zkb\ wrb}$$

$I_{zkb\ ee}$: Rated DC link current of the rectifier unit

$I_{zkb\ wr}$: Rated DC link current of the inverters

6

Compact PLUS rectifier units

Control functions

The Compact PLUS rectifier units do not have a microprocessor and, after being switched into circuit, immediately charge the DC links of the connected inverters. They are switched on and off by means of the main contactor or the supply voltage. In the event of a fault, a binary output (terminal X91: 1/2) enables the main contactor to be opened. The binary output has a switching capacity of 24 V DC/1 A. If a main contactor with a 230 V coil is used, an interface relay is necessary. The rectifier units are fitted with an integrated brake chopper. For regenerative mode, only a suitable braking resistor has to be connected.

The operating status of the rectifier unit is indicated by three LEDs on the front panel.

When the LEDs light up, they indicate the following operating statuses:

- LED green:
  Rectifier unit ready for operation
- LED red:
  Fault
- LED yellow:
  Brake chopper active

Note

A record of faults is not kept and they do not have to be acknowledged. A fault is indicated as long as the fault signal is being sent (at least 1 s).

If a 100 kW rectifier unit is used to set up a multi-motor drive, it must be ensured that the 120 A current carrying capacity of the copper busbars is lower than the rated DC link current of this rectifier unit. The 100 kW rectifier unit must therefore be placed in the middle of the multi-motor drive and the inverters will then be supplied on the right and left-hand sides via the copper busbars.

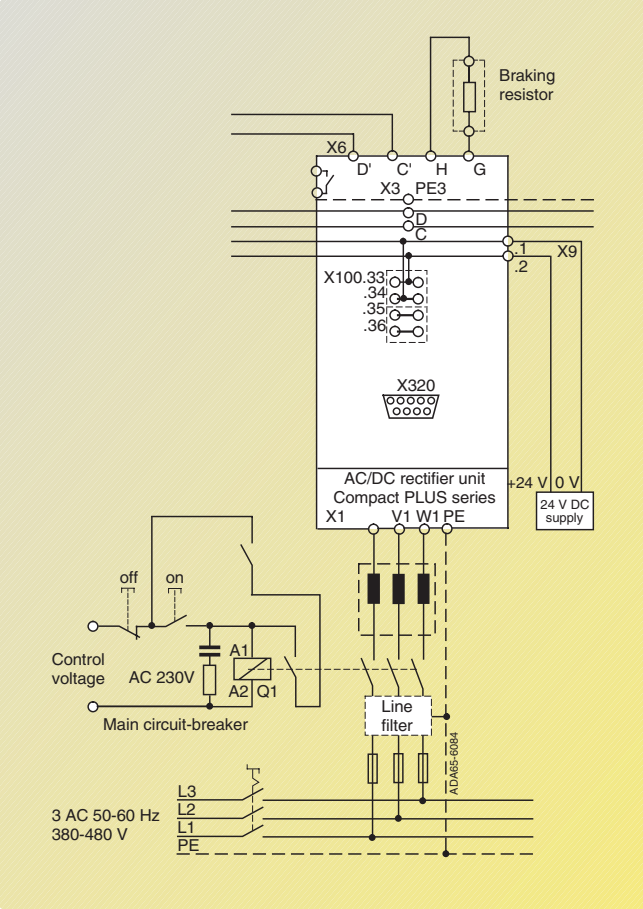
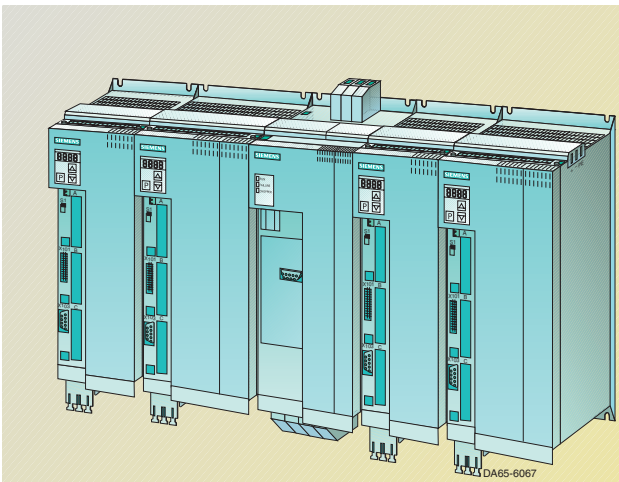


Fig. 6/22
Block diagram of rectifier units, Compact PLUS series



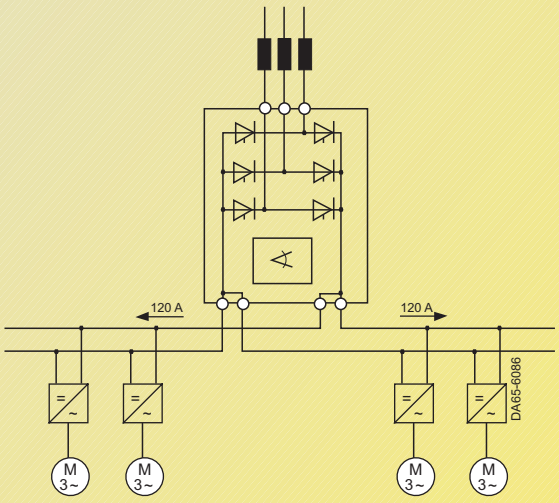
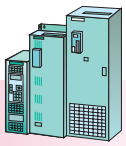


Fig. 6/23
Multi-motor drive with 100 kW rectifier unit



Rectifier units

Control functions

Rectifier units, sizes B, C and E

These rectifier units do not have a processor board and charge the DC link of the connected inverter immediately after it is powered up. They are powered up/down via the main contactor or by turning on/off the supply voltage.

A binary output (terminal X9: 4, 5) with a switching voltage of 230 V AC enables switching of the main contactor in the event of a fault. The signalling contact (terminal X36: 1, 2) can be used to signal "Overtemperature" or "Precharge enable", as required.

Rectifier units, sizes H and K

These rectifier units are equipped with a processor board and an electronics box. Communication with a PLC via PROFIBUS DP or with the USS protocol is therefore possible.

A binary output (terminal X9: 4, 5) with a switching voltage of 230 V AC can be used to operate the main contactor (operation main contactor rectifier/regenerative unit, see Fig. 6/24).

For the control terminal strip functionality, see page 6/43, "Control terminal strip on the CUR control board".

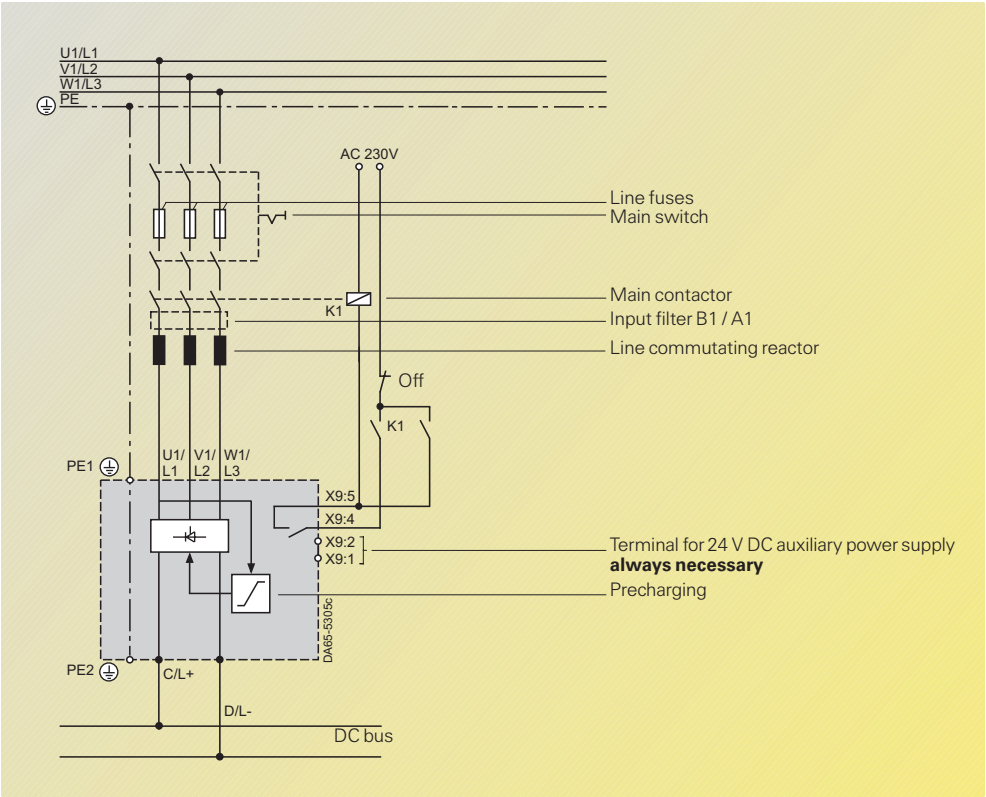


Fig. 6/24
Block diagram of the rectifier unit (sizes B, C and E)

Standard functions for rectifier units, sizes H and K

Basic setting/reserve setting

This function logically combines process data (setpoints and control functions). In other words, it enables, for example, switching from manual operation to automatic operation (internal/external) between two sources, e.g. between the operator control panel (terminal strip, interfaces, dual port RAM) to the terminal strip (interfaces, dual port RAM, operator control panel).

Reserve data sets

This control function includes 4 reserve data sets so that the control parameters can be stored and selected for varying numbers of connected inverters. Selection can also take place during operation. In this way, the rectifier units are able to use modified control data when inverters are powered up/down.

Circuit identification

With this measurement, the parameter settings of the DC link controller for the rectifier units are determined and optimized.

Automatic restart

This restarts the drive when the power returns following a power failure.

Terminal	Function
X9: 1	24 V DC power supply
X9: 2	Ground
X9: 4 / X9: 5	Contact material Ag CdO Operation of main contactor. Load capability: 230 V AC: 7.5 A ($\cos\varphi = 0.4$), L/R = 7 ms, 30 V DC: 5 A; DC 60 V: 1 A. Minimum load: 100 mA
X36: 1 / X36: 2	Contact material AgPb Alarm: Overtemperature, Precharging fault. Load capability: 48 V AC, 60 VA ($\cos\varphi = 1$) to 160 VA ($\cos\varphi = 0.8$); 48 V DC, 24 W Minimum load: 5 mA
X19: 1 X19: 2	Power supply for fans, sizes E, H, K 230 V 50/60 Hz

Assignment of the control terminal strip on rectifier units size B, C, E and H, K (only X19)

Note:
If a size H or K rectifier unit supplies an inverter for which the kinetic buffering function for bridging power failures or dips is activated, the automatic-restart function must be enabled.

Rectifier/regenerative units

Rectifier/regenerative units (line-commutated) not only supply the DC bus for inverters with motor power from a three-phase supply, they also inject regenerative power[1]) back into the line supply from the DC bus. This is done by means of two independent thyristor bridges; the regenerative bridge is connected via an autotransformer (for selection and ordering data, see Section 3).

The autotransformer for the regenerative bridge has the following advantage:

- maximum motor torque at full motor speed, even when regenerating.

When a rapid changeover from infeed to regeneration is carried out, a dead time of 15 ms has to be taken into account.

Rectifier/regenerative units can only be ordered as chassis units for mounting in control cubicles.

If a multi-motor system, consisting of inverters and rectifier/regenerative unit, is to be supplied from Siemens ready made as a cabinet version, this is possible on request via an application workshop.

The supply voltage ranges from 3-ph. 380 V AC to 690 V AC, 50/60 Hz.

Rectifier units for 3-ph. 50/60 Hz 380 V AC to 3-ph. 50/60 Hz 480 V AC can also be connected to 3-ph. 50/60 Hz 200 V AC to 3-ph. 50/60 Hz 230 V AC with the same rated current; the output power is reduced according to the ratio of the supply voltages.

The output range of the rectifier/regenerative units is from 7.5 kW to 1500 kW in sizes C, E, H and K.

Parallel switching of size K parallel units

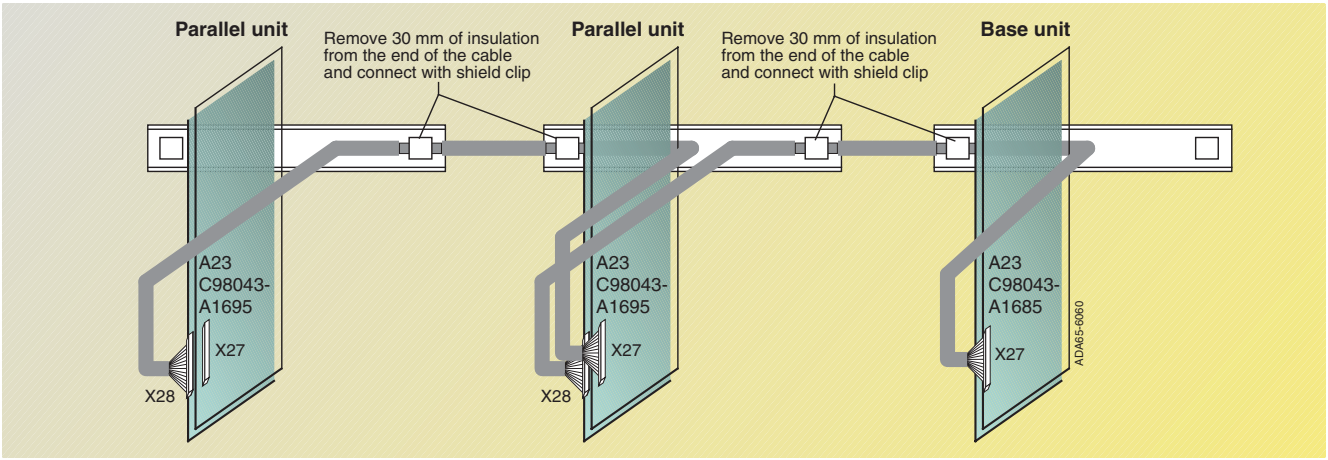


Fig. 6/25
Base and parallel units

Up to 2 units with the same rated current can be connected in parallel to the power sections of rectifier units or rectifier/regenerative units of type K ("base unit") in order to increase output current.

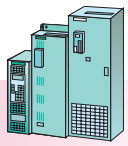
The parallel circuit consists of a master unit and up to 2 slave units.

The parallel units are to be mounted on the left side of the base unit.

In the following table, the parallel units suitable for a parallel connection are assigned to the respective base units.

Base unit (Master) Type	Parallel unit (Slave) Type
Rectifier units	
6SE7041-3EK85-0AA0	6SE7041-3EK85-0AD0
6SE7041-8EK85-0AA0	6SE7041-8EK85-0AD0
6SE7041-3FK85-0AA0	6SE7041-3FK85-0AD0
6SE7041-5FK85-0AA0	6SE7041-5FK85-0AD0
6SE7041-8FK85-0AA0	6SE7041-8FK85-0AD0
6SE7041-3HK85-0AA0	6SE7041-3HK85-0AD0
6SE7041-5HK85-0AA0	6SE7041-5HK85-0AD0
6SE7041-8HK85-0AA0	6SE7041-8HK85-0AD0
Rectifier/regenerative units	
6SE7041-3EK85-1AA0	6SE7041-3EK85-1AD0
6SE7041-8EK85-1AA0	6SE7041-8EK85-1AD0
6SE7041-3FK85-1AA0	6SE7041-3FK85-1AD0
6SE7041-5FK85-1AA0	6SE7041-5FK85-1AD0
6SE7041-8FK85-1AA0	6SE7041-8FK85-1AD0
6SE7041-3HK85-1AA0	6SE7041-3HK85-1AD0
6SE7041-5HK85-1AA0	6SE7041-5HK85-1AD0
6SE7041-8HK85-1AA0	6SE7041-8HK85-1AD0

1) Generating mode is permissible with 92 % of the rated DC link current.



Rectifier/regenerative units (continued)

When planning parallel switching, it must be ensured that (due to the distribution of current among the power sections) the output current is 10% less than the total of the rated currents of the individual power sections.

For uniform distribution of current between the basic unit and parallel unit(s), the following is necessary:

- Use of identical power sections (for assignment of basic unit and parallel unit(s), see table)
- Phase coincidence at the rectifier/regenerative power-section connections between basic unit and parallel unit(s)
- Separate commutating reactors and (in the case of rectifier/regenerative units), separate autotransformer with the same technical data for basic unit and parallel unit(s). Each individual parallel path must have a minimum v_k value of 2%.

Rectifier/regenerative units

In the case of very high v_k values of the incoming power supply ("soft power supply"), primary connection of the autotransformer must be directly at the point of incoming power (before the commutating reactors). This is necessary to ensure that the total v_k value in the regenerative direction is not too high.

If the total v_k value in the regenerative direction is very high, the thyristor commutating time is increased, thus making it necessary to reduce the inverter stability limit (parameter P776). This can make it necessary to lower V_d.

Preconditions:

- Same fuses for basic unit and parallel unit(s)
- Same cable lengths to the power-section terminals of basic unit and parallel unit(s)
- Do not use any output reactors in the DC link

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

The scope of supply of a parallel unit includes a 4 m 50-pole shielded round cable (Order No. as spare part: 6SY7010-8AA00).
Order No. for 10 m cable, round, shielded: 6QX5368 (other lengths on request).

Up to 3 size-K units can be connected in parallel. The parallel circuit consists of a master unit and up to 2 slave units (see Section 3). For uniform division of power, line commutating reactors with at least 2% v_k must be provided. In this case, the rated current must be reduced by 10%.

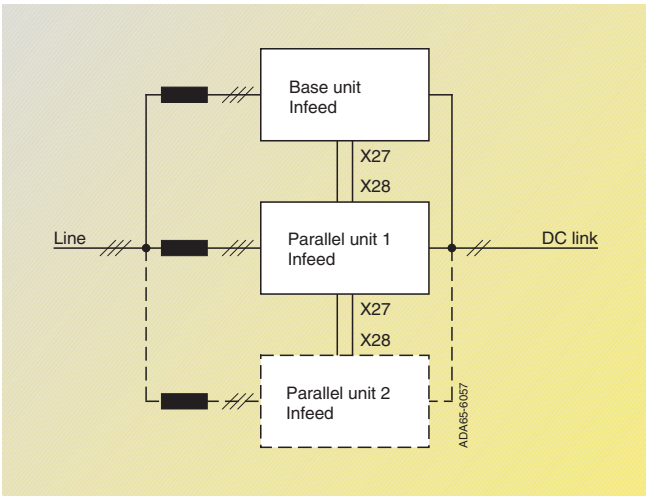


Fig. 6/26
Parallel circuit with rectifier units

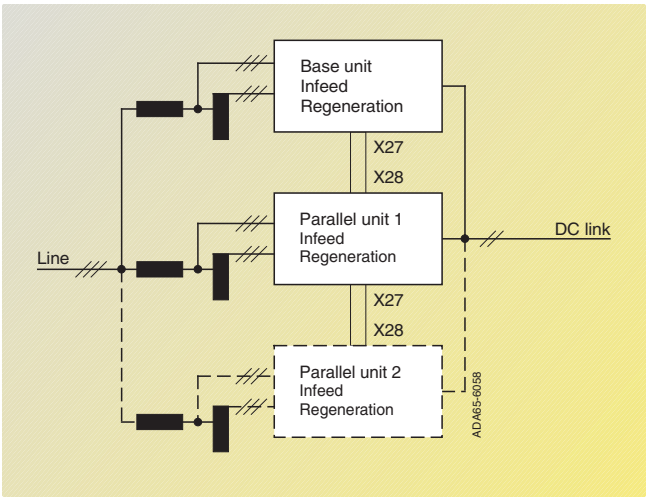


Fig. 6/27
Arrangement of "rigid power supply"

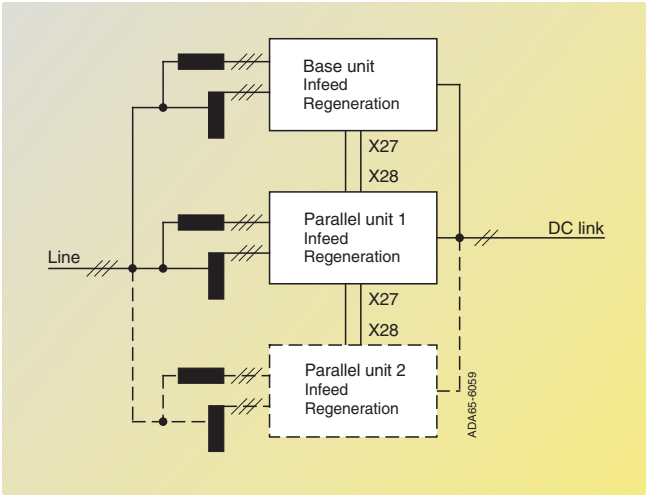
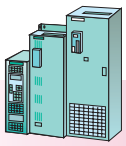


Fig. 6/28
Arrangement of "soft power supply"



Rectifier/regenerative units (continued)

12-pulse operation

Supplying two rectifier/regenerative units via a three-winding transformer enables 12-pulse operation. In order to enable a uniform load distribution for these rectifier/regenerative units and thus optimum working of the 12-pulse system, a line commutating reactor with at least 2% v_k (not required in the case of a double-tier transformer) is necessary in each secondary-side system.

Note

12-pulse operation with size H and K units takes place in a master-slave configuration. Interface adapters (Order No. 6SE7090-0XX85-1TA0) and separate cables are necessary, see Fig. 6/21 and also selection and ordering data, page 3/32.

Standard design

- supply connecting panel for motoring rectifier bridges
- supply connecting panel for generating, anti-parallel rectifier bridges
- 6-pulse thyristor bridge for the motor torque direction; 6-pulse anti-parallel thyristor bridge for the generative torque direction; earth-fault-proof precharging.
- PMU parameterizing and operator control unit
- electronics box with CUR control board
- DC link connecting panel

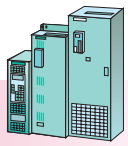
Note

Rectifier/regenerative units can only supply a certain number of inverters. The total DC link current flowing on the inverter side must not exceed the rated output DC link current of the rectifier unit. When selecting the rectifier unit, this means that the DC link currents of inverters in regenerative mode are subtracted from the DC link currents of inverters in motoring mode. It must also be noted that the rectifier unit has to precharge the whole effective DC link capacity of the drive.
This results in the following ruling regarding dimensions:

$$I_{\text{zkb ee}} \geq (0.3...1)\sum I_{\text{zkb wrb}}$$

$I_{\text{zkb ee}}$: Rated output DC link current of the rectifier/regenerative unit

$I_{\text{zkb wr}}$: Rated DC link current of the inverters



Rectifier/regenerative units (continued)

The rectifier/regenerative units require a relative impedance voltage of at least 5 % on the supply side. This is achieved by using a 4 % line commutating reactor or an appropriate converter transformer. The rectifier/regenerative units are decoupled from the supply and system perturbations are limited in accordance with DIN VDE 0160.

The maximum relative impedance voltage must not, however, exceed 10 %. In practice, the following combinations can be expected.

Supply (transformer)	Line reactor	Autotransformer
$v_D \leq 3\,\%$	4 %	2 %
$3\,\% < v_D \leq 6\,\%$	2 %	2 %
$6\,\% < v_D \leq 8\,\%$	without	2 %

Note on 12-pulse operation

For this purpose, three-winding transformers with 6 % v_D should be provided. In addition, 2 % line commutating reactors are to be built in for uniform load distribution. In the case of double-tier transformers it is possible to eliminate the line commutating reactors. An external 24 V DC power supply is required for operating rectifier/regenerative units. The current required depends on the rating of the unit (see Section 3).

In order to electrically isolate a rectifier unit from the supply system, a main switch and/or a switch disconnector can be connected on the supply side.

The rectifier is powered-up and powered-down by means of a main contactor which, in the event of a fault, also protects the connected rectifier/regenerative units. It is imperative that the main contactor is controlled via the equipment electronics (X9: 4 to 5). If the main contactor is actuated by bypassing the equipment

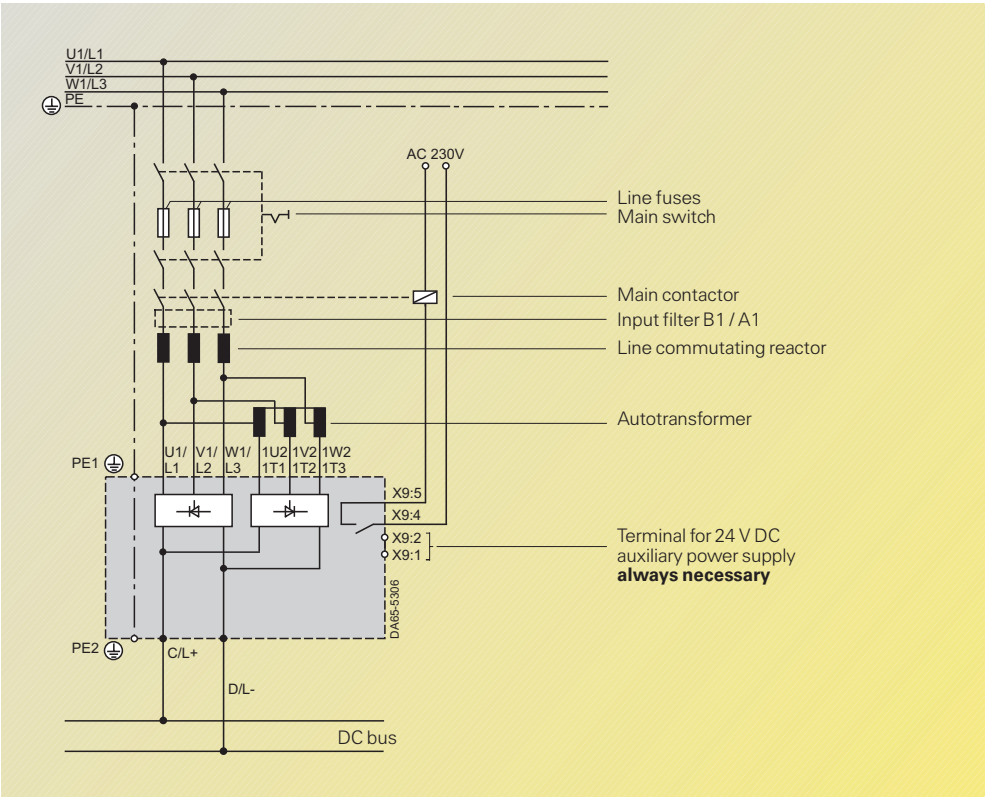


Fig. 6/29
Block diagram of the rectifier/regenerative unit

electronics in regenerative mode, fuses in the unit are triggered or thyristors shoot through (converter communication failure). The emergency Stop circuit must be set up so that the equipment electronics receive the Stop command first and thus disconnects the main contactor from the supply. Only after a delay is the supply for the main contactor disconnected by the emergency Stop circuit.

The electronics box of the rectifier/regenerative unit contains the CUR control board. It can accommodate two additional boards (communication and/or technology board). The rectifier/regenerative unit can thus be automated with PROFIBUS DP and can perform distributed technological tasks using the technology boards.

The open-loop and closed-loop control functions are fully digital with a microprocessor system and ASICs implemented on a PC board using SMD technology (CUR board):

- sequence control and operator control via PMU
- gating unit and command stage
- voltage and current controllers
- monitoring function and actual-value processing
- terminal strip
- communication via dual-port RAM and the SCom1 basic unit serial interfaces.

For information on the control terminal strip on the CUR board, see page 6/43.

The rectifier/regenerative units have the same standard functions as the rectifier units, sizes H and K; see page 6/16.

Overcurrent protector units for rectifier/regenerative units

The OCP unit can be used for new projects and existing installations. For the scope of supply and the assignment to rectifier/regenerative units, see Section 3.
When it is retrofitted, the positive busbar between the rectifier/regenerative unit and the inverter has to be divided and the OCP unit then looped in. The negative busbar is not affected (the correct flow of current must be ensured – incoming current via diode, feedback current via IGBT). The OCP unit must be built into an additional cabinet or, in the case of retrofitting, on the roof of an existing cabinet (horizontal).
The units are air-cooled. It must be ensured that the additional heat loss which occurs can be removed. It is calculated as the product of

- the DC link current and the diode's forward voltage in supply mode or
- the DC link current and the voltage drop at the IGBT in regenerative mode.

The efficiency of the rectifier/regenerative unit is only minorly influenced.

If the motor current is constant, the DC link current depends on the speed. For an economically efficient design of the rectifier/regenerative unit and the OCP unit, this feature of operation must be taken into account. Only at full speed, for example, is the full motor current taken as DC link current. At lower speeds, the DC link current can be reduced proportionally. For this reason, the OCP unit has been designed in duty class II in inverter mode with a delta function (see page 3/36, Fig. 3/11).
The necessary version of the hardware and software of rectifier/regenerative units must be checked, especially when retrofitting:

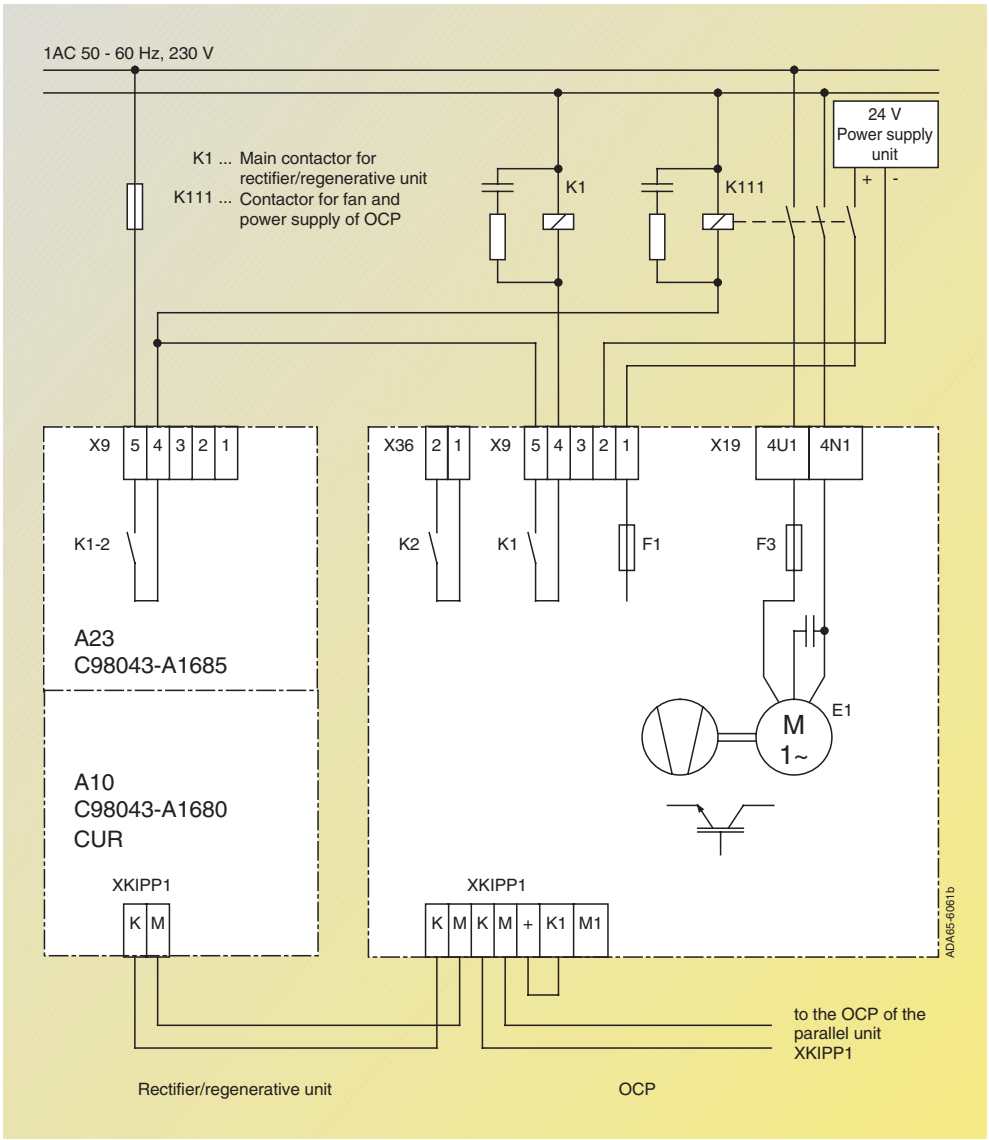


Fig. 6/30
Connection diagram of the controller

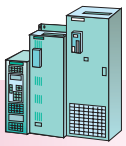
- CUR electronics board of the rectifier/regenerative unit:
  ≥ Version 13.
  Order No. for upgrading:
  6SE7090-0XX85-1DA0
  (without EPROM)
- Software version for rectifier/regenerative unit:
  ≥ Version 4.5.
  Order No. for upgrading:
  6SW1701-0DA14 (EPROM).

As a component of the SIMOVERT MASTERDRIVES drive system, the OCP unit is protected by the fuses in the rectifier/regenerative unit and in the DC link of the inverter and does not require extra fusing. It is self-protected by the electronically triggered power cut-off feature in normal operation.

Similar to the rectifier/regenerative units, the OCP unit must be supplied with 24 V DC from an external source because of the electronics (maximum power intake 0.5 A at 24 V).

Due to air-current monitoring, the OCP unit's fan must always be connected in circuit with the external 24 V DC supply (see Fig. 6/30). Here, a switch-off delay (approx. 15 s) of K111 is advantageous due to fan coasting.

Due to the OCP unit's own air-current monitoring function, the equipment is prevented from being switched off in an uncontrolled manner in the event that the OCP unit fan is defective (warning signalled by a floating relay contact, fault signalled by another floating relay contact). Inside the unit, the fan is protected by a fuse. The fan type and fuse are the same as those in the rectifier/regenerative unit.



Overcurrent protector units for rectifier/regenerative units (continued)

A two-pole control cable (XKIPP1, see Fig. 6/30) must be laid between the CUR electronics board of the rectifier/regenerative unit and the stall protection device.
Apart from correct assignment of the OCP unit to the rectifier/regenerative unit (rated current and rated voltage) and correct connection of the OCP unit, no further settings or adaptations have to be carried out on the OCP unit.

Parallel connection of size K rectifier/regenerative units with OCP unit

- 6-pulse circuits:
  If rectifier/regenerative units are connected in parallel, an OCP unit must be connected between each rectifier/regenerative unit and the DC link. Each of the parallel-connected units needs its own OCP unit in the cable leading to the DC link. The OCP units are to be connected to each other by means of control cables between the XKIPP1 terminal strips.
- 12-pulse circuits:
  In the case of 12-pulse circuits, it is also possible to use one OCP unit for both rectifier/regenerative units provided that the total rated current of the individual units together does not exceed the rated current of the OCP unit. In this case, however, it must be noted that redundancy no longer exists if one rectifier/regenerative unit fails, the reason being that the failed unit switches off the OCP unit via terminals K and M.

Operation with non-Siemens rectifier/regenerative units

The OCP unit was specially developed for line-commutating rectifier/regenerative units of the SIMOVERT MASTERDRIVES drive system. A special advantage of the software of the rectifier/regenerative unit is that stalling of the inverter is detected at an early stage and a switch-off signal is sent to the OCP unit. In this way, formation of a high "stalling current" can be prevented in nearly all cases.
In exceptions, this signal may be too slow. The IGBT is then switched off by means of its own V_{CE} monitoring function, whereby higher overcurrents have to be handled which affect the voltage surge suppressors and reduces their lifetime.
It can be assumed that, in the case of non-Siemens rectifier/regenerative units, this special software function does not exist and there is a high switching load every time the inverter stalls.
Combination with a non-Siemens rectifier/regenerative unit is therefore not advisable.

AFE rectifier/regenerative unit (Active Front End)

Function

The AFE rectifier/regenerative unit's main components are a voltage source DC link converter with a CUSA control board. From a three-phase power supply, it generates a regulated DC voltage, the so-called DC link voltage. This DC link voltage is kept almost constant irrespective of the supply voltage, even during regenerative operation.

On the three-phase side, a supply-angle-oriented high-speed vector controller is subordinate to the DC link voltage controller. This vector controller impresses an almost sinusoidal current towards the supply and, with the help of the Clean Power filter, minimizes network perturbations.

The vector controller also enables the power factor cos φ and thus reactive power compensation to be set, whereby the drive's power requirement has priority.

The VSB board (Voltage Sensing Board) functions as a supply-angle encoder and works according to a principle similar to that of an encoder.

Power spectrum

	AFE compact units	AFE chassis units	AFE cabinet units
Infeed rating	6.8 kW to 49 kW at 400 V	63 kW to 250 kW at 400 V 51 kW to 192 kW at 500 V 70 kW to 245 kW at 690 V	Standard cabinet unit 37 kW to 1200 kW Application 1200 kW to 6000 kW
Design	Compact A to D	Chassis E to G	–

Caution!

AFE inverters are aligned inversely to the supply and are not capable of functioning autonomously. In order to function, they need at least the following system components:

For the compact units

- Precharger
- Main contactor
- AFE reactor
- VSB voltage sensing board

For safety reasons, an AFE rectifier/regenerative unit must be connected to the supply via a line contactor. An external 24 V power supply is therefore always necessary for supplying the VSB board and the AFE inverter.

For the chassis units

- AFE supply connecting module

This module contains a Clean Power filter and also main circuit-breaker with fuses, the 230 V power supply and 24 V power supply as well as the VSB, precharger and the main contactor.

Technical characteristics

Optimum infeed and regenerative feedback

SIMOVERT MASTERDRIVES AFE are 100 % capable of regenerative power feedback without the need for an auto-transformer. Even during regenerative mode, power losses do not occur as is the case with a braking resistor. The transition from motoring to regenerative mode is stepless, with pulse-frequency response. The exactly regulated DC link voltage ensures optimum supply of the drive inverter, almost independently of the supply voltage.

Minimal network perturbations thanks to AFE with Clean Power technology

With SIMOVERT MASTERDRIVES AFE, harmonics and commutating dips are avoided, except for a very small residue. Optimum matching between the electronically controlled active section (AFE inverter) and the passive section (Clean Power filter) ensures that almost sinusoidal voltages and currents are impressed in the direction of the supply. Network perturbations practically no longer occur.

Maximum availability even if the supply system is instable

With SIMOVERT MASTERDRIVES AFE, it is possible to intentionally operate a drive system reliably irrespective of the properties displayed by the power supply, i.e. active protection against power outages, overvoltages, frequency and voltage fluctuations by means of AFE vector control and high-speed electronic monitoring. The downstream Clean Power filter provides optimum passive protection against transient power peaks.

If the voltage moves outside the permissible range or if it fails completely, the electronics reports the problem immediately and the AFE disconnects the drive from the supply by actively switching it off. As a consequence, inverter commutation failure with fuse tripping can no longer occur even during regenerative mode. The back voltage of the AFE inverter to the supply is impressed with a high control and pulse frequency and tolerates even very short power interruptions in the millisecond range. In the case of single-phase power dips, the controller distributes the power to the other two phases and can continue to work for seconds.

AFE rectifier/regenerative unit (Active Front End) compact and chassis units

Optimum power conversion

Because the AFE method does not place stress on the power supply systems by producing harmonics, the supply currents are lower. Supply components can thus be rated lower than with conventional methods. This applies to the line transformer, the supply cables as well as the fuses and the switches.

Optimum drive utilization due to the step-up controllability of the AFE technology

Because the DC link voltage is kept constant irrespective of the supply voltage, lower rating of the drive inverters and motor currents is also possible.

Uniform configuration

Because the AFE method is free of system perturbations and very robust when it comes to line-voltage and frequency fluctuations, uniform, reliable and simple configuration is possible with regard to the power-supply properties and system perturbations.

Supply voltage range

SIMOVERT MASTERDRIVES AFE can be operated from a 3-phase power supply system with or without an earthed neutral point.
Supply voltage ranges:
3 ph. 380 V AC -20 % to 460 V AC +5 %
3 ph. 500 V AC -20 % to 575 V AC +5 %
3 ph. 660 V AC -20 % to 690 V AC +5 %.

Power system tolerances

A high-performance vector controller with high-speed encoder (VSB) enables operation from power systems whose properties fluctuate and are difficult to define.

The following therefore applies to power system undervoltages:

a) In the case of short voltage dips, i.e. < 1 min, and up to 30 % of rated voltage, unrestricted operation is possible. If a long-term deviation from the rated value occurs, the power configuration must be adapted.
b) In the case of short voltage dips lasting from approx. 20 ms to 1 min and up to 50 % of the rated voltage, a special auxiliary power supply must be provided and the power correspondingly configured.
c) Transient supply undervoltages in the range < 20 ms are tolerated up to 50 % of the rated voltage.
d) In the case of supply dips of > 50 %, the AFE actives switches off with the fault "Supply undervoltage" and the line contactor is opened.

The following therefore applies to supply overvoltages:

a) Transient supply overvoltages in the range of 10 ms are tolerated up to 50 % of the rated voltage.
b) The continuously tolerated maximum voltage is 485 V supply voltage rms for 400 V units, 605 V supply voltage rms for 500 V units and 725 V supply voltage rms for 690 V units.
c) Short-time overvoltages of 20 % to 30 % in the range of 1 s to 1 min can be tolerated, depending on the loading level. In the case of 690 V units, this is only 10 to 20 %.

AFE MASTERDRIVES in a master-slave circuit

AFE rectifier/regenerative units can be connected in parallel by cascading (master-slave mode). Power outputs can thus be combined as if they were modules, and redundant arrangements are possible.

The following is applicable: The power outputs do not have to be the same and it is permissible to mismatch them up to a ratio of 1:4. Whereas only one unit can work as the master, the number of slaves can be ≥ 1. Previously, master/slave combinations with only one slave were used.

Functioning of the master unit (AFE master)

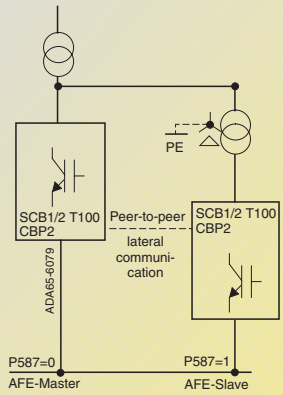
- In connection with AFE function, the "MASTER" unit is responsible for controlling the DC link voltage V_d. The output of the V_d controller (observation parameter r263) must be sent as a current setpoint to the slave.
  The unit is defined as the master by means of parameter P587 "Slave AFE" = 0.
  Parameter P443 (V_d setpoint) is then processed as the main setpoint.

Functioning of the slave unit (AFE slave)

- The slave unit takes and controls the current setpoint I_{ActSet} from the master unit. The unit is defined as the slave by means of parameter P587 "Slave AFE" = 1.
  Parameter P486 (I_{Set}) is then processed as the main setpoint.

Data link between master and slave

- 1. SCB1/2 or T100 peer-to-peer link
  2. PROFIBUS slave-to-slave communication CBP2, slave-to-slave communication can be parameterized by means of Drive ES.



For the slave unit, its own low-voltage isolation transformer **must** be assigned.

Data:

Winding connection: Dyn5
Transmission ratio 1:1
v_k = 4% to 6%
Rated apparent power of the transformer at least 1.2 times the rated power of the AFE.

Fig. 6/31

Clean Power filter

Whereas the Clean Power filter is generally necessary for the chassis units (sizes E to G), it is optional in the case of Compact units.

For very small line transformers, i.e. for a power ratio of P_{AFE} to P_{Trans} = 1:5, use of this filter is recommended (e.g. if P_{AFE} = 6.8 kW , a Clean Power filter should be used where the line transformer output < 34 kVA).

Basic interference-suppression board

The basic interference-suppression board must be used if an EMC filter has not been configured so that at least basic EMC interference-suppression is ensured. It is only permissible to use this board on earthed supply systems.

AFE rectifier/regenerative unit (Active Front End) compact and chassis units (continued)

Nominal power rating and rectifier/regenerative power

The rectifier/regenerative power describes the actual possible power of the AFE inverter when $\cos\varphi = 1$ and the rated voltage is applied. There is also the term "nominal power rating." This is a purely formal term which is based on the way of thinking relating to motor-side inverters and is intended to facilitate the stocking of spare parts. The background to this is that the power sections of the AFE inverters are designed identically to the power sections belonging to the standard inverters of the SIMOVERT MASTERDRIVES series. Special stocking of spare parts is therefore not necessary.

Example:

An AFE inverter with 6.8 kW infeed/regenerative power has the order number 6SE7021-0EA81. What spare parts and how many are stocked can then be derived from the basic inverter with a nominal power rating of 4 kW, i.e. an inverter type 6SE7021-0TA61.

Ordering examples

1st example
AFE rectifier/regenerative unit with 63 kW, 400 V (chassis unit) with operating instructions
Item 1
AFE supply connecting module
6SE7131-0EE83-2NA0
Item 2
AFE inverter
6SE7031-0EE80
Item 3
Operating instructions
6SE7080-0CX86-2AA0

2nd example
AFE rectifier/regenerative unit with 6.8 kW, 400 V (Compact unit with minimum configuration) with EMC filter
Item 1
AFE inverter
6SE7021-0EA81
Item 2
VSB with housing
6SX7010-0EJ00
Item 3
AFE reactor
6SE7021-3ES87-1FG0
Item 4
Precharging resistors
6SX7010-0AC81 (3 pieces)
Item 5
EMC filter
6SE7021-0ES87-0FB1
Recommendation for line and precharging contactor:
3RT1016 with 24 V actuation.

Note

A 24 V power supply must be provided externally.

Rated data and continuous operation of the AFE inverters

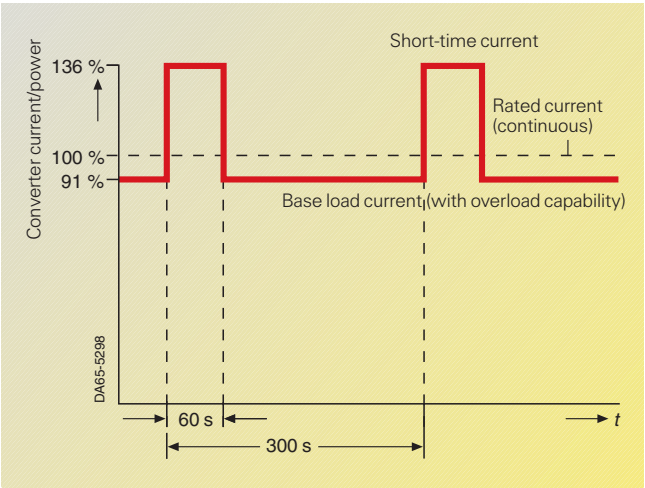


Fig. 6/32
Definition of the rated value and also the overload and base load values

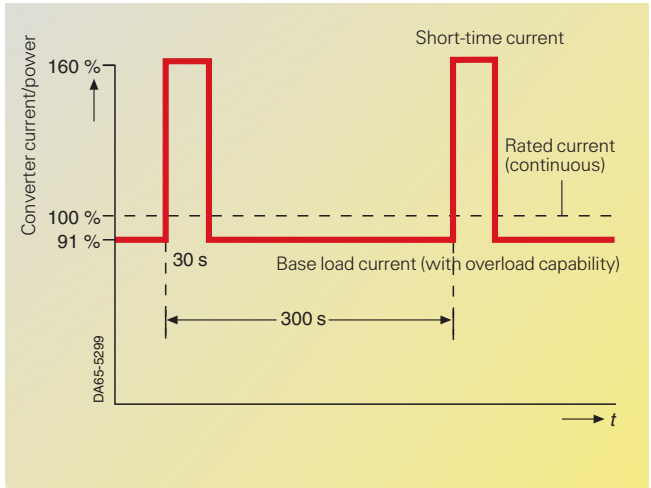


Fig. 6/33
Additional definition of the rated value and the overload and base load values

The line voltage used as a basis is 400 V in the case of Compact units and 400 V, 500 V or 690 V in the case of chassis units. The power section is protected against overload using I^2t monitoring.

The units are designed for continuous operation with an AFE input current I_{UN}. If this current is used over a long period of time (> 60 s), corresponding to the 100 % value of Fig. 6/20 or 6/21, the unit reaches its maximum permissible operating temperature and the I^2t monitoring does not allow any overload above this.

AFE rectifier/regenerative unit (Active Front End) compact and chassis units (continued)

Overload capability of the AFE inverters

For explanations, see "Overload capability of the converter" (see page 6/2).

Installation conditions and correction factors

For explanations, see page 6/3.

AFE inverters with a large power output

AFE inverters can be connected in parallel for increasing the power output. For configuration, please contact one of our offices in your vicinity (see appendix).
The largest cabinet unit has a nominal power rating of 1200 kW at 690 V.
The largest chassis unit has a nominal power rating of 200 kW at 690 V supply voltage.
The largest Compact unit has a nominal power rating of 37 kW at 400 V.

Water-cooled AFE inverters Cooling circuit

For explanations, see pages 6/4 to 6/6.

Notes on dimensioning of the AFE rectifier/ regenerative power

Appropriate selection of the AFE inverters is supported by the PATH engineering tool.

Due to the sinusoidal, precisely controlled voltages and currents, SIMOVERT MASTERDRIVES AFE can be designed very simply and reliably.

The following applies:
$P_{AFE} = 1.73 \cdot V_{Supply} \cdot I_{AFE} = P_{mech} + P_{Losses}$

The power loss is determined by the efficiency of the inverters and the motor. The mechanical power, i.e. the product of the motor torque and the motor speed, is defined by the application. What is decisive for dimensioning, therefore, is the power and not the torque as is the case with drive inverters. One or several inverters can be connected to the output. The maximum power of the connected inverters can be 4 times the rated power of the AFE inverter. The sum of the power taken from the supply is not permitted to continuously exceed the rated power of the AFE inverter.

Methods of operation and control

There are several ways of operating and controlling the unit:

- via the PMU parameterizing unit
- via an optional OP1S operator panel
- via the terminal strip
- via a serial interface.

In combination with automation systems, the unit is controlled via optional interfaces (e.g. PROFIBUS DP) or via technology boards (T100, T300).

Capacitor module for Compact PLUS units

The capacitor module enables short-time energy buffering, e.g. for bridging brief power supply failures or for absorbing braking energy. The buffered energy W can be calculated with the following formula:

$$W = \frac{1}{2} \cdot C \cdot \left(V_{d1}^2 - V_{d2}^2\right)$$

C effective capacity of the capacitor module 5.1 mF

V_{d1} DC link voltage at the start of buffering

V_{d2} DC link voltage at the end of buffering

Example:
V_{d1} = 560 V; V_{d2} = 420 V
→ W = 350 Ws

For example, a 3 kW converter under rated load can be buffered with this energy for approximately 100 ms.

The capacitor module has an integrated precharging function. The integrated precharging function is used when the module is connected to a Compact PLUS converter and to a Compact PLUS 15 kW rectifier unit.

A capacitor module can be connected to a Compact PLUS converter and 15 kW rectifier unit.

If the capacitor module is connected to multi-motor drives with 50 kW and 100 kW Compact PLUS rectifier units, the integrated precharging function is not used. The reason is that these rectifier units carry out precharging by means of phase angle control. In this configuration, a capacitor module counts as an inverter with a rated DC link current of 110 A.

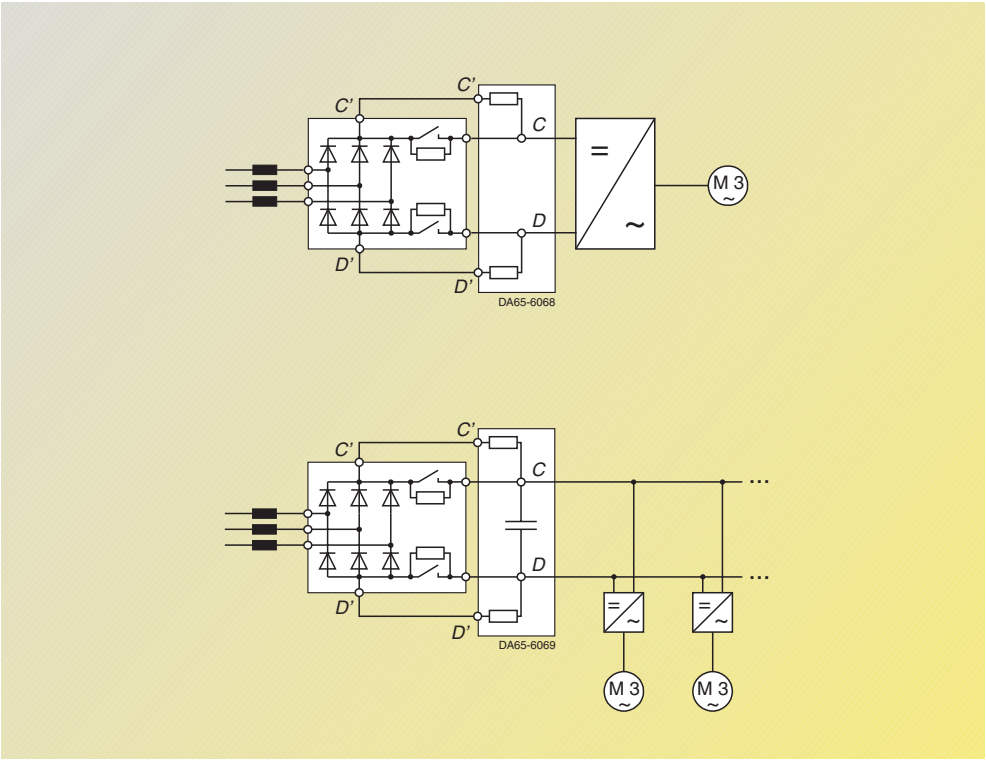


Fig. 6/34
Connection of capacitor module to Compact PLUS converters and rectifier unit 15 kW

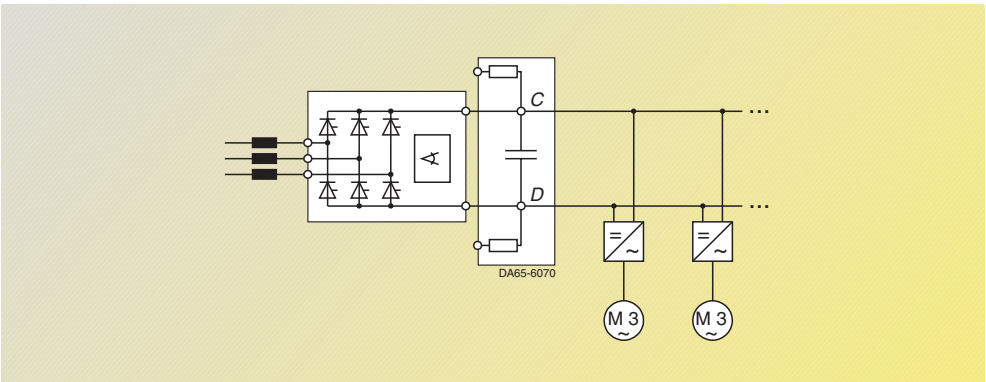
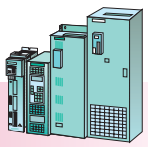


Fig. 6/35
Connection of capacitor module to 50 kW and 100 kW Compact PLUS rectifier units



Block diagrams

The standard software contains various open-loop and closed-loop control functions for all relevant applications. These include

- Control modes with *V/f* characteristic for simple applications
- Vector control modes for medium to high dynamic performance drives.

V/f control characteristic

V/f characteristic with tachometer

Frequency control with closed-loop speed control for single induction motor drives, where, with slip compensation, sufficient speed accuracy is not achieved. The actual speed from an analog tachometer can be evaluated via an analog input and the actual speed value of a 2-track incremental encoder via the incremental encoder input.

V/f characteristic for general applications

As frequency control with slip compensation for single-motor and multi-motor drives with induction motors, without any high demands regarding dynamic performance, e.g. pumps and fans, simple traversing drives.

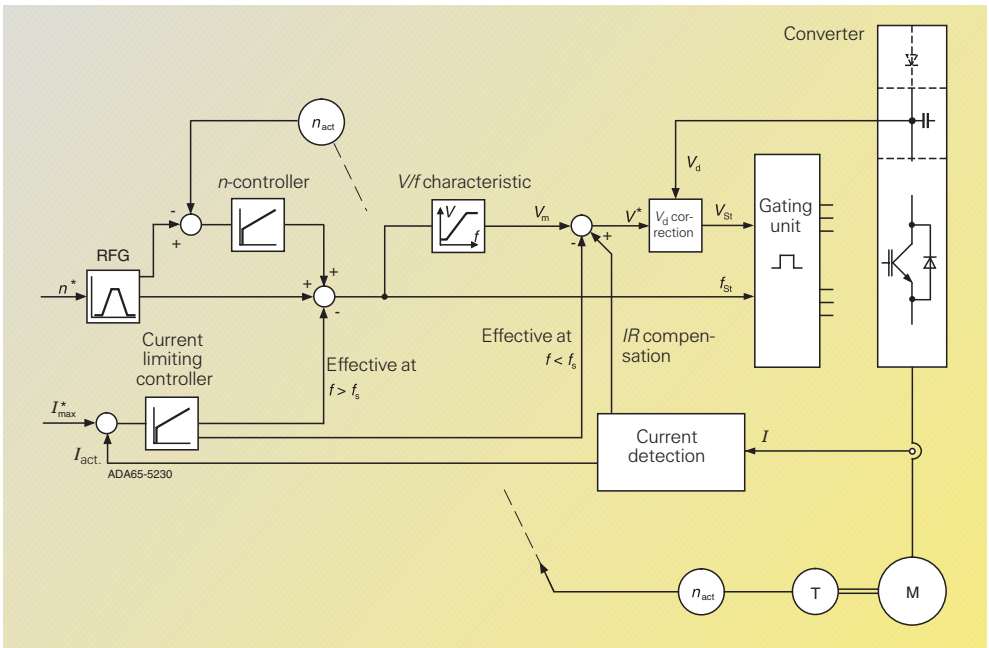


Fig. 6/36
Speed control with *V/f* characteristic

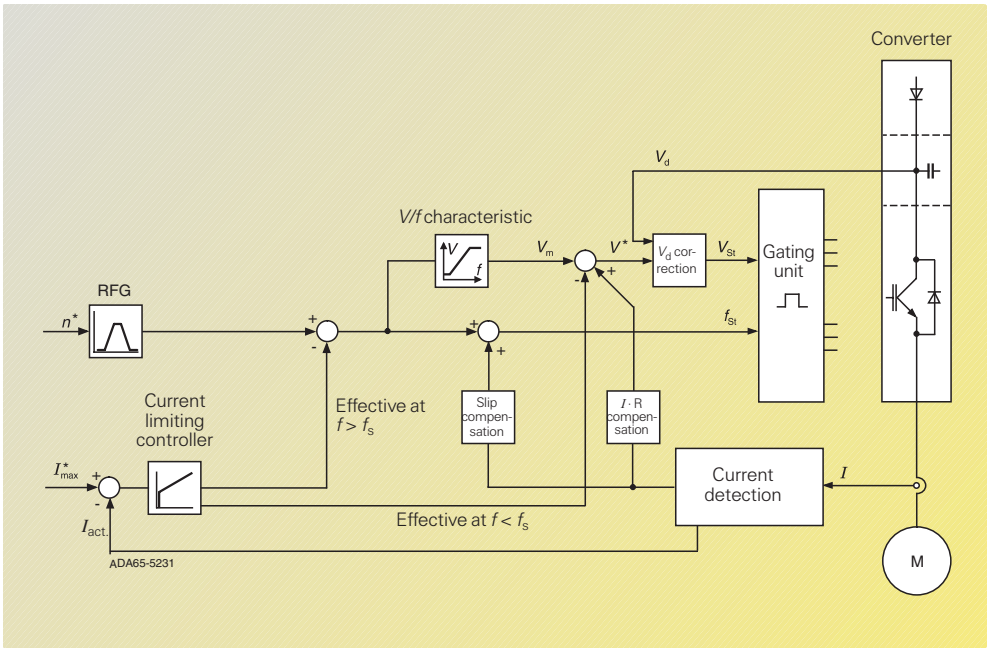


Fig. 6/37
V/f control without speed detection

Block diagrams (continued)

V/f characteristic for textile applications

Frequency control without the frequency (resolution: 0.001 Hz) being influenced by the control function; for single-motor and multi-motor drives with SIEMOSYN motors and reluctance motors with high speed accuracy, e.g. in the textile industry.

These *V/f* characteristic types of control include the following functions:

- *I* x *R* compensation
- current limiting control with influence on the voltage and frequency
- choice between characteristics for constant-torque drives and drives for pumps and fans (with $M \sim n^2$).

Stall protection damping to prevent motor resonance effects and slip compensation can be activated (except with *V/f* characteristic for textile applications).

With the *V/f* characteristic for textile applications, the current limiting controller acts on the output voltage only.

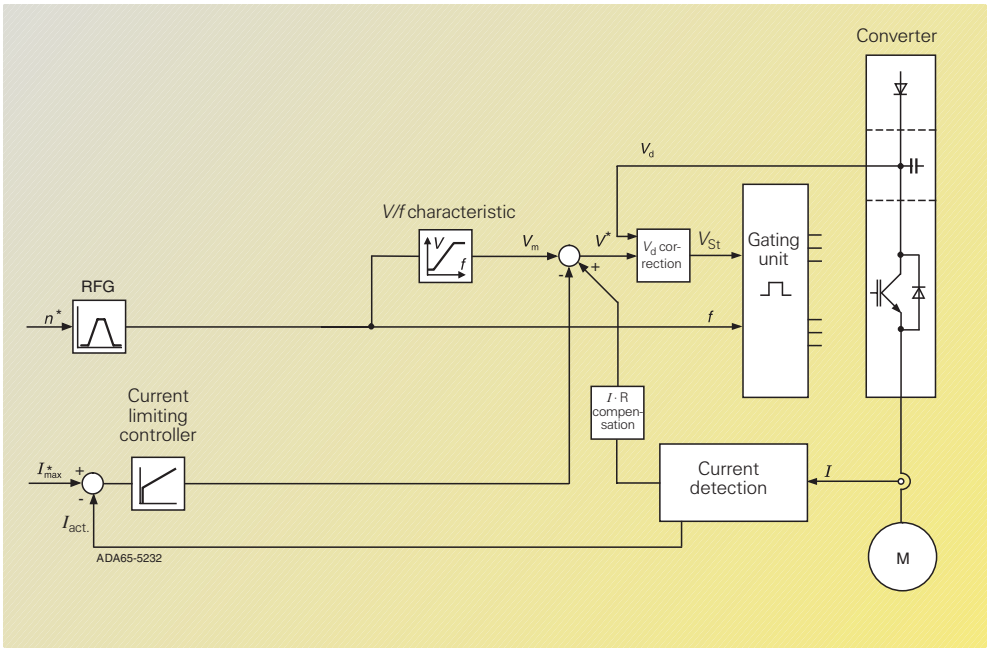


Fig. 6/38
V/f control for textile applications

Vector control or field-oriented control

The vector types of control can be used only for induction motors and for single-motor drives or multi-motor drives with a mechanically coupled load. With these types of control, a dynamic performance comparable to that of a DC drive is achieved. This is enabled by the torque and flux generating components which can be precisely determined and controlled. Reference torques can be maintained and effectively limited with the vector control system.

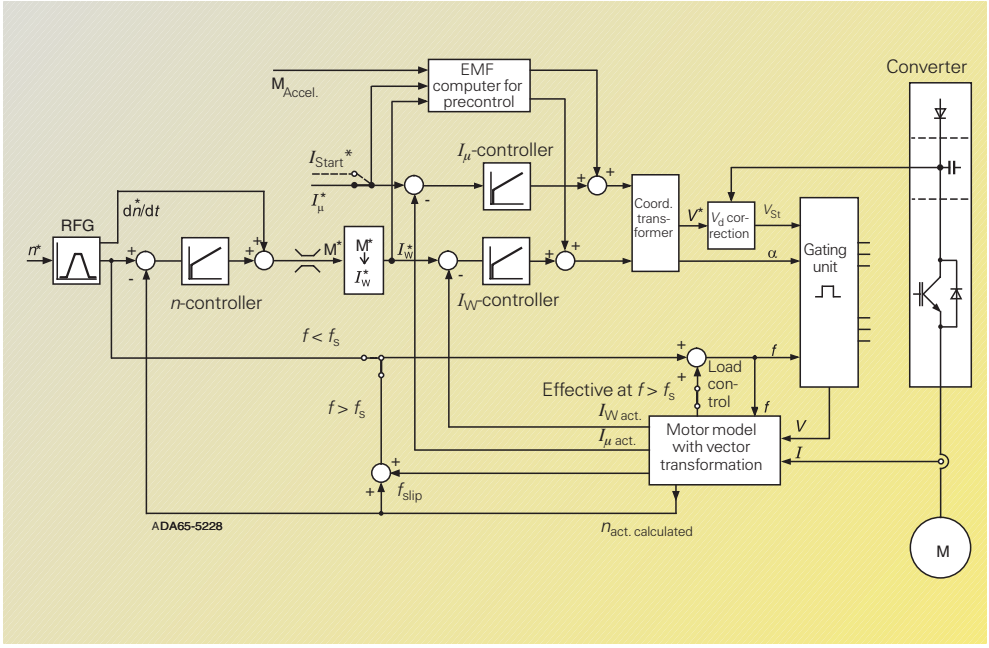
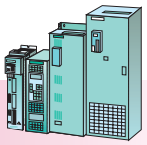


Fig. 6/39
Frequency control: field-oriented control without speed detection

Frequency control or field-oriented control without speed detection

Preferably used for single-motor drives with induction motors, from low to high-performance dynamic demands, at speed setting ranges of up to 1:10, i.e. for most industrial applications such as extruders and fans with a large power output, traversing and hoisting drives and centrifuges.



Block diagrams (continued)

Field oriented speed control with speed detection

For single-motor drives with induction motors and high demands regarding dynamic performance even at low speeds, plus increased accuracy, e.g. elevators and positioning drives, drives for continuous webs, for cranes with positioning requirements, etc.

An incremental encoder, e.g. an incremental encoder with 1024 pulses per revolution or more, is necessary for this type of closed-loop speed control. Due to its accuracy a DC tachometer is not suitable.

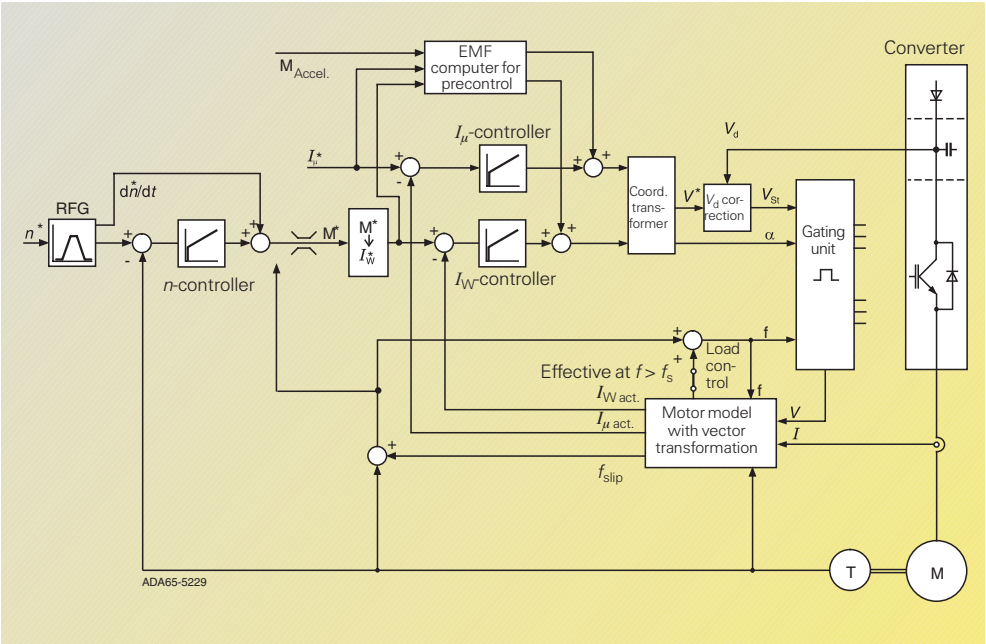


Fig. 6/40
Closed-loop speed control: field-oriented control with speed detection

Field oriented torque control with speed detection

For single-motor drives with induction motors; applications with high dynamic performance demand if, for technological reasons, a reference torque must be maintained, e.g. winder drives, slave drives with closed-loop tension control and master-slave drives.

An incremental encoder is also necessary for this type of closed-loop control, preferably with 1024 pulses per revolution or more. Due to its accuracy a DC tachometer is not suitable.

Control with or without speed detection

In certain applications, the question often arises as to whether speed detection is necessary or not. The criteria listed below can be of help.

Speed detection is necessary when

- the highest degree of speed accuracy is required
- the highest demands regarding dynamic performance have to be satisfied
- torque control in the setting range >1:10 is required
- a defined and/or changing torque has to be maintained at speeds lower than approx. 10 % of the rated motor speed.

Control performance

For maximum permissible output frequencies, see table. The rated motor frequency must be at least 8 Hz. The following three-phase motors can therefore be used:

- Standard motors with 50 Hz or 60 Hz characteristics, also
  - with an "87 Hz characteristic" (motor winding switched from Y→ Δ)
  - with a "29 Hz characteristic" (motor winding switched from Δ → Y)
- 1PH7/1PL6 type motors
- SIMOSYN 1FU type motors and 1FP type reluctance motors.

Supply voltages	Output	Max. inverter frequency for	Max. inverter frequency for constant-flux range	Max. inverter frequency for field-weakening range	Max. inverter frequency for constant-flux range	Max. inverter frequency for field-weakening range
		V/f textile	*V/f* characteristic	*V/f* characteristic	Vector control	Vector control
3-ph. 380 to 480 V AC	0.55 to 200 kW 250 to 1300 kW	500 Hz 300 Hz	200 Hz	300 Hz or 5 · f_n Mot	200 Hz	300 Hz or 5 · f_n Mot 250 Hz or 5 · f_n Mot
3-ph. 500 to 600 V AC	2.2 to 11 kW 18.5 to 160 kW 200 to 1700 kW	500 Hz 300 Hz 300 Hz				300 Hz or 5 · f_n Mot 300 Hz or 5 · f_n Mot 250 Hz or 5 · f_n Mot
3-ph. 660 to 690 V AC	55 to 200 kW 250 to 2300 kW	300 Hz 300 Hz				300 Hz or 5 · f_n Mot 250 Hz or 5 · f_n Mot

Speed and torque accuracy levels, rise times

Operating mode	*V/f* characteristic	V/*f* textile	f control	*n* control	*T* control
Setpoint resolution digital	0.001 Hz, 31 bits + sign				0.1 %, 15 bits + sign
Setpoint resolution analog	f_{max}/2048				
Internal frequency resolution	0.001 Hz, 31 bits + sign				
Frequency accuracy		0.001 Hz			
Speed accuracy[4] at n > 10 % at n < 5 % during field-weakening operation	0.2 · f_{slip}[1]) f_{slip}[1])		0.1 · f_{slip}[2]) f_{slip} $f_{max}/f_n \cdot f_{slip}/10$	0.0005 %[3]) 0.001 %[3]) 0.001 %[3])	
Speed rise time			25 ms for n > 2 %	20 ms	
Frequency constancy		0.005 %			
Torque linearity					< 1 %
Torque accuracy in the constant-flux range in the field-weakening range			< 2.5 % for n > 5 % < 5 %	< 2.5 % for n > 1 % < 5 %	< 2.5 % for n > 1 % < 5 %
Torque rise time			approx. 5 ms for n > 10 %	approx. 5 ms	approx. 5 ms
Torque ripple			< 2 %	< 2 %	< 2 %

Note

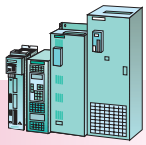
Percentages relate to the rated speed or the rated torque of the respective motor.

1) These values apply without a tachometer. If speed detection is used, the same values apply to stationary operation as in the column for "n control". If an analog tachometer is used, its accuracy must also be taken into account.

2) The slip values of standard motors are: 6 % for 1 kW, 3 % for 10 kW, 2 % for 30 kW, 1 % for 100 kW, 0.5 % for > 500 kW. For motor outputs of 30 kW and more, the speed accuracy is therefore ≤ 0.3 %.

3) These values apply if an incremental encoder with 1024 pulses per revolution is used.

4) These values apply over a time average of 10 s.



Incremental encoder evaluation

With SIMOVERT MASTERDRIVES Vector Control units, an incremental encoder can be evaluated in the standard unit.

Incremental encoders with the following specifications can be connected:

- HTL encoder with 2 tracks offset by 90°
- Supply voltage V = 11 V to 30 V
- HTL level: H ≥ 8 V; L ≤ 3 V
- Input current: approx. 3.5 mA at 15 V
- Number of increments which can be evaluated 60 – 10000 pulses per revolution
- Limit frequency: f_{max} = 400 kHz.

The base unit has a supply voltage for the encoder with a load capability of 190 mA.

The SBP option board is used for evaluating TTL encoders. The SBP board can also evaluate unipolar and bipolar HTL level encoders. The DTI adapter board (can only be used together with compact and chassis units) enables floating connection of the encoder.

Software functions

The following software functions are provided in the standard unit:

BICO data sets (standard/reserve setting)

logically combine process data (setpoints and open-loop control functions). In other words, they enable, for example, switching from manual operation to automatic operation (internal/external) between two sources, e.g. between the operator control panel (terminal strip, interfaces, dual port RAM) and the terminal strip (interfaces, dual port RAM, operator control panel).

Setpoint input

The sum of the main setpoints and the supplementary setpoints can be used. The setpoints can be entered either internally or externally. Internally as the fixed setpoint, motorized-potentiometer setpoint or inching setpoint, externally via the analog input, the serial interfaces or the option boards. The internal fixed setpoints and the motorized-potentiometer setpoint can be toggled or adjusted by means of control commands from all interfaces.

Function data sets FDS (setpoint data sets SDS)

The control function includes 4 setpoint data sets which can be toggled. These data sets each include, for example, 4 fixed setpoints, a suppression bandwidth for resonance frequencies, a minimum frequency and a set of ramp-function generator data. This allows the control function to be adapted to different setpoints or other technical requirements. The ramp-function generator, for example, provides separately adjustable ramp-up and ramp-down times, initial and final rounding-off times and adjustable waiting times during braking.

Technology controllers

e.g. for pressure or power control.

Motor data set (MDS)

This control function includes 4 motor data sets so that the open-loop and closed-loop control parameters can be stored and selected for different motors. One or more different motors with different control modes can thus be operated. When a changeover is made to the "Ready" status, the control data are adapted to the parameterized operating data of the motor.

Motor identification

The open-loop and closed-loop control parameters are pre-assigned with the help of the parameterized converter and motor data. The subsequently executed DC and no-load measurement optimizes the parameter settings using these measurement results. This function allows the drives to be both quickly and simply optimized.

$V_{d\ max}$ controller

This controller adjusts the frequency when the DC link voltage is too high, e.g. if the set ramp-down time is too short, the drive converter does not go into fault condition but increases the ramp-down time.

Automatic restart

This restarts the drive when the power returns following a power failure; there is no time limit.

Kinetic buffering

This buffers power failures or dips as long as the drive kinetic energy is large enough.

Restart-on-the-fly

This function allows the SIMOVERT MASTERDRIVES Vector Control to be connected to a rotating motor.

DC current braking

This permits occasional braking without the need for a pulsed resistor or regenerative feedback. The DC braking activation point can be parameterized along the ramp-down ramp.

Converter-converter synchronization

(not for Compact PLUS)

enables motors or motor groups to be switched from one converter/inverter to another. The overlapping changeover is via an output reactor. The TSY board is necessary for this function.

Evaluation of motor temperature sensors

KTY84 for alarms and tripping or thermistor for alarms or tripping.

Wobble generator

with triangular wobble pattern, adjustable P steps and a synchronizing input and output for traversing drives in the textile industry.

Brake operation

With this function, brakes fitted to the motor or external brakes can be operated. Parameterizable values are, e.g. threshold values and delay times for closing and opening of the brakes.

Free function blocks with BICO system

In the software of the base units, there are function blocks which can be "softwired" as required with the help of the "BICO system." The user is therefore able to tailor the MASTERDRIVES exactly to the task to be solved.

Data between the function blocks as well as with the available control variables such as actual values and setpoints is exchanged via "plug-in connectors" which are designated either as binectors (for binary signals) or connectors (for analog signals as a 16 or 32 bit word), depending on the type of signal to be transmitted. BICO system = Binector-Connector system.

As freely usable function blocks, the following are available (with influence on the computing time):

• General function blocks

Fixed setpoints
Indicator blocks
Converter blocks
Diagnostic blocks

• Arithmetic and control blocks

Adders, subtracters
Multipliers, dividers
Absolute-value generators with filtering
Sign inverters
Limiters, limit-value monitors
Minimum, maximum selection
Timers
Polygon curve characteristics
Storage elements

• Logic blocks

AND elements
OR elements
EXCLUSIVE OR elements
Inverters
NAND elements
RS storage elements
D storage elements
Timers, pulse generator

• Complex blocks

Ramp-function generator, software counter
PID controller
Wobble generator
Brake control

Note

Refer to the compendium for a complete list and description of the blocks.

Safe Stop

The "Safe Stop" function for SIMOVERT MASTERDRIVES is a "device for avoiding unexpected starting" according to EN 60 204-1, Section 5.4. In combination with an external circuit, the "Safe Stop" function for SIMOVERT MASTERDRIVES has been certified by the professional association in accordance with EN 954-1 Safety Category 3. With the "Safe Stop" function, motor-side contactors as a second switch-off path can be dispensed with.

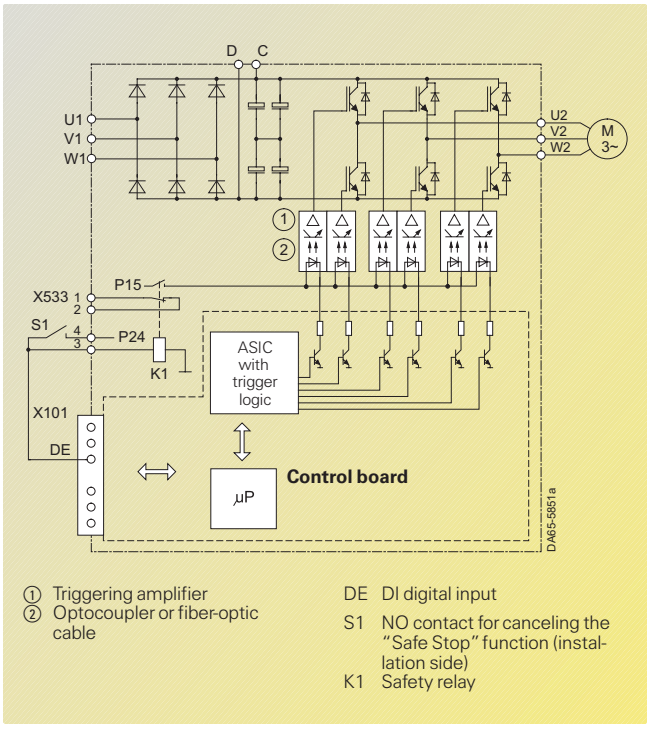
The "Safe Stop" function prevents unexpected starting of the connected motor from standstill. The "Safe Stop" is only to be activated when the drive is at standstill because, otherwise, it loses its ability to brake the motor.

The "Safe Stop" function is integrated in Compact inverters 510 V to 650 V DC and 675 V to 810 V DC and is available for Compact PLUS and chassis units (converters and inverters) as option K80.

Method of functioning

The safety relay with positively driven contacts uses the NO contact to interrupt the power supply to the optocoupler/fiber-optic cable and thus prevents pulsing of the power section for building up a phase sequence.

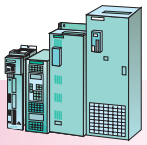
The NC contact (= checkback contact) is used to report the switching status of the safety relay to the external control unit. The checkback contact of the safety relay always has to be evaluated and can be used for directly triggering a second switch-off path as shown in Fig. 6/42. The "Safe Stop" function is to be activated before the protective device is opened. If the NO contact of the safety relay is stuck, the checkback contact of the K2 main contactor switches off. The circuit in Fig. 6/42 assumes that the operator triggers the protective device at regular intervals. This checks the effectiveness of the switch-off paths.



① Triggering amplifier
② Optocoupler or fiber-optic cable

DE DI digital input
S1 NO contact for canceling the "Safe Stop" function (installation side)
K1 Safety relay

Fig. 6/41
Basic circuit of the "Safe Stop" function
(terminal designation applies to chassis unit with option K80)



Safe Stop (continued)

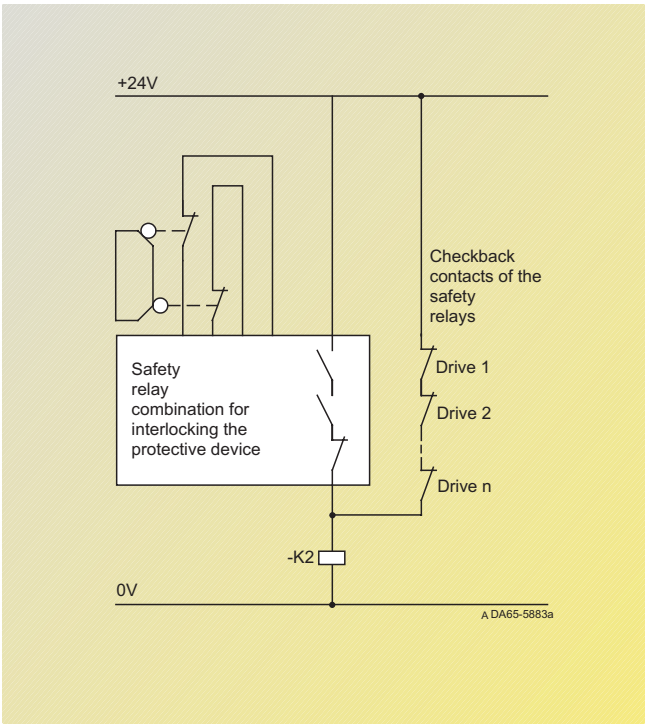


Fig. 6/42
Direct triggering of the K2 main contactor via the checkback contact of the safety relay

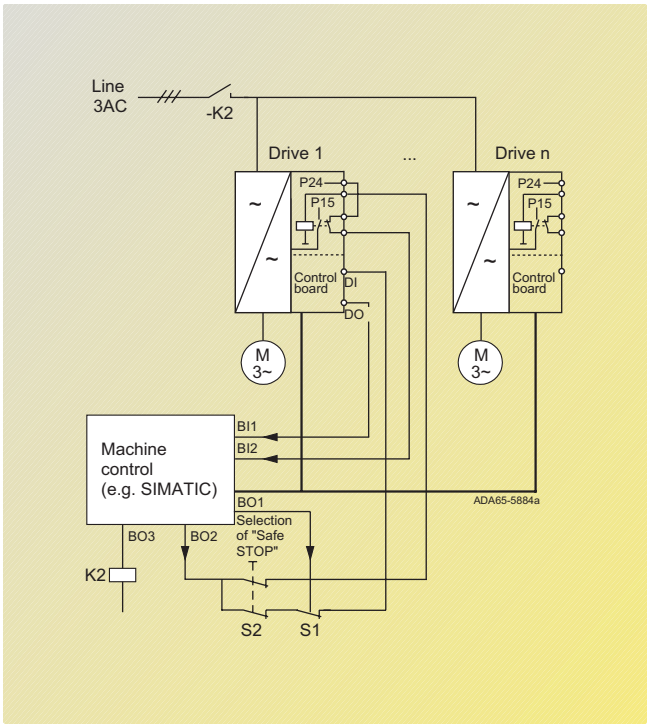


Fig. 6/43
Test of the switch-off paths via the machine control

In conjunction with the machine control, the switch-off paths in the converter or inverter can be tested and the higher-level K2 contactor is opened if a fault is discovered. The machine control unit selects "Safe Stop" via binary output BO2 and tests the reaction of the safety relay via binary input BI2. BO2 then changes to operating mode and the reaction of the control board can be tested via BO1 and S1 by means of BI1. When "Safe Stop" is selected in the status word, the control board must signal back the "OFF2" command. If a reaction does not match expectations according to the programmed reaction, the control unit generates a fault and opens the K2 main contactor. The switch-off paths can also be tested via a communication link, e.g. PROFIBUS DP.

The circuit shown in Fig. 6/43 assumes that the machine control tests the effectiveness of the switch-off paths at regular intervals and before each start (e.g. every 8 hours).

When the "Safe Stop" function is activated, electrical isolation from the supply does not take place. The function is therefore not a device for providing protection against electric shock.

Functional safety and applications

The entire machine must be fully isolated from the supply by means of the main switch for operational interruptions, maintenance, repair and cleaning work **on the electrical equipment** such as SIMOVERT MASTERDRIVES and motors (EN 60 204/5.3).

The "Safe Stop" function supports the requirements according to EN 954-1 Category 3 and EN 1037 relating to the safety of machines.

The function is based on switching off/interruption the power supply for firing the IGBT modules so that a "hazardous movement" is prevented.

In the case of induction motors, no rotational movement is possible even if several faults occur.

In applications with synchronous motors, e.g. 1FT6, 1FK6, it must be pointed out that, due to the physics when 2 faults occur, and in very particular constellations, a residual movement can occur.

Fault example:
Simultaneous break down of an IGBT in one phase in the positive branch and an IGBT of another phase in the negative branch.

Residual movement:

$$\alpha_{max} = \frac{360}{\text{Pole number of the motor}}$$

e.g. 1FT6, 6-pole motor
$\alpha = 60°$

In order to estimate the hazard potential of this critical residual movement, a safety evaluation must be carried out by the engineer.

Advantage:
Motor contactors are no longer needed to meet these requirements.

Caution!
When "Safe Stop" has been activated, hazardous voltages are still present at the motor terminals due to the inverter circuit.

For further information on Siemens safety engineering, please visit the internet at: http://www.siemens.com/safety

The application manual "Safety Integrated: The safety program for protecting man, machine, environment and process for the world's industries" with technical explanations and application examples can be ordered at the above internet address.

Control terminal strip Compact PLUS units

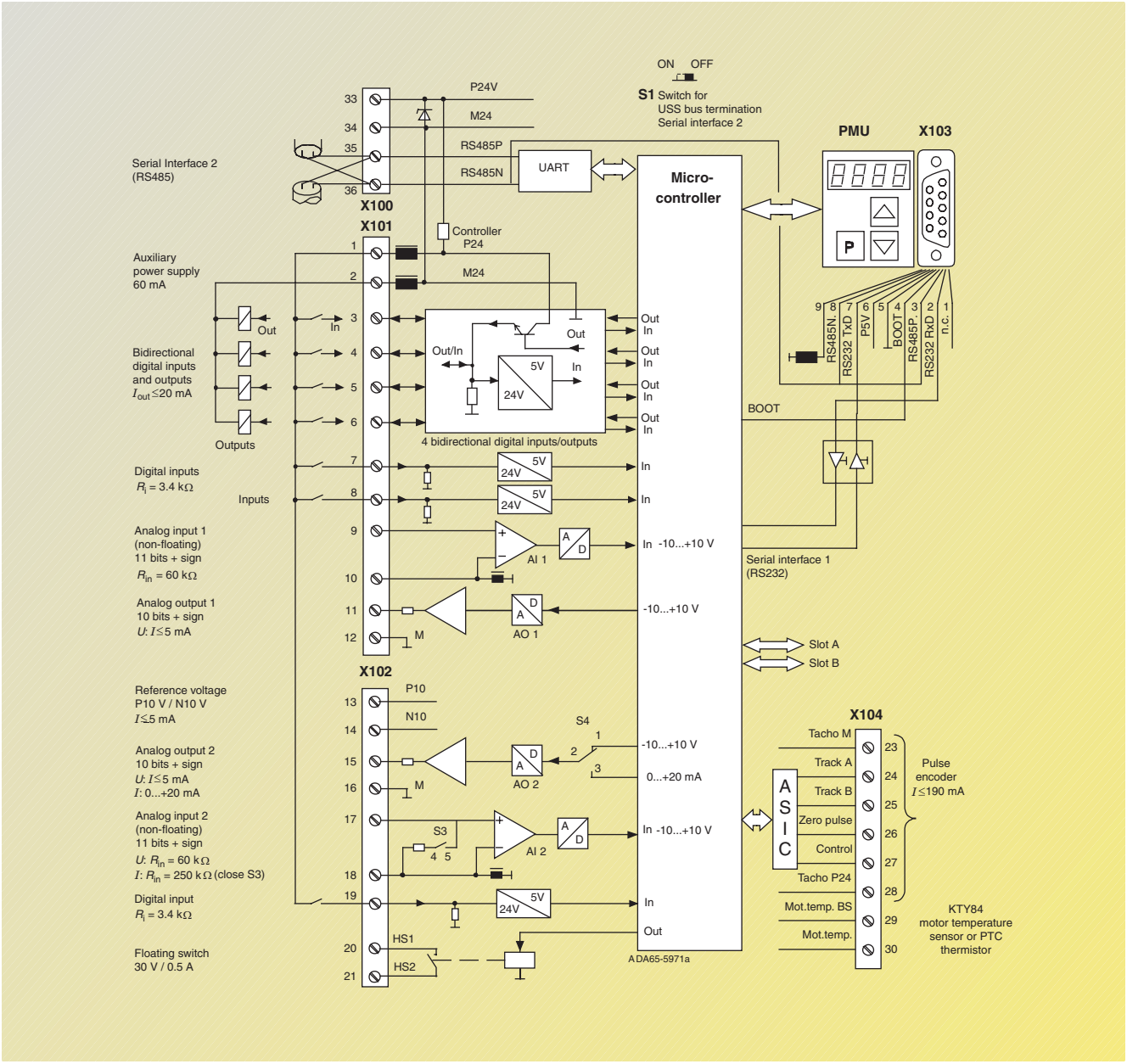
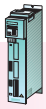


Fig. 6/44

Note

Analog input parameter programmable:
–10 V to +10 V
0 V to +10 V
0 mA to 20 mA
4 mA to 20 mA
–20 mA to +20 mA

Analog output 2:
The display range with impressed current (S4: 2; 3, S4: 5; 6) 0 mA (4 mA) to 20 mA refers to the entire value range of the output parameter:
e.g. motor torque –200% M_{Motn} to +200% M_{Motn} corresponds to 0 mA up to 20 mA.



Control terminal strip Compact PLUS units (continued)

Preassignment of the terminal strip

a) Factory setting (without quick parameterization)

Control commands (single bits of the control word) and feedback signals (single bits of the status word) are assigned to the individual control sources (operator control panel, terminal strip, serial interface) by parameterization using binectors and connectors . For this purpose, two BICO sets are provided via which the control commands can be switched over to different sources. The factory setting ensures that the unit can be operated

- with BICO set 1 via the PMU operator control panel as standard or the OP1S as an option
- with BICO set 2 via the terminal strip.

Switching over between BICO set 1 and BICO set 2 thus corresponds to the previous switch-over "Base/Reserve".
The following tables show the terminal assignment of BICO set 2. They apply to compact, chassis and cabinet units (without external terminal strip).

Terminal	No.	Type	Preassignment	Comment
Control terminal strip on Compact PLUS units in accordance with the factory setting with PMU or OP1S				
X101	1	P24	Voltage supply for control terminal strip [1]	
	2	M throttled		
	3	Binary input/output 1	Fault	Parameterized as binary output
	4	Binary input/output 2	Operation	Parameterized as binary output
	5	Binary input/output 3	Change-over BICO set	Control panel/terminal strip
	6	Binary input/output 4	None	
	7	Binary input 5	Acknowledge	
	8	Binary input 6	Off 2	
	9	Analog input 1		
	10	M analog 1		
	11	Analog output 1		
	12	M analog 1		
X102	13	P10		
	14	N10		
	15	Analog output 2		
	16	M analog 2		
	17	Analog input 2		
	18	M analog 2		
	19	Binary input 7	On/Off 1	
	20	HS1		
	21	HS2		

Note: Binary outputs on the terminal strip are SIMATIC-compatible transistor outputs, not floating relay contacts!

The speed setpoint has been set in the factory via the operator control panel with higher/lower keys or by means of the fixed setpoint, changeable via the operator control panel.

If the main setpoint is to be entered via analog input 1, terminals X101: 9/10, the following parameters are to be set:
P443 Source, main setpoint → K0011
P444 Scaling, main setpoint.

1) The P24 voltage supply of terminal X101:1 must not be connected to the 24 V DC auxiliary supply's (20 V to 30 V) positive pole, which is supplied via terminal X9 (damage to the internal 24 V controller!).

Control terminal strip Compact PLUS units (continued)

Preassignments of the terminal strip (cont.)

b) Terminal assignments after quick parameterization

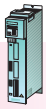
In the case of quick parameterization and with the following preassignments of the terminal strip, a selection can be made which is different to the factory setting by means of parameter P368.

Terminal	No.	Type	Preassignment	Comment
Control terminal strip on Compact PLUS units after quick parameterization P368 = 1: "Analog input and terminal strip"				
X101	1	P24	Voltage supply for control terminal strip [1]	
	2	M throttled		
	3	Binary input/output 1	Fault	
	4	Binary input/output 2	Operation	
	5	Binary input/output 3	Warning	
	6	Binary input/output 4	None	Reserve for options
	7	Binary input 5	Acknowledge	
	8	Binary input 6	Off 2	
	9	Analog input 1	Speed setpoint	
	10	M analog 1		
	11	Analog output 1	Actual speed	
	12	M analog 1		
X102	13	P10		
	14	N10		
	15	Analog output 2		
	16	M analog 2		
	17	Analog input 2	Torque setpoint with torque control	
	18	M analog 2		
	19	Binary input 7	On/Off 1	
	20	HS1		
	21	HS2		

With this preassignment, a total of 4 parameterizable fixed setpoints can be selected (either as main setpoints or as torque setpoints). This is done via the binary inputs FSetp bit 0 and FSetp bit 1.

Terminal	No.	Type	Preassignment	Comment
Control terminal strip on Compact PLUS units after quick parameterization P368 = 2: "Fixed setpoints and terminal strip"				
X101	1	P24	Voltage supply for control terminal strip [1]	
	2	M throttled		
	3	Binary input/output 1	Fault	
	4	Binary input/output 2	Operation	
	5	Binary input/output 3	FSetp bit 0	
	6	Binary input/output 4	FSetp bit 1	
	7	Binary input 5	Acknowledge	
	8	Binary input 6	Off 2	
	9	Analog input 1		
	10	M analog 1		
	11	Analog output 1	Actual speed	
	12	M analog 1		
X102	13	P10		
	14	N10		
	15	Analog output 2		
	16	M analog 2		
	17	Analog input 2	None	
	18	M analog 2		
	19	Binary input 7	On/Off 1	
	20	HS1		
	21	HS2	None	

1) The P24 voltage supply of terminal X101:1 must not be connected to the 24 V DC auxiliary supply's (20 V to 30 V) positive pole, which is supplied via terminal X9 (damage to the internal 24 V controller!).



Control terminal strip Compact PLUS units (continued)

Terminal	No.	Type	Preassignment	Comment
Control terminal strip on Compact PLUS units after quick parameterization P368 = 3: "Motor potentiometer and terminal strip"				
X101	1	P24	Voltage supply for control terminal strip [1)]	
	2	M throttled		
	3	Binary input/output 1	Fault	
	4	Binary input/output 2	Operation	
	5	Binary input/output 3	Motor potentiometer higher	
	6	Binary input/output 4	Motor potentiometer lower	
	7	Binary input 5	Acknowledge	
	8	Binary input 6	Off 2	
	9	Analog input 1		
	10	M analog 1		
	11	Analog output 1	Actual speed	
	12	M analog 1		
X102	13	P10		
	14	N10		
	15	Analog output 2	None	
	16	M analog 2		
	17	Analog input 2	None	
	18	M analog 2		
	19	Binary input 7	On/Off 1	
	20	HS1		
	21	HS2	None	

1) The P24 voltage supply of terminal X101:1 must not be connected to the 24 V DC auxiliary supply's (20 V to 30 V) positive pole, which is supplied via terminal X9 (damage to the internal 24 V controller!).

Control terminal strip on the CUVC control board (Vector Control)

Application: SIMOVERT MASTERDRIVES converters and inverters compact and chassis units
Order No. of CUVC: 6SE7090-0XX84-0AB0

Connector for the terminal strip:
Order No. 6SY7000-0AD27 (connectors X101 to X103)

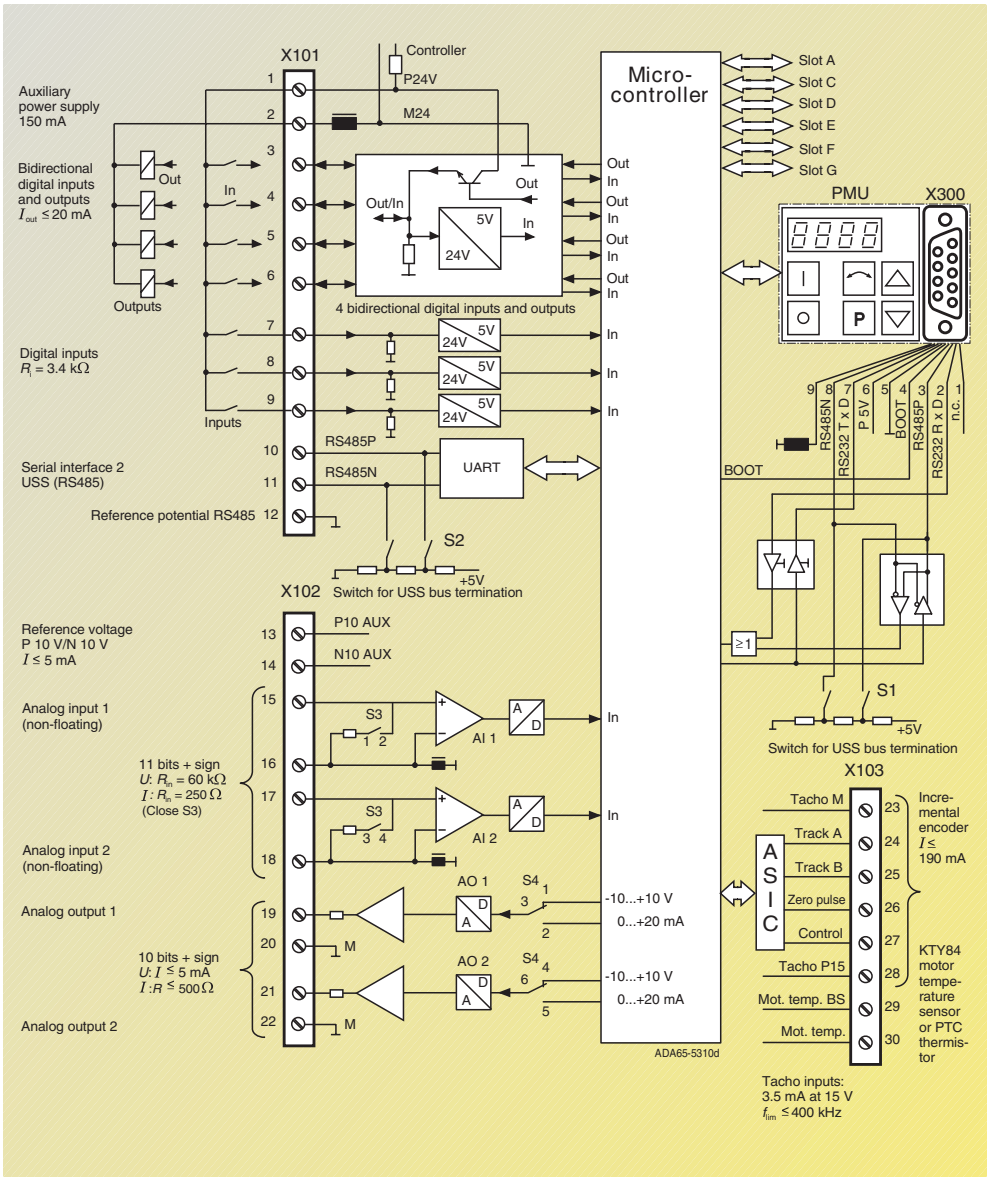
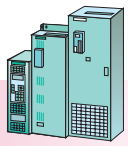


Fig. 6/45

Note

Analog input parameter programmable:
–10 V to +10 V
0 V to +10 V
0 mA to 20 mA
4 mA to 20 mA
–20 mA to +20 mA

Analog output:
The display range with impressed current (S4: 2; 3, S4: 5; 6) 0 mA (4 mA) to 20 mA refers to the entire value range of the output parameter:
e.g. motor torque –200 % M_{Motn} to +200 % M_{Motn} corresponds to 0 mA up to 20 mA.



Control terminal strip on the CUVC control board (Vector Control) (continued)

Preassignments of the terminal strip

a) Factory setting (without quick parameterization)

Control commands (single bits of the control word) and feedback signals (single bits of the status word) are assigned to the individual control sources (operator control panel, terminal strip, serial interface) by parameterization using binectors and connectors . For this purpose, two BICO sets are provided via which the control commands can be switched over to different sources. The factory setting ensures that the unit can be operated

- with BICO set 1 via the PMU operator control panel as standard or the OP1S as an option
- with BICO set 2 via the terminal strip.

Switching over between BICO set 1 and BICO set 2 thus corresponds to the previous switch-over "Base/Reserve".
The following tables show the terminal assignment of BICO set 2. They apply to compact, chassis and cabinet units (without external terminal strip).

Note: Binary outputs on the terminal strip of the CUVC board are SIMATIC-compatible transistor outputs, not floating relay contacts!

The speed setpoint has been set in the factory via the operator control panel with higher/lower keys or by means of the fixed setpoint, changeable via the operator control panel.

If the main setpoint is to be entered via analog input 1, terminals X102: 15/16, the following parameters are to be set:
P443 Source, main setpoint → K0011
P444 Scaling, main setpoint.

Terminal	No.	Type	Preassignment	Comment
Control terminal strip on the CUVC control board in accordance with the factory setting For Compact and chassis units with PMU or OP1S				
X101	1	P24	Voltage supply for control terminal strip [1]	
	2	M throttled		
	3	Binary input/output 1	Fault	Parameterized as binary output
	4	Binary input/output 2	Operation	Parameterized as binary output
	5	Binary input/output 3	Change-over BICO set	Control panel/terminal strip
	6	Binary input/output 4	None	
	7	Binary input 5	Acknowledge	
	8	Binary input 6	Off 2	
	9	Binary input 7	On/Off 1	
	10	RS485 P		Serial interface
	11	RS485 N		Com2
	12	RS485 M		
X102	13	P10		
	14	N10		
	15	Analog input 1	None	
	16	M analog 1		
	17	Analog input 2	None	
	18	M analog 2		
	19	Analog output 1	Actual speed	
	20	M analog 1		
	21	Analog output 2	None	
	22	M analog 2		
Terminal strip on CUVC control board in accordance with the factory setting For cabinet units without any additional external terminal strip; with PMU or OP1S				
X101	1	P24	Voltage supply for control terminal strip [1]	
	2	M throttled		
	3	Binary input/output 1	Acknowledge	Parameterized as binary output
	4	Binary input/output 2	Change-over BICO set	Control panel/terminal strip
	5	Binary input/output 3	Fault	
	6	Binary input/output 4	None	Reserve for options
	7	Binary input 5	External fault	
	8	Binary input 6	External alarm	
	9	Binary input 7	On/Off 1	
	10	RS485 P		Serial interface
	11	RS485 N		Com2
	12	RS485 M		
X102	13	P10		
	14	N10		
	15	Analog input 1	None	
	16	M analog 1		
	17	Analog input 2	None	
	18	M analog 2		
	19	Analog output 1	Actual speed	
	20	M analog 1		
	21	Analog output 2	None	
	22	M analog 2		

1) The P24 voltage supply of terminal X101:1 must not be connected to the 24 V DC auxiliary supply's (20 V to 30 V) positive pole, which is supplied via terminal X9 (damage to the internal 24 V controller!).

Control terminal strip on the CUVC control board (Vector Control) (continued)

Preassignments of the terminal strip (cont.)

b) Terminal assignments after quick parameterization

In the case of quick parameterization and with the following preassignments of the terminal strip, a selection can be made which is different to the factory setting by means of parameter P368.

Control terminal strip on the CUVC control board after quick parameterization
P368 = 1: "Analog input and terminal strip"

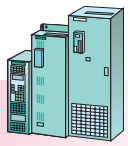
Terminal	No.	Type	Preassignment	Comment
X101	1	P24	Voltage supply for control terminal strip [1]	
	2	M throttled		
	3	Binary input/output 1	Fault	
	4	Binary input/output 2	Operation	
	5	Binary input/output 3	Warning	
	6	Binary input/output 4	None	Reserve for options
	7	Binary input 5	Acknowledge	
	8	Binary input 6	Off 2	
	9	Binary input 7	On/Off 1	
	10	RS485 P		Serial interface
	11	RS485 N		Com2
	12	RS485 M		
X102	13	P10		
	14	N10		
	15	Analog input 1	Speed setpoint	
	16	M analog 1		
	17	Analog input 2	Torque setpoint with torque control	
	18	M analog 2		
	19	Analog output 1	Actual speed	
	20	M analog 1		
	21	Analog output 2	None	
	22	M analog 2		

With this preassignment, a total of 4 parameterizable fixed setpoints can be selected (either as main setpoints or as torque setpoints). This is done via the binary inputs FSetp bit 0 and FSetp bit 1.

Control terminal strip on the CUVC control board after quick parameterization
P368 = 2: "Fixed setpoints and terminal strip"

X101	1	P24	Voltage supply for control terminal strip [1]	
	2	M throttled		
	3	Binary input/output 1	Fault	
	4	Binary input/output 2	Operation	
	5	Binary input/output 3	FSetp bit 0	
	6	Binary input/output 4	FSetp bit 1	
	7	Binary input 5	Acknowledge	
	8	Binary input 6	Off 2	
	9	Binary input 7	On/Off 1	
	10	RS485 P		Serial interface
	11	RS485 N		Com2
	12	RS485 M		
X102	13	P10		
	14	N10		
	15	Analog input 1	None	
	16	M analog 1		
	17	Analog input 2	None	
	18	M analog 2		
	19	Analog output 1	Actual speed	
	20	M analog 1		
	21	Analog output 2	None	
	22	M analog 2		

1) The P24 voltage supply of terminal X101:1 must not be connected to the 24 V DC auxiliary supply's (20 V to 30 V) positive pole, which is supplied via terminal X9 (damage to the internal 24 V controller!).



Control terminal strip on the CUVC control board (Vector Control) (continued)

Terminal	No.	Type	Preassignment	Comment
Control terminal strip on the CUVC control board after quick parameterization P368 = 3: "Motor potentiometer and terminal strip"				
X101	1	P24	Voltage supply for control terminal strip [1]	
	2	M throttled		
	3	Binary input/output 1	Fault	
	4	Binary input/output 2	Operation	
	5	Binary input/output 3	Motor potentiometer higher	
	6	Binary input/output 4	Motor potentiometer lower	
	7	Binary input 5	Acknowledge	
	8	Binary input 6	Off 2	
	9	Binary input 7	On/Off 1	
	10	RS485 P		Serial interface
	11	RS485 N		Com2
	12	RS485 M		
X102	13	P10		
	14	N10		
	15	Analog input 1	None	
	16	M analog 1		
	17	Analog input 2	None	
	18	M analog 2		
	19	Analog output 1	Actual speed	
	20	M analog 1		
	21	Analog output 2	None	
	22	M analog 2		

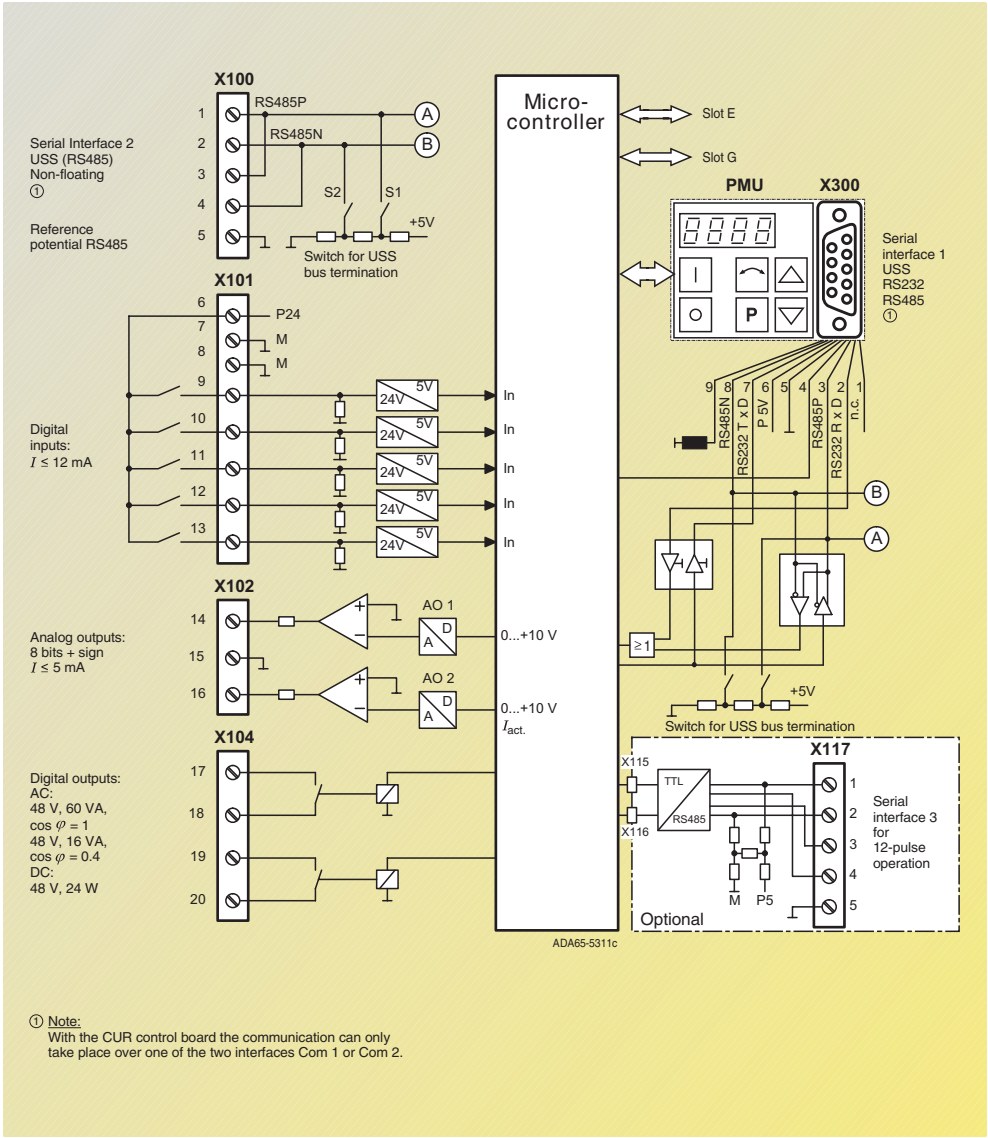
1) The P24 voltage supply of terminal X101:1 must not be connected to the 24 V DC auxiliary supply's (20 V to 30 V) positive pole, which is supplied via terminal X9 (damage to the internal 24 V controller!).

Control terminal strip on the CUR control board (rectifier unit and rectifier/regenerative unit)

Application: SIMOVERT MASTERDRIVES rectifier/ regenerative units and rectifier units with a rated current ≥ 774 A
Order No. of the CUR: 6SE7090–0XX85–1DA0

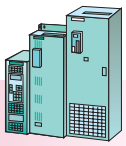
The firmware for the CUR control board must be ordered separately.

Order No. EPROM with up-to-date firmware: 6SW1701–0DA14



① Note:
With the CUR control board the communication can only take place over one of the two interfaces Com 1 or Com 2.

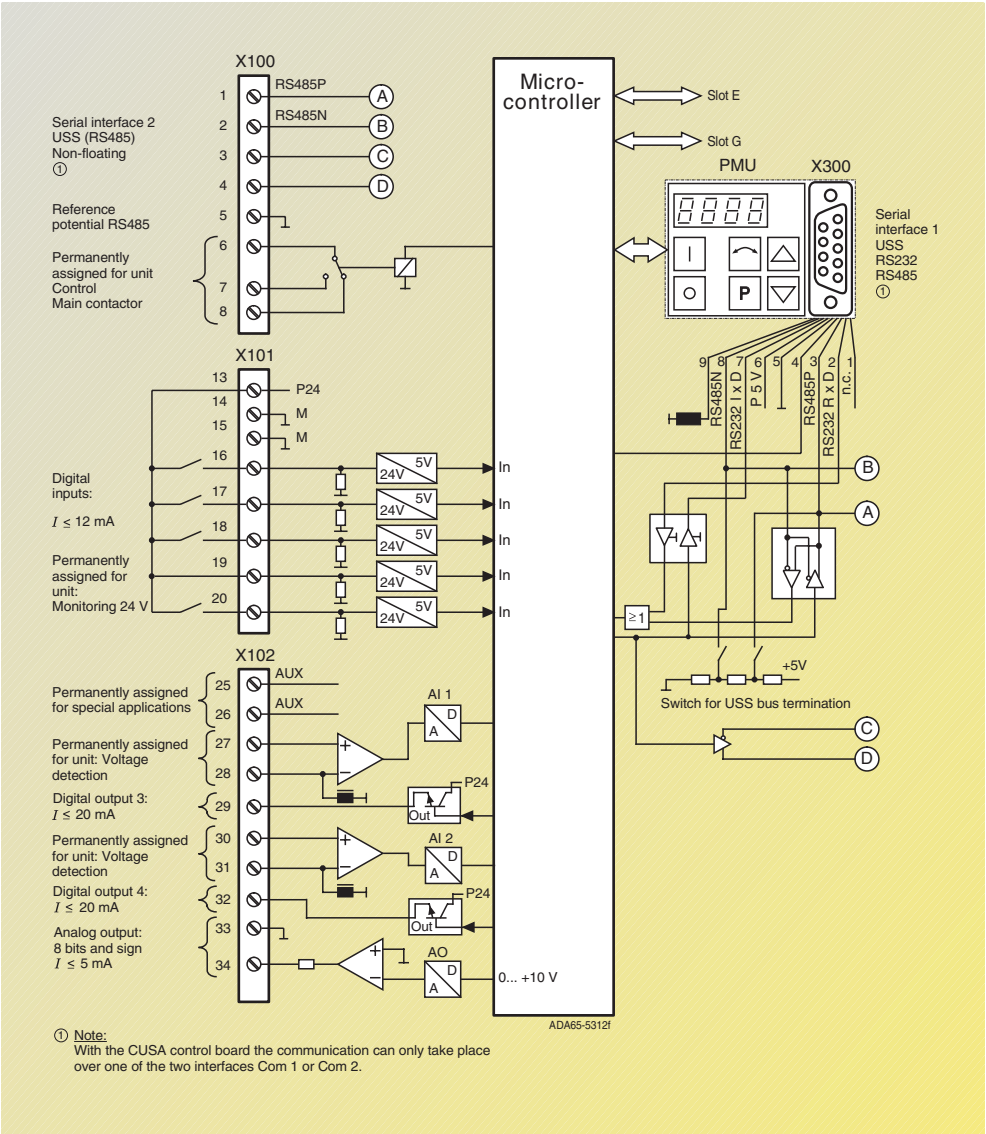
Fig. 6/46



Control terminal strip on the CUSA control board (AFE inverter)

Application:
SIMOVERT MASTER-DRIVES cabinet units, as control electronics for the self-commutated pulsated AFE rectifier/regenerative unit Order No. of the CUSA: 6SE7090–0XXB4–0BJ0

Connector for the terminal strip:
Order No.: 6SY7000–0AC50 (connectors X100 to X102)



① Note:
With the CUSA control board the communication can only take place over one of the two interfaces Com 1 or Com 2.

Fig. 6/47

Control terminal strip X9

Control terminal strip X9 acts as an interface to the electronics and to the power section. The electronics frame is connected to the earth conductor inside the unit.

The following functions are connected to control terminal strip X9:

24 V DC auxiliary power supply (for all units)

The external auxiliary power supply is necessary when the SIMOVERT MASTERDRIVES has to operate its own main contactor via the CUVC/CUR/CUSA board. The auxiliary power supply must be in the form of a PELV circuit (Protective Extra Low Voltage).

The auxiliary power supply also secures communication to the automation system, even if the supply to the power section has been turned off.

Voltage range 20 V to 30 V DC

If the safety relay of the "Safe STOP" function is supplied with power via terminal X9: 5 or X533: 4, the voltage of the auxiliary power supply must be in the range of 22 V to 30 V DC.

The values specified in the Selection and ordering data, Section 3 under "Aux. current requirement DC 24 V, standard version at 20 V" indicate the power requirement of the converter necessary for operating the electronics and for simulating the power section. The power requirement indicated in the column "24 V DC maximum version for 20 V" has to be provided by the external power supply under worst-case conditions (fitting the electronics box with the largest loads).
The table below shows the power requirement of the option boards and also indicates the minus requirement of the inverter units and when the "simulation of the power section" function is not being used.

Auxiliary power requirement of the units

Use	Current requirement at 24 V DC:					
Size	A to D	E	F	G	J, K, L	M, Q
For current values, see Technical data, Section 3 Standard version for 20 V						
Without simulation	–200 mA	–240 mA	–350 mA	–600 mA	–850 mA	–1600 mA
Inverter	–100 mA					
Electronic options						
SCB 1	+ 50 mA					
SCB 2	+150 mA					
SLB	+190 mA					
CBP	+190 mA					
CBC	+160 mA					
EB1	+135 mA					
EB2	+135 mA					
SBP	+250 mA					
TSY without encoder	+155 mA					
T100 + (BIN + BOUT)	370 mA + 180 mA					
T300 without encoder	+695 mA					
Encoder 1XP8001-1	I_o/I_{max}: +95 mA/190 mA					

Operation of main contactor (for all units)

All SIMOVERT MASTERDRIVES Vector Control units have a parameterizable binary output which is preassigned with the task of operating an external main contactor by means of the "ON" command of the SIMOVERT MASTERDRIVES. Precondition: external 24 V DC power supply.

Different versions of control terminal strip X9

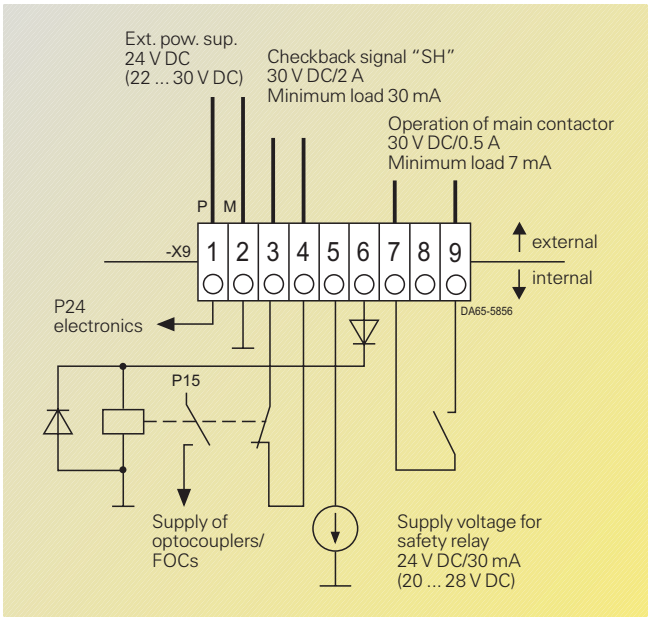


Fig. 6/48
Control terminal strip X9 for compact inverters (sizes A to D) with the "Safe STOP" function

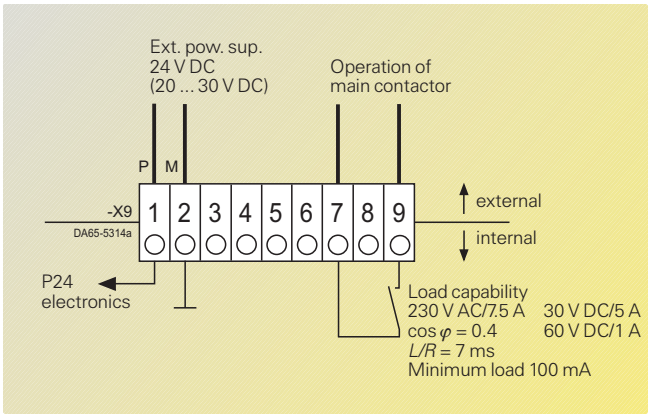


Fig. 6/49
Control terminal strip X9 for compact converters (sizes A to D)

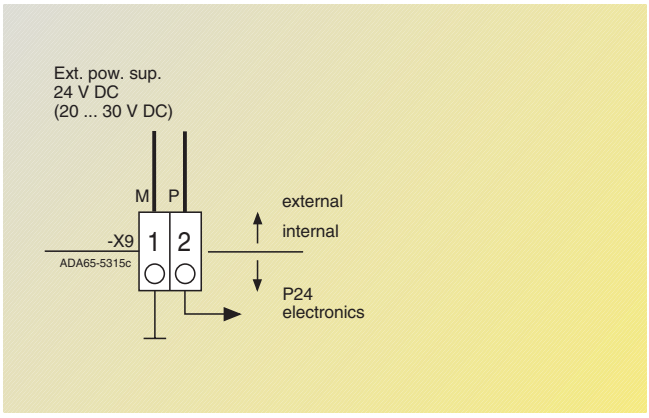


Fig. 6/50
Control terminal strip X9 for Compact PLUS converters

Electromagnetic compatibility (EMC)

EMC stands for electromagnetic compatibility and, according to the definition of the EMC directive, describes the "ability of a device to function satisfactorily in an electromagnetic environment without itself causing electromagnetic interference which is unacceptable for other devices in this environment." In order to ensure that the relevant EMC standards are complied with, the devices must demonstrate a sufficiently high immunity, on the one hand, and interference emission must be limited to compatible values, on the other.

The **product standard, EN 61 800-3**, relevant to "variable-speed drives" describes the requirements for residential and industrial sectors.

Immunity

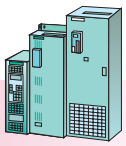
The units satisfy the requirements of the EMC product standard, EN 61 800-3, for the industrial sector and thus the lower values regarding immunity required by the residential sector as well.

Interference emission and radio interference suppression

If converters are used in a residential area, conducted interference or electromagnetically emitted interference must not exceed the limit values according to "B1".

Type of interference	Level of interference	Comments
Electrostatic discharge	up to 12 kV	
Rapid transient interference (burst)	up to 4 kV	for power section
	up to 2 kV	for signal cables

Compact and chassis units Cabinet units



A residential area in this sense is a connection, i.e. an outgoing section of a transformer, to which private households are also connected.

The EMC directive requires that an industrial system as a whole is electromagnetically compatible with its environment.

In order to limit the interference emission, the following measures must be provided:

- Radio-interference suppression filters, including line commutating reactors for reducing the conducted interference
- Shielded cables for motor supply cables and signal cables for reducing electromagnetically emitted interference
- Compliance with the installation guidelines.

In systems with MASTERDRIVES units and other components, e.g. contactors, switches, monitoring units, automation units etc., it must be ensured that no interference is emitted to the outside and also that the individual units do not cause any interference among themselves. In this respect, the measures described in the Compendium, Section 3, "Design of Drives in Conformance with EMC guidelines" are to be implemented (Compendium Order No., see Section 5 "Documentation and Training").

The most important of these measures are as follows:

- The components of a system must be housed in a cabinet which acts like a Faraday cage.
- Signal cables and motor supply cables must be shielded. The shields must be connected to earth at both ends.
- Signal cables should be spatially separated (at least 20 cm) from the power cables. If necessary, screening plates are to be provided.

For further measures and details, see the installation guidelines referred to.

Supply-side components

Line fuses

The 3NE1 SITOR fuse provides both cable protection and semiconductor protection in one fuse. This results in significant cost savings and reduced installation times.

For Order No. and assignment, see Section 3.

For the description and technical data of the fuses, see Configuration Manual "SITOR Halbleiterschutz-Sicherungen," Order No.: E20001–A700–P302 (available only in German).

Line commutating reactor

The line commutating reactor reduces the harmonics of the converter, the rectifier unit and the rectifier/regenerative unit. The effect of the reactor depends on the ratio of the line short-circuit output to the drive output. Recommended ratio of line short-circuit output to drive output > 33 : 1:

- Use a 2 % line commutating reactor for converters and rectifier units.
- Use a 4 % line commutating reactor for rectifier/regenerative units.

A line commutating reactor also limits current spikes caused by line-supply voltage disturbances (e.g. due to compensation equipment or earth faults) or switching operations on the power system.

Reactors for supply voltages of 380 V to 480 V and 50 Hz can be used with 60 Hz without any restrictions. In the case of supply voltages of 500 V and 690 V, the permissible operating current with 60 Hz must be reduced to 90 % of the specified value and it may be necessary to use a reactor with the next higher current rating (see Selection and ordering data, Section 3).

For rated currents up to 40 A, connecting terminals are fitted. In the case of reactors with rated currents ≥ 41 A, flat connections are provided. The conductor cross-sections which can be connected are indicated in the dimension drawings (see Section 7).

The commutating reactors are designed with degree of protection IP00.

For further technical data regarding the mechanical design, see Catalog PD 30, Order No.: E86060–K2803–A101–A1 (only available in German).

Autotransformers for rectifier/regenerative units

Rectifier/regenerative units require a 20 % higher supply voltage at the anti-parallel inverter bridge for regenerative operation. An autotransformer can be used to adapt the voltage accordingly. Two types of autotransformer are available, one with 25 % and another with 100 % power-on duration. They correspond to the required technical specifications and cannot be replaced by any other types.

For Order No. and assignment, see Section 3; for dimension drawings, see Section 7.

Radio-interference suppression filters

When integrated in the installation in accordance with EMC guidelines, SIMOVERT MASTERDRIVES applications comply with the EMC product standard for electrical drives, EN 61 800-3.

The radio-interference suppression filters, in conjunction with the line commutating reactor, reduce the interference voltages of the converters, the rectifier units and the rectifier/regenerative units – up to an output of 37 kW . The specified limits acc. to EN 55 011 Class B1 (residential sector) for 3-ph. 200 V AC to 230 V AC and 3-ph. 380 V to 480 V AC are adhered to with the suggested filters (TN systems).

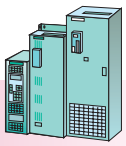
Radio-interference suppression filters with rated currents up to 2500 A and rated voltages of up to 690 V are available for the different types of power systems in the industrial sector.

For Order No. and assignment, see Section 3; for dimension drawings, see Section 7.

For limit values, see "Electromagnetic compatibility (EMC)" on page 6/46.

Note

If several converters are built into a drive cabinet or control room, a common shared filter with the total current of the installed converters is recommended in order to avoid exceeding the limit values. The individual converters are to be decoupled with the corresponding line commutation reactor.



DC link components

The DC bus is a DC voltage system which supplies the inverters.

The DC bus itself is supplied via a rectifier unit or a rectifier/regenerative unit whose supply-side fuses also protect the DC bus against short-circuits and overload.

The inverter and the braking units can be connected to the DC bus in three ways:

- Direct connection with the fuses integrated in the unit
  Option: **L30**
  for sizes E to G.
- Electro-mechanical connection (Fig. 6/51)
  A load switch disconnector (2-pole connection) with two SITOR fuses (which protect the inverter) connects the inverter and braking units to the DC bus.
  The DC bus must be in a de-energized state when inverters or braking units are switched in or out.
  For ordering data, see Section 3.
- Electrical connection (Fig. 6/52)
  A load switch disconnector (2-pole connection) with SITOR fuses, precharging resistors and a coupling contactor connects inverters to the DC bus.
  In the standard version, the coupling contactor can be operated by the electronics of the inverter. The inverters can thus be switched in/out while the DC bus is live. During switch-in and switch-out, the inverter pulses are blocked, i.e. switching takes place without power. During configuration, it must be ensured that the contacts do not open during operation, e.g. if the control voltage for the contactor coils fails. For ordering data, see Section 3.

The suggested components have rated insulation voltages of ≥ 1000 V when used under conditions according to VDE 0110 and with pollution degree 2.

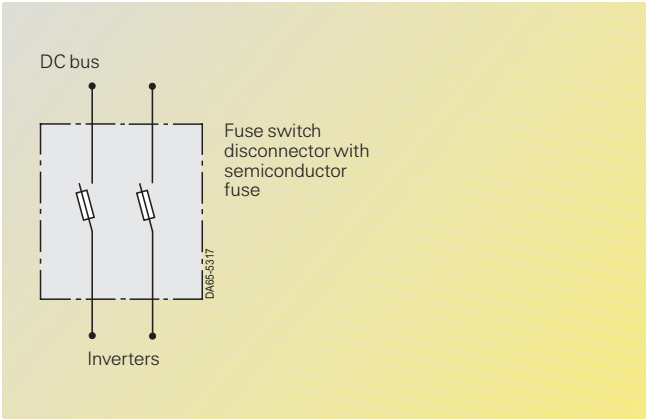


Fig. 6/51
Electro-mechanical connection

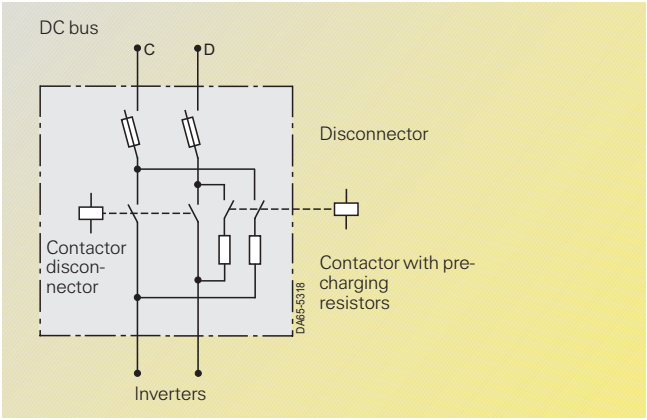


Fig. 6/52
Electrical connection

DC voltage range	Precharging contactor type
to 810 V	3TC44
810 V to 930 V	3TC52

Free-wheeling diode on the DC bus

The free-wheeling diodes for multi-motor drives (inverters connected to a common DC bus) are to be used for the following applications:

1. When a braking unit is connected.
2. When the output range exceeds the levels in the following table:

DC voltage range	Nominal DC voltage output or rated current of the inverters
510 V to 650 V	2.2 kW to 15 kW (6.1 A to 34 A) 5.5 kW to 45 kW (13.2 A to 92 A) 18.5 kW to 90 kW (47 A to 186 A) 37 kW to 160 kW (72 A to 315 A) 45 kW to 250 kW (92 A to 510 A) 110 kW to 1300 kW (210 A to 2470 A)
675 V to 810 V	2.2 kW to 55 kW (4.5 A to 79 A) 11 kW to 110 kW (22 A to 156 A) 18.5 kW to 250 kW (29 A to 354 A) 45 kW to 450 kW (66 A to 650 A) 75 kW to 1700 kW (108 A to 2340 A)
890 V to 930 V	55 kW to 200 kW (60 A to 208 A) 90 kW to 2300 kW (128 A to 2340 A)

Braking units and braking resistors

The braking units in the range P_{20} = 5 kW to 20 kW consist of a chopper power section and an internal load resistor.

An external load resistor can be connected to increase the braking power or to increase the continuous braking power. The internal load resistor must be disabled by removing the connecting jumper (see Fig. 6/55) when an external load resistor is connected.

Units with 50 kW to 200 kW braking power require an external load resistor, which is to be connected to the braking unit.

The braking units of adjacent or the same power ratings, e.g. P_{20} = 100 kW and 170 kW or 5 kW and 10 kW, can be connected in parallel to increase the power. Each braking unit, however, requires its own load resistor. The maximum permissible continuous braking power (with an external resistor) connected to a converter or inverter is

$P_{DBMAX} \leq 0.6\ P_{conv.}$

$P_{20MAX} \leq 2.4\ P_{conv.}$

Note

When the internal load resistor is being used, P_{20} can be used for a braking time of 2.5 s and P_3 for a braking time of 1.7 s with a cycle time of 72.5 s (see Fig. 6/56).

When a braking unit is used on a DC bus, a fuse complying with page 3/78 should be fitted.

Braking units are used when regenerative power occurs occasionally and for a short time, e.g. during braking of the drive (emergency stop). For braking over a longer period of time, self- commutating pulsed rectifier/ regenerative units AFE or rectifier/regenerative units are to be used.

Protective functions which are visualized via the LEDs	
Overcurrent	Overcurrent has occurred. Reset necessary.
Overload	The braking unit is powered down after the permissible I^2t value has been exceeded. The unit is ready for operation again after expiry of the defined pause intervals.
Overtemp	Temperature of the heat sink is too high, self-resetting after falling below the switch-on threshold.
Ready	DC voltage is connected (LED is on). Braking unit is operating (LED flashes).

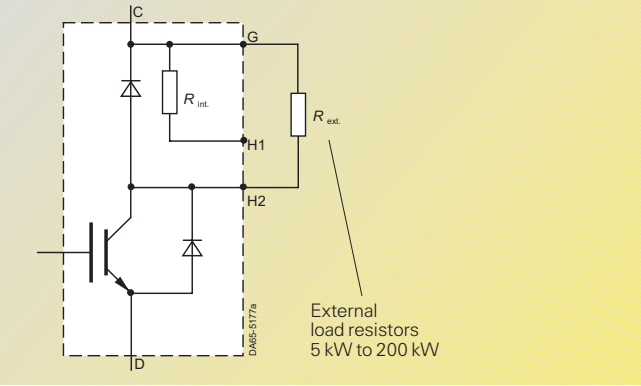


Fig. 6/53
Block diagram of a braking unit with **external** braking resistor

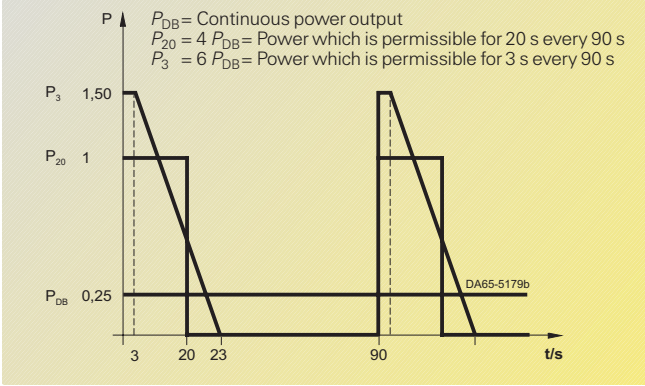


Fig. 6/54
Load diagram with **external** load resistor

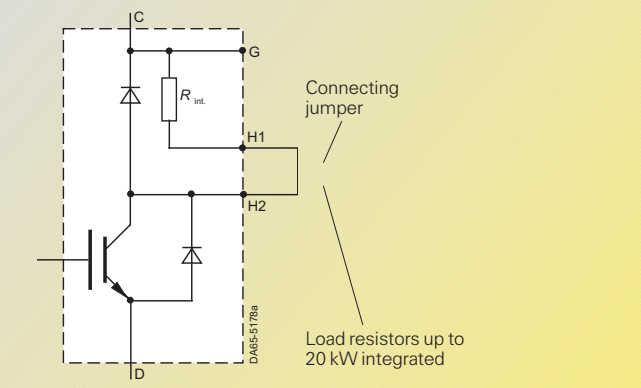


Fig. 6/55
Block diagram of braking unit with **internal** braking resistor

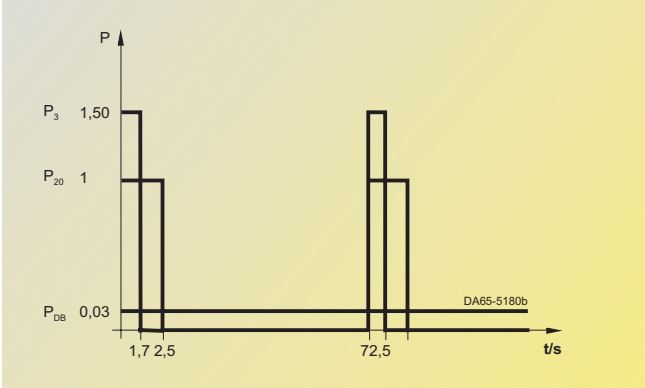
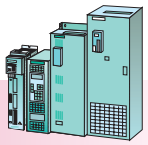


Fig. 6/56
Load diagram with **internal** load resistor



Load-side components and cables

Output reactors

compensate capacitive recharging currents in long cables.

The maximum cable lengths which can be connected to the standard unit without reactors are specified in the first table on this page. Longer power cables should be dimensioned according to the second table below.

Maximum cable lengths without output reactors

Output	Rated voltage	Non-shielded cables and PROTOFLEX EMV	Shielded cables
to 4 kW	380 V to 600 V	50 m	35 m
5.5 kW	380 V to 600 V	70 m	50 m
7.5 kW	380 V to 600 V	100 m	67 m
11 kW	380 V to 600 V	110 m	75 m
15 kW	380 V to 600 V	125 m	85 m
18.5 kW	380 V to 600 V	135 m	90 m
22 kW	380 V to 600 V	150 m	100 m
30 kW to 200 kW	380 V to 690 V	150 m	100 m
250 kW to 630 kW	380 V to 480 V	200 m	135 m
710 kW and 1300 kW	380 V to 480 V	unlimited	
900 kW to 1100 kW	380 V to 480 V	200 m	135 m
250 kW to 2300 kW	500 V to 690 V	150 m	100 m

Maximum cable lengths when output filter reactors are used

Note

If a converter/inverter supplies several motors (group drive), the capacitive charge/discharge currents of the motor cables are added together. In the case of group drives, therefore, an output filter reactor should always be used. The total cable length is the sum of the cable lengths for the individual motors.

Number of reactors in series		1	2	3	1	2	3
Converter/ inverter rating	Rated voltage	Reactor[2] Non-shielded cables			Reactor[2] Shielded cables[5]		
0.55 kW to 1.1 kW	380 V to 480 V	100 m	[1]	[1]	60 m	[1]	[1]
1.5 kW to 4 kW	380 V to 600 V	90 m	[1]	[1]	100 m	[1]	[1]
5.5 kW	380 V to 600 V	200 m	[1]	[1]	135 m	[1]	[1]
7.5 kW	380 V to 600 V	225 m	450 m	[1]	150 m	300 m	[1]
11 kW	380 V to 600 V	240 m	480 m	[1]	160 m	320 m	[1]
15 kW	380 V to 600 V	260 m	520 m	[1]	175 m	350 m	[1]
18.5 kW	380 V to 600 V	280 m	560 m	[1]	190 m	375 m	[1]
22 kW	380 V to 600 V	300 m	600 m	900 m	200 m	400 m	600 m
30 kW to 200 kW	380 V to 690 V	300 m	600 m	900 m	200 m	400 m	600 m
250 kW to 630 kW	380 V to 480 V	400 m	800 m	1200 m	270 m	530 m	800 m
1100 kW	380 V to 480 V	400 m	800 m	1200 m	270 m	530 m	800 m
250 kW to 2300 kW[3]	500 V to 690 V	300 m	600 m	900 m	200 m	400 m	600 m
900 kW to 1500 kW[4]	380 V to 690 V	300 m	450 m	600 m	200 m	300 m	450 m

1) Cannot be used.

2) In the case of sizes M, N and Q, 2 inverters are connected in parallel and the number of reactors for the permissible cable lengths is therefore required for each inverter section.

3) Applies to sizes E, F, G, J, K, L, N and Q.

4) Applies to size M.

5) The effective capacitance per unit length of the PROTOFLEX EMC cable corresponds to that of an unshielded cable. With the PROTOFLEX EMC cable, the same motor cable lengths are therefore possible as with an unshielded cable.

Use of iron-core reactors

- Drives with standard and non-standard induction motors with a rated motor frequency (frequency at the start of field weakening) of up to 87 Hz and a maximum frequency of 200 Hz.
- Drives with reluctance motors or permanent-magnet synchronous motors with a maximum frequency of 120 Hz.

Use of ferrite-core reactors

- Induction-motor drives with a rated motor frequency (frequency at the start of field weakening) of 200 Hz and a maximum frequency of 300 Hz.
- Drives with reluctance motors or permanent-magnet synchronous motors with a maximum frequency of 600 Hz.
- The ferrite-core reactors can also be used up to the maximum pulse frequency of the units. The derating of the units at higher pulse frequency compensates the higher reactor losses at the higher pulse frequency. Pulse frequencies exceeding 6 kHz cause the resonant frequency to change and therefore influence the permissible cable lengths.

The permissible cable lengths are calculated as follows from the data given in the 2nd table on page 6/50:

$$I_{permissible} \leq I_{table} \cdot \frac{6\ kHz}{f_{pulse}}$$

only valid for $f_{pulse} > 6$ kHz.

The output reactors, together with the conductor capacitance/cable capacitance, limit the voltage rate-of-rise in the motor winding (see table below).

In the case of cable lengths > 7.5 m the output filter reactor does not have a defined limiting effect on the voltage spikes across the motor terminals due to reflections.

Maximum d*v*/d*t* < 500 V/μs with output filter reactor

Converter/ inverter size	Non-shielded cable	Shielded cables
A to D	> 30 m	> 20 m
E to N	> 150 m	> 100 m

Voltage limiting filters

Voltage limiting filters (output d*v*/d*t* filters for SIMOVERT MASTERDRIVES Vector Control) should be used for motors where the voltage strength of the insulation system is not known or is inadequate. Standard Siemens 1LA5/1LA6/1LA8 type motors only require a d*v*/d*t* filter for supply voltages of > 500 V + 10 %.

The d*v*/d*t* filters limit the voltage rate-of-rise to values of < 500 V/μs and the typical voltage spikes for the rated supply voltage to the following values:

- < 1000 V at $V_{supply} \leq$ 575 V,
- < 1150 V at 660 V $\leq V_{supply} \leq$ 690 V

with a motor cable length of ≤ 150 m.

When reactors and filters are connected in series, the cable lengths can be dimensioned according to the above table.

Maximum cable lengths when a d*v*/d*t*-filter is used

Converter/ inverter rated current	d*v*/d*t*-filter	d*v*/d*t*-filter and reactor	d*v*/d*t*-filter and 2 reactors[2]	d*v*/d*t*-filter	d*v*/d*t*-filter and reactor	d*v*/d*t*-filter and 2 reactors[2]
	Non-shielded cables			Shielded cables		
5 A to 22 A	150 m	[1]	[1]	100 m	[1]	[1]
≤ 370 A[4]	150 m	300 m	450 m	100 m	200 m	300 m
≤ 225 A[5]	150 m	300 m	450 m	100 m	200 m	300 m
510 A to 1300 A[4]	150 m	375 m	[1]	100 m	250 m	[1]
297 A to 1230 A[5]	150 m	375 m	[1]	100 m	250 m	[1]
≥ 1400 A[6]	[3]	[3]	[3]	[3]	[3]	[3]

Note

The total cable length is the sum of the cable lengths connected to the individual motors. From a motor current of ≥ 120 A, single-motor drives can also be supplied with parallel cables (up to the maximum permissible cable length) in the case of standard units.

The voltage limiting filters can be used up to a maximum frequency of 300 Hz.

The d*v*/d*t* filters can **only** be used with a motor connected.

For selection and ordering data for the d*v*/d*t* filters, see Section 3; for dimensions, see Section 7.

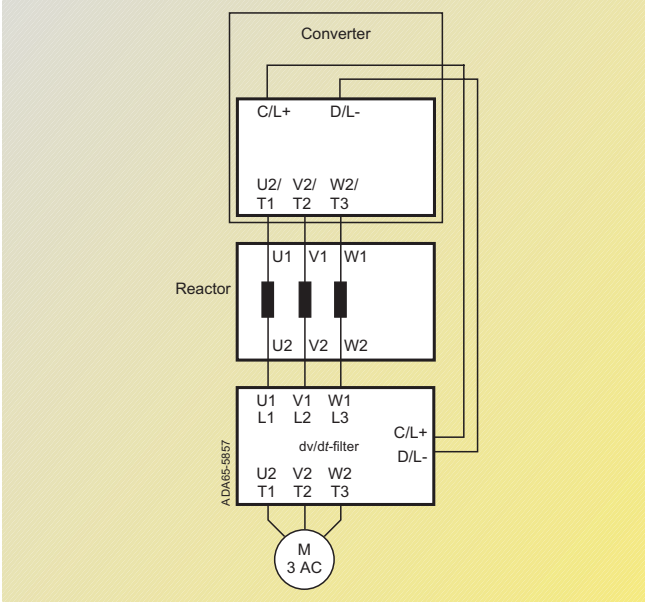
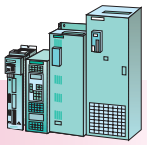


Fig. 6/57
Converter with reactor

1) Cannot be used.
2) Voltage limiting is no longer effective for supply voltages of > 500 V.
3) Not available at present.
4) Rated supply voltage 380 V to 480 V.
5) Rated supply voltage 500 V to 690 V.
6) Rated supply voltage 380 V to 690 V.



Load-side components and cables (continued)

Sinusoidal filters

ensure that the motor voltage and currents are almost sinusoidal. The harmonic distortion factor for a 50 Hz motor voltage with sinusoidal filter, for example, is approximately 5 %. The stressing levels of motors which are supplied via sinusoidal filters are lower than the values specified in DIN VDE 0530.

When engineering the drive, it should be ensured that the output voltage of converters and inverters with sinusoidal filters is approximately 85 % of the associated supply voltage at 380 V to 480 V and approximately 90 % at 500 V to 600 V.

The sinusoidal filters for supply voltages of 380 V to 480 V are designed for a 6 kHz pulse frequency. The maximum output frequency is:

Cable lengths which can be connected when a sinusoidal filter is used

Output	380 V to 480 V	500 V to 600 V	380 V to 480 V	500 V to 600 V
	Non-shielded cables		Shielded cables	
to 4 kW	250 m	350 m	170 m	250 m
5.5 kW	320 m	475 m	210 m	320 m
7.5 kW	400 m	550 m	270 m	400 m
11 kW	500 m	700 m	330 m	500 m
15 kW	600 m	900 m	400 m	600 m
18.5 kW to 132 kW	A	B	0.67 · A	A

$$A = 600\ \text{m} + 7.5\frac{\text{m}}{\text{kW}} \cdot (P - 15\ \text{kW})$$

$$B = 900\ \text{m} + 10\frac{\text{m}}{\text{kW}} \cdot (P - 15\ \text{kW})$$

P Rated motor output of the converter or inverter

- 400 Hz for Compact units (sizes A to D),
- 200 Hz for chassis units (sizes E to G).
  Note the current derating for chassis units as a result of the 6 kHz pulse frequency!

The sinusoidal filters for supply voltages of 500 V to 600 V are designed for a pulse frequency of 3 kHz.

The maximum output frequency is:

- 200 Hz for Compact units (sizes B to D),
- 100 Hz for chassis units (sizes E to G).

Sinusoidal filters are suitable for supplying Ex(d) motors. They limit the voltage stressing in the motor terminal boxes to below 1080 V up to a supply voltage of ≤ 500 V.

For possible cable lengths, see table.

Note

The total cable length is the sum of the cable lengths to the individual motors. From a motor current of ≥ 120 A, single-motor drives can also be operated with parallel cables (up to the maximum permissible cable length) in the case of standard units.

For selection and ordering data for the sinusoidal filters, see Section 3; for dimension drawings, see Section 7.

Required cross-sections of protective conductor

The protective conductor is to be dimensioned considering the following functions:

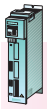
- In the event of an earth fault, it must be ensured that no excessively high touch voltages occur on the protective conductor as a result of voltage drops of the earth-fault current (< 50 V AC or 120 V DC, EN 50 178 Section 5.3.2.2, IEC 60 364, IEC 60 543).
- The earth fault current flowing in the protective conductor in the event of an earth fault must not overheat the protective conductor.
- In the event of a fault in accordance with EN 50 178, Section 8.3.3.4, it is possible that continuous currents can flow through the protective conductor. The cross-section of the protective conductor is therefore to be dimensioned for this continuous current.

The cross-section of the protective conductor is to be selected in accordance with EN 60 204-1, IEC 60 364.

Cross-section, outer conductor	Min. cross-section of external protective conductors
to 16 mm²	Cross-section of outer as minimum
16 mm² to 35 mm²	16 mm²
from 35 mm²	Min. 50 % of cross-section of outer conductor

- Switchgear and motors are usually earthed separately using a local earth electrode. With this constellation, the earth-fault current, in the event of an earth fault, flows through the parallel earth connections and is divided up. In spite of the cross-sections of the protective conductor as specified in the table, no non-permissible touch voltages then occur with this kind of earthing.
- The MASTERDRIVES converters, inverters, rectifier units (>400 kW) and rectifier/regenerative units limit the current to an effective value in accordance with the rated current, thanks to their rapid control.

  Given these facts, we recommend that the cross-section of the protective conductor is generally the same as the cross-section of the outer conductor for earthing the control cubicle and the motor.



Option boards for the available slots (slot A and B) of Compact PLUS converters and inverters.

Communication Boards

CBP2

- Communication via PROFIBUS DP
- The CBP2 board supports PROFIBUS Profile V3 (slave-to-slave communication, acyclical communication with Master Class II).

CBC

- Communication via CAN Bus
- The CBC board supports CAN levels 1 and 2.

SLB

- Fast drive coupling via the SIMOLINK board (fiber-optic cable) with a maximum of 201 nodes.

Terminal Expansion Boards

EB1

- 4 bidirectional digital inputs/outputs
- 3 digital inputs
- 2 analog outputs
- 3 analog inputs

EB2

- 3 relay outputs with make contacts
- 1 relay output with change-over contact
- 2 digital inputs
- 1 analog output
- 1 analog input

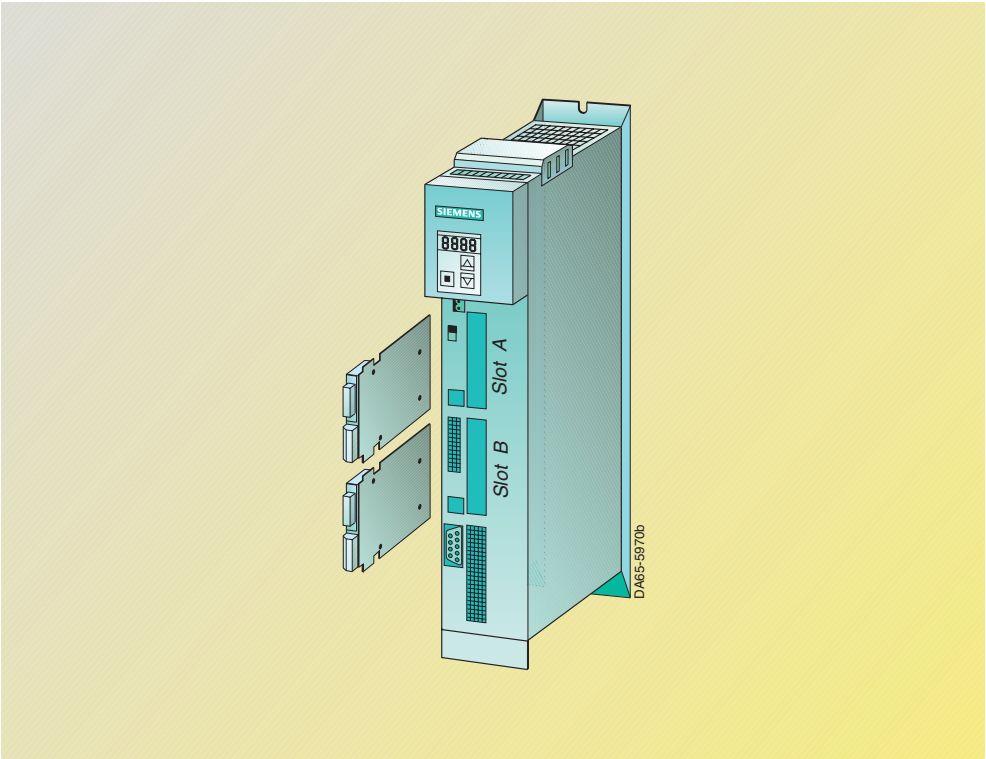


Fig. 6/58
Integration of option boards

Incremental Encoder Evaluation

SBP

- Evaluation of an external encoder or frequency generator, e.g. setpoint signal
- HTL or TTL level selectable

Notice

The base unit already has a motor encoder input (incremental encoder HTL).

The units can be supplied ex works with the corresponding option board. If this board is required, the option code must be quoted when ordering. A maximum of two option boards can be plugged in. Even two identical option boards are possible but please note the exceptions to this which are indicated. For a description of the option boards, see page 6/63 and the following.

Board	Slot A Supplementary order code	Slot B
CBP2	**G91**	**G92**
CBC	**G21**	**G22**
SLB [1]	**G41**	**G42**
EB1	**G61**	**G62**
EB2	**G71**	**G72**
SBP [1]	**C11**	**C12**

1) Only one board, either in slot A or slot B.

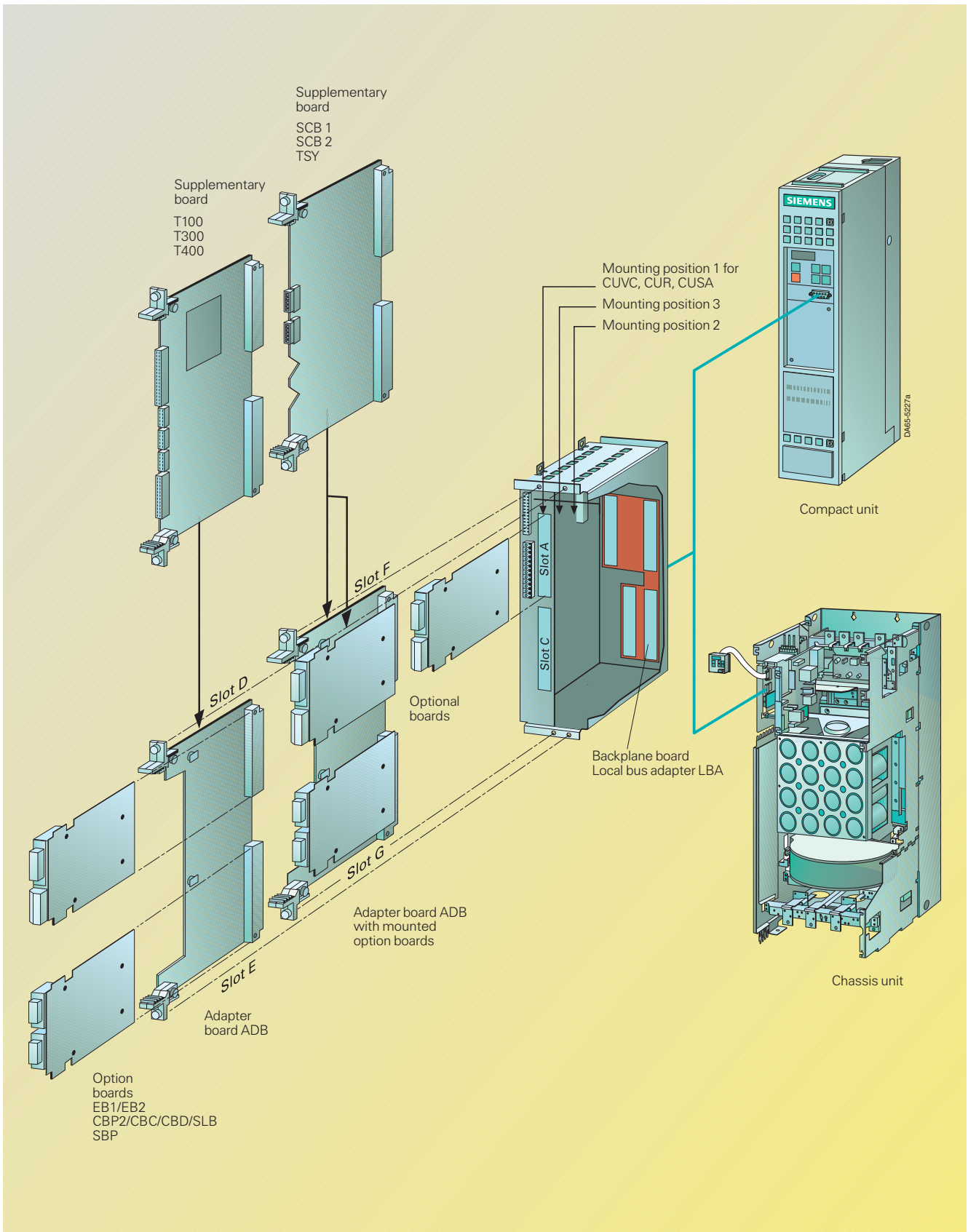


Fig. 6/59
Integration of the optional boards and supplementary boards in the electronics box of compact and chassis units

Integrating boards in the electronics box

Note

If technology boards (T100, T300, T400) are used, the following rules apply:

- Only one technology board can be used, in mounting position 2 only.
- Only one CB communication board can be used. It must be mounted in slot G using an ADB adapter board. The communication board communicates directly with the technology board (a condition for standard engineering).
- If a SIMOLINK board (SLB) is used, it is to be plugged into a slot on the basic electronics board. The SIMOLINK board communicates directly with the basic unit. Signal connections to the technology board can be established by means of BICO links.

Boards	Mounting position 1	Mounting position 3	Mounting position 2	Max. number of boards in the electronics box
Electronics box with CUVC control board - option board possibilities				
Boards		**LBA[1])**	**LBA[1])**	
Communication SCB1 SCB2	 CUVC CUVC	 • •	 • •	 only one SCB1 or SCB2
Technology T100/T300/T400 TSY	 CUVC CUVC	 – •	 • •	 only one technology or synchronizing board
Option boards	Slot A Slot C	ADB and LBA[2]) Slot F Slot G	ADB and LBA[2]) Slot D Slot E	
Communication CBP2[3]) CBC SLB	 • • • • • •	 • • • • • •	 • • • • • •	 max. two CBP2 max. two CBC only one SLB
Expansion boards EB1 EB2	 • • • •	 • • • •	 • • • •	 max. two EB1 max. two EB2
Incremental encoder boards SBP	 • •	 • •	 • •	 only one SBP
Electronics box with CUR or CUSA control board - option board possibilities				
Boards		**LBA[1])**	**LBA[1])**	
Communication SCB1 SCB2	 CUR/CUSA CUR/CUSA	 • •	 • •	 only one SCB1 oder SCB2
Technology T100/T300 TSY	 CUR/CUSA CUR/CUSA	 – •	 • •	 only one technology or synchronizing board
Option boards	Slot A Slot C	ADB and LBA[2]) Slot F Slot G	ADB and LBA[2]) Slot D Slot E	
Communication CBP2 CBC	 – – – –	 – • – •	 – • – •	 only one CBP2 only one CBC

• Possible mounting position – Mounting not possible

Note

Fig. 6/60 shows the technically possible equipment variants. Not all the variants can be ordered ex works via supplementary option codes.

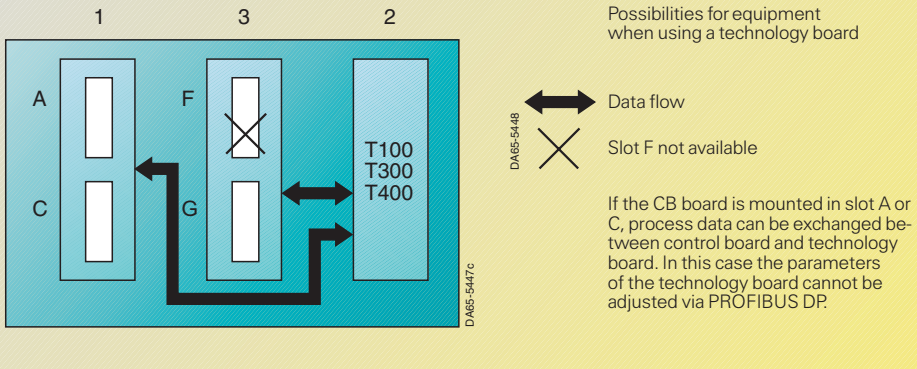
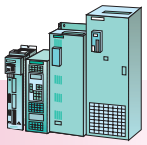


Fig. 6/60
Integration of boards in the electronics box

1) Supplementary board in mounting position 2 or 3 only possible with backplane bus LBA. When ordering LBA use the supplementary order code K11. Mounting position 3 can only be used if mounting position 2 is assigned.

2) Option boards in mounting position 2 or 3 only possible with backplane bus LBA and adapter board ADB. Supplement the Order No. with the supplementary order code K11 (LBA) and K01 (ADB in mounting position 2) or K02 (ADB in mounting position 3). Mounting position 3 can only be used if mounting position 2 is occupied.

3) For mechanical reasons only 90° angled PROFIBUS connectors can be used (e.g. 6ES7972–0BA11–0XA0). With swivel and axial connectors as well as OLP (Optical Link Plug), especially on compact units the front door cannot be closed anymore. With compact units version A the CBP2 should not be mounted in slot A because the parameterization unit PMU can touch the PROFIBUS connector if the front door is closed.



USS protocol

The user data which can be transmitted with the USS protocol have the structure shown in Fig. 6/61.

The PKW area allows reading and writing of parameter values and the reading of parameter descriptions and texts. This mechanism is mainly used for exchanging data for operator control and visualization as well as start-up and diagnosis.

The PZD area contains the signals necessary for process control – such as control words and setpoints – from the automation system to the drive, and status words and actual values from the drive to the automation system.

For MASTERDRIVES Vector Control units, USS interfaces are available on

- the basic CUVC board (SCom1, SCom2)
- the T100 technology board
- the SCB2 interface board.

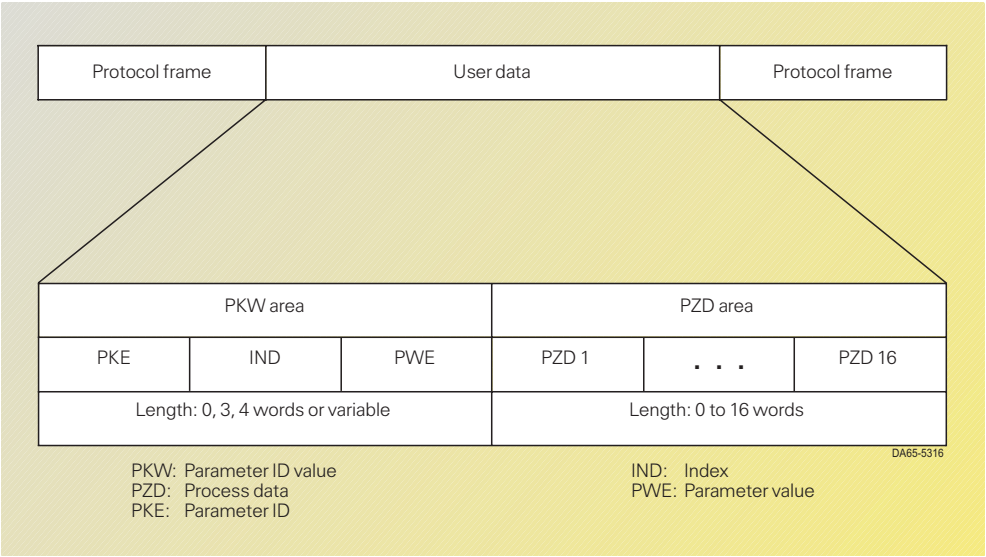


Fig. 6/61
Telegram structure with the USS protocol

USS-Master		Additional hardware/software[1)]
SIMATIC S5	AG95/AG100U with CP521 Si communication processor	RS232/RS485 interface converter DVA_S5 option package for SIMATIC S5 (see page 2/12 and 3/92)
	AG115 to AG155U with CP524 communication processor	RS485 interface module for CP524 373 memory module for CP524 COM 525 parameterization software for CP524 S5R00T special driver for CP524 (6ES5897-2MB11) DVA_S5 option package for SIMATIC S5 (see page 2/12 and 3/92)
SIMATIC S7	S7-200 (CPU 214, 215 or 216)	STEP 7-MICRO/DOS or STEP 7-MICRO/WIN configuration tool for S7-200
	S7-300 with CP340-1C	Configuration package for CP340, point-to-point coupling Drive ES SIMATIC (STEP 7 ≥ V 5.0) option software (see pages 2/13 to 2/15, 3/91 and 3/92)
	S7-400 with CP441	X27 RS422/RS485 interface module Configuration package for CP441, point-to-point coupling Drive ES SIMATIC (STEP 7 ≥ V 5.0) option software (see pages 2/13 to 2/15, 3/91 and 3/92)
SIMATIC TI	FIM505 field interface module	
SIMADYN D	CS7 adaption board with SS4 interface module	
PC	RS485 interface card or RS232/RS485 converter, USS driver	

Bus topology

The USS bus is to be established as a line without spur lines.

Bus cable

The SINEC L2 bus cable (Order No. 6XV1830-0AH10) can be used as the bus cable. The maximum cable length is 1200 m.

Installing the bus cable

The USS bus cable is usually connected with screw or plug-in terminals. The SCom1 on the basic board is accessible via a 9-pole SUB-D socket. The pin or terminal assignment of the SCom1 is given in Section 2 and that of the SCom2 in the section "System components".

The assignment of the interface on the supplementary boards can be found in the respective operating instructions.

Bus termination

The bus cable is to be terminated at both ends (first and last node). In the case of MASTERDRIVES Vector Control units, it is terminated with the S1 switches (SCom1, X300) or S2 (SCom2, X101) on the base electronics board.

Possible USS masters are

- a user-friendly operator control panel, OP1S (local operator control)
- a Drive ES or a DriveMonitor PC (central parameterization and diagnosis) or
- an automation system (see table).

Possible USS automation masters and the necessary hardware/software additions are shown in the table.

Configuring of USS communication

Configuration of USS communication in an automation system consists of the following steps:

- parameterization of the USS master
- creation of the communication program in the master
- parameterization of the drives.

Parameterization of the master and the communication program is system-specific.

Parameterization of the drives consists of two steps (example of SCom1/SCom2):

- parameterization of the interface (parameters P700, P701, P702, P703, P704)
- parameterization of the process data interconnection and parameterizing enable (control words P554 to P591, setpoints P443, P433, etc., status words and actual values P707, P708, parameter access P053).

1) For the ordering data of the additional items, see Catalogs ST 50 and ST 70.

PROFIBUS DP

If the PROFIBUS DP is used, the CBP or CBP2 communication board is necessary for interfacing drives to higher-level automation systems.

With extended functionality, CBP2 is fully compatible with CBP and has replaced it as standard. In the following, therefore, "CBP" signifies both boards; individual special features of CBP2 are indicated.

Functionality of the CBP

- Cyclical user data exchange with the master according to the "PROFIBUS Profile for PROFIDRIVE Variable-Speed Drives " (Order No. 3.071, PROFIBUS Nutzerorganisation e.V., Karlsruhe).
- Acyclical communication channel for exchanging parameter values up to a length of 118 words with a SIMATIC S7 CPU.
- Acyclical communication channel for connecting the Drive ES Basic start-up, parameterization and diagnostics tools.
- Support of the PROFIBUS control commands, SYNC and FREEZE, for synchronized data transfer from the master to several slaves and vice versa.

Extended functionality of CBP2

to PROFIBUS profile, drive systems V3 PROFIDRIVE

- Flexible configuration of cyclic messages at up to 16 process data words
- Direct communication for direct exchange of data between slaves
- Acyclic communication channel for direct access of a SIMATIC OP to a drive.

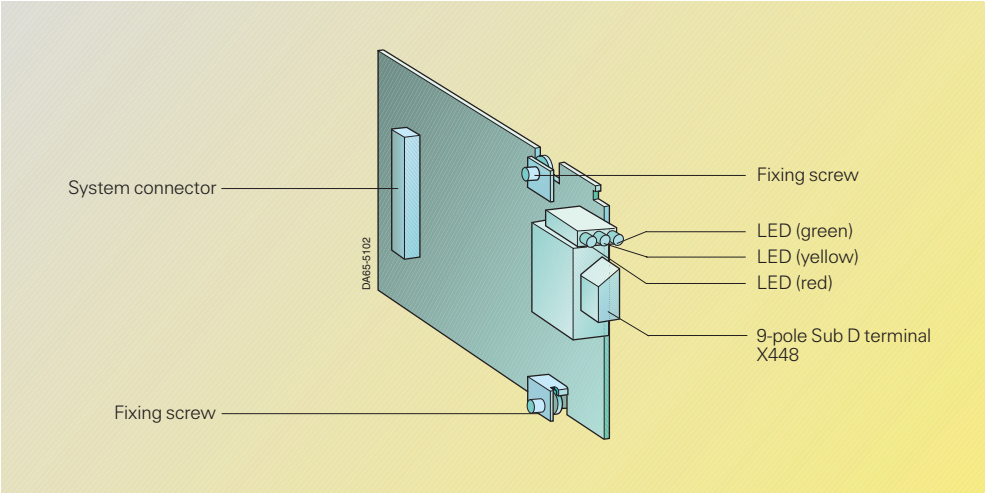


Fig. 6/62
CBP communication board

Possible user data structures with CBP and CBP2

PPO-Type	PKW area			PZD area			Functionality	
	PKW	IND	PWE	PZD1	• • •	PZD16	CBP	CBP2
PPO1	fixed length: 4 words			fixed length: 2 words			✔	✔
PPO2	fixed length: 4 words			fixed length: 6 words			✔	✔
PPO3	fixed length: 0 words			fixed length: 2 words			✔	✔
PPO4	fixed length: 0 words			fixed length: 6 words			✔	✔
PPO5	fixed length: 4 words			fixed length: 10 words			✔	✔
none	0 or 4 words			flexible configurable from 1 to 16 words				✔

PKW: Parameter ID value
PZD: Process data
PKE: Parameter ID
IND: Index
PWE: Parameter value

Cyclic exchange of user data

In the PROFIBUS profile on which the CBP functionality is based, the structure of the user data, amongst other items, with which a DP master can access the drives is defined. There are five permanently defined PPO (parameter process-data objects); these are subdivided into a PKW area (parameter identifier value area, up to 4 words) and the PZD area (process data area, up to 10 words).

The PKW area enables reading and writing of parameter values and the reading of parameter descriptions. This mechanism is used to visualize or change any of the slaves' parameters.

The PZD area contains the data – such as control words and setpoints needed for process control – from the automation system to the drive or status words and actual values from the drive to the automation system.

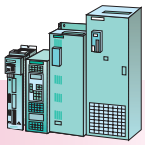
When a CBP2 is used, local user data structures with up to 16 process data words can now also be utilized in addition to the five PPO types.

Technical data of the CBP

- RS485 interface acc. to EN 50 170, short-circuit proof and floating
- Baud rates from 9.6 Kbit/s to 12 Mbit/s.

Mounting of the CBP

In MASTERDRIVES Vector Control, slots A, C, E and G in the electronics box are available (see also page 6/54). For slots G and E, the local bus adapter (6SE7090–0XX84–4HA0) and the adapter board (6SE7090–0XX84–0KA0) are necessary.



PROFIBUS DP (continued)

Bus cable

A bus cable to the PROFIBUS DP specifications is to be used for data transmission (see page 3/85).

Bus connection

The bus is connected to the PROFIBUS DP via the 9-pole Sub-D socket (X448) in accordance with the PROFIBUS DP standard. For the pin assignment at terminal X448, see the table, top right.

On the bus side, a 9-pole Sub-D connector plug is necessary (see page 3/85).

The CBP2 communication board can alternatively be connected via an optical bus terminal or an optical link module to the optical PROFIBUS DP (see page 3/85).

Bus termination

Each RS485 bus segment must be provided at both its ends with a bus termination. The bus is terminated by means of a switch integrated in the PROFIBUS DP plug-in connector; with its help the termination can be opened or closed.

PROFIBUS DP master systems

Drives can generally be coupled to any DP master in accordance with EN 50 170. The lower table on this page contains a list of the automation masters most frequently used in drive technology, which can be used together with CBP2.

Pin assignment at terminal X448

Pin	Designation	Meaning	Area
1	SHIELD	Ground connection	
2	–	Not assigned	
3	RxD/TxD-P	Receive/transmit data P (B/B')	RS485
4	CNTR-P	Control signal	TTL
5	DGND	PROFIBUS DP data reference potential (C/C')	
6	VP	Supply voltage plus	5 V ± 10 %
7	–	Not assigned	
8	RxD/TxD-N	Receive/transmit data N (A/A')	RS485
9	–	Not assigned	

PROFIBUS DP master systems		Additional software[1])
SIMATIC S5	AG95U/DP master AG115 to AG155U with IM308-C (or CP5431) communications board	COM PROFIBUS parameterization software DVA_S5 option package for SIMATIC S5 (see page 3/92)
SIMATIC S7	S7-300 with CPU315-2DP, 318-2 S7-300 with CP342-5 S7-400 with CPU413-/414-/416-2DP, 417-4 S7-400 with CP443-5 Ext. S7-400 with IM467	Drive ES SIMATIC (STEP 7 ≥ V 5.0) (see page 3/91)
SIMATIC M7	IF 964 interface module	
SIMATIC TI	TI545/TI555 with integrated DP interface FIM505 field interface module	
SIMADYN D	CS7 adaption board with SS52 interface module	
PC	CP5613/5614 (PCI) communication board	COM PROFIBUS parameterization software
	CP55511 (PCMCIA) communication board CP5611 (PCI) communication board	SOFTNET-DP/Windows 95/98/NT for PROFIBUS
	CP5412 (A2) communication board	software package DP-5412/Windows 95/98/NT

Configuration of PROFIBUS DP communication

Configuration of DP communication consists of the following steps:

Configuring the DP master

With SIMATIC S7, the bus system is configured together with the hardware in STEP 7. The CBP is already integrated here so that the cyclic exchange of user data can be configured (STEP 7 < V 4.02: it can be made known by loading file SI8045AX.200 supplied).

Here, a CBP2 is configured as a CBP.

To be able to configure the extended functionality of CBP2, software package Drive ES Basic or Drive ES SIMATIC is needed in addition to STEP 7 ≥ V 5.0. (Additional hardware requirement for implementation of direct communication: S7-CPU with integrated DP interface more recent than 04/99.)

With SIMATIC S5, the bus system can be configured via the COM PROFIBUS software. The CBP board is already integrated in COM PROFIBUS as of version 3.2; for older versions, the procedure is as for STEP 7. The extended CBP2 functionality is not supported by SIMATIC S5.

In principle, the CBP2 can be made known to other configuration tools by adopting file "SIEM8045.GSD".

Creating the communication program in the master

The communication program is application-specific. For convenient programming, the software Drive ES SIMATIC is available for SIMATIC S7. Option software DVA_S5 is available for programming communication on a SIMATIC S5.

Parameterization of the drives

Parameterization of the drives consists of two steps:

- parameterization of the interface (parameter P918)
- parameterization of the process-data interconnection and parameterization enabling (control words P554 to P591), setpoints P443, P433 etc., status words and actual values P734, process-data monitoring P722, parameter access P053).

1) For the ordering data of the additional items, see Catalogs ST 50 and ST 70.

CAN

The CBC board (Communication Board CAN) enables SIMOVERT MASTERDRIVES units to communicate with a higher-level automation system, with each other and with field devices by means of the CAN protocol. Power is supplied via the base unit.

The CAN protocol (*C*ontroller *A*rea *N*etwork) is specified in the international standard recommendation ISO DIS 11898 where, however, only the electrical components of the physical layer and the data-link layer (layers 1 and 2 in the ISO and OSI layers reference model) are specified. The CiA (*C*AN *i*n *A*utomation, an international association of users and manufacturers) has defined its use as an industrial field bus with the DS 102-1 recommendations for bus interfacing and the bus medium.

- The specifications in ISO-DIS 11898 and in DS 102-1 are complied with by the CBC board.
- The CBC board only supports CAN layers 1 and 2. At present, additional higher-level communications specifications of the different user organizations such as CAN open of the CiA are *not* supported (CAN open upon request).

The CBC board is limited to the specifications of CAN and is therefore not tied to the dependent specifications of the user organizations. Data exchange with SIMOVERT MASTERDRIVES takes place according to the user data specification for drive systems with PROFIBUS-DP: PROFIBUS Profile for PROFIDRIVE Variable-Speed Drives, PNO, Order No. 3.071.

The user data structure is divided into two areas:

- Process data (control words, setpoints, status words and actual values)
- Parameter area (mechanism for reading and writing parameter values, e.g. settings, alarms, fault numbers or values).

These areas are transmitted as communication objects (identifiers).

Functions		
Process data	max. 16 words	
Data transfer rate:	10, 20, 50 Kbit/s	up to 1000 m cable length
	100 Kbit/s	up to 750 m cable length
	125 Kbit/s	530 m cable length
	250 Kbit/s	270 m cable length
	500 Kbit/s	100 m cable length
	1 Mbit/s	9 m cable length
Max. bus nodes:	≤ 124	

Individual communication objects for the process data from and to the drive are defined, as well as for the parameter tasks of "reading" and "writing".

A defined description can be found in the Compendium for SIMOVERT MASTERDRIVES (for Order No., see Section 5).

Data exchange via CAN

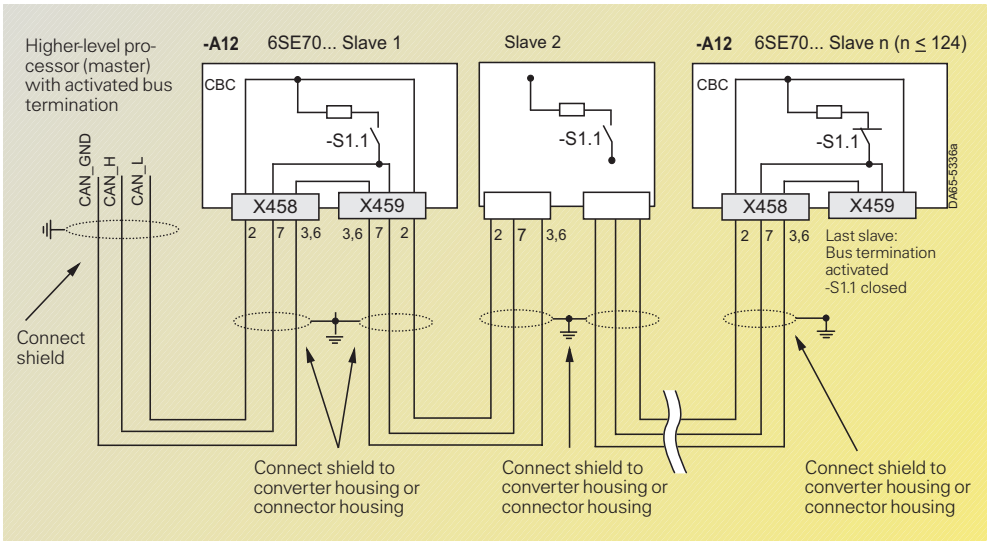


Fig. 6/63
Data exchange between CBC boards, with bus interruption

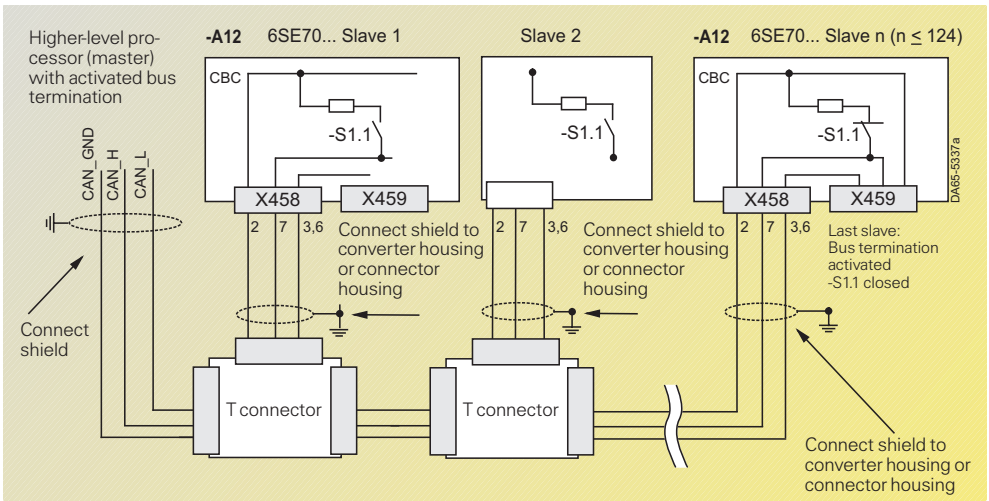
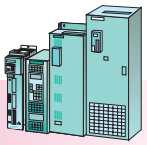


Fig. 6/64
Data exchange between the CBC boards, without bus interruption



CAN (continued)

The CAN protocol enables rapid data exchange between the bus nodes. With regard to user data, a distinction is made between parameter values (PKW) and process data (PZD).

A CAN data telegram consists of a protocol header, the CAN identifier (up to 8 bytes of user data) and the protocol trailer. The CAN identifier serves to uniquely identify the data telegram. A total of 2048 different CAN identifiers are possible in the standard message format. In the extended message format, 2^{29} CAN identifiers are possible.

The extended message format is tolerated by the CBC board but not evaluated. The CAN identifier specifies the priority of the data telegram. The smaller the number of the CAN identifier, the higher is its priority.

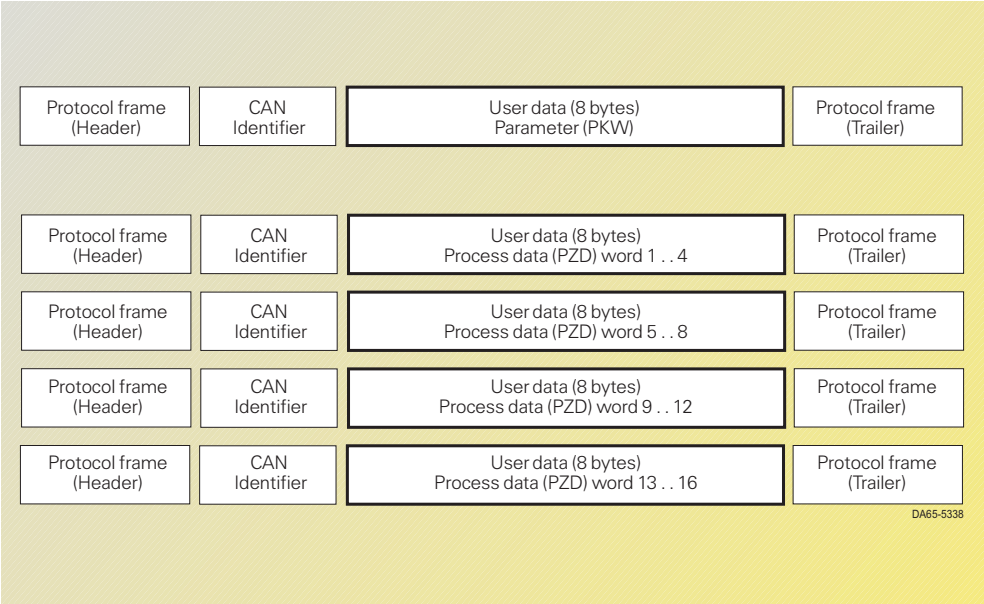


Fig. 6/65
Structure of the net data in the telegram

A maximum of 8 bytes can be transmitted in a CAN data telegram. The PKW area always consists of 4 words or 8 bytes, i.e. the data can be transferred in a single data telegram. In the case of SIMOVERT MASTERDRIVES, the process-data area, for example, consists of 16 words. A total of 4 data telegrams is therefore needed in order to transfer all process data.

X458 and X459 terminals on the CBC board

The CBC communication board has a 9-pole Sub-D connector (X458) and a 9-pole Sub-D socket (X459) for connection to the CAN.

Both terminals are assigned identically and are connected internally. The connecting interface is short-circuit proof and floating.

Fitting the CBS board

In the compact and chassis units, slots A, C, E and G in the electronics box are available. If one of slots E and G is used, the backplane bus LBA (Order No. 6SE7090–0XX84–4HA0) and adapter board ADB (Order No. 6SE7090–0XX84–0KA0) are required.

Pin	Designation	Description
1	–	Not assigned
2	CAN_L	CAN_L bus line
3	CAN_GND	CAN ground (frame M5)
4	–	Not assigned
5	–	Not assigned
6	CAN_GND	CAN ground (frame M5)
7	CAN_H	CAN_H bus line
8	–	Not assigned
9	–	Not assigned

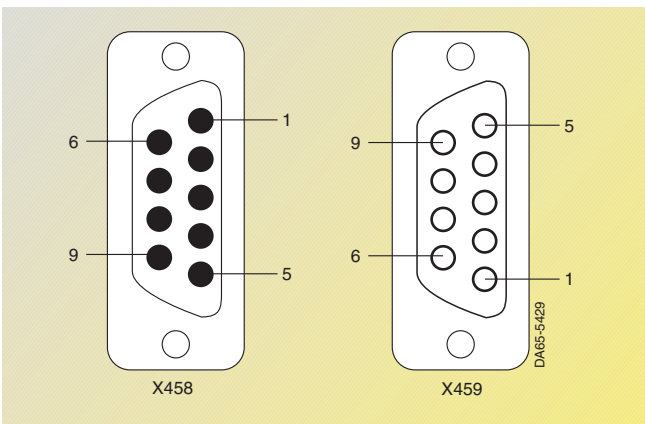


Fig. 6/66
Terminals X458 (plug) and X459 (socket)

SIMOLINK

The SIMOLINK drive-interface is for rapid data exchange between different drives. This is based on a closed ring in which all nodes are integrated.

The SLB communication board (SIMOLINK board) is for linking drives to the SIMOLINK. Each SLB communication board is a node connected to the SIMOLINK. The maximum number of nodes is limited to 201.

Data is exchanged between the individual nodes via fiber-optic cable. Plastic-fiber or glass-fiber cable can be used.

The SLB option board has a 24 V voltage input allowing external voltage supply to be connected to the board. This ensures that data exchange is maintained via SIMOLINK even if the converter/inverter has been turned off.

The board has three LEDs which provide information on the current operating status.

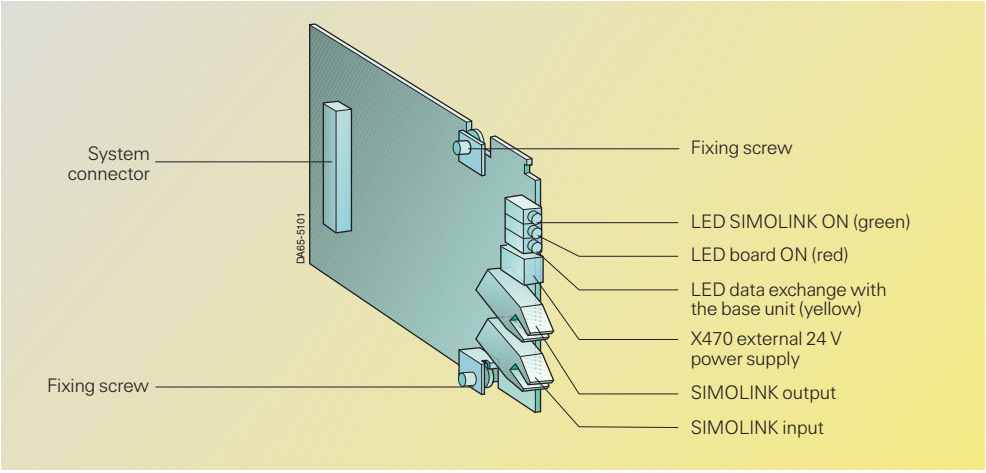


Fig. 6/67
The SLB communications board

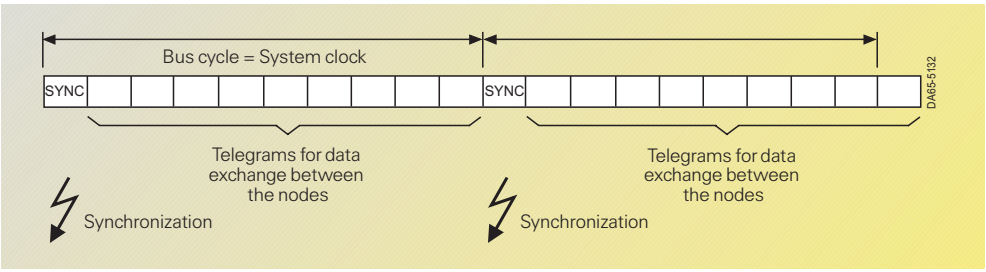
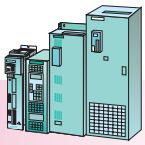


Fig. 6/68
SIMOLINK telegram traffic

Features

- The transmission medium is a fiber-optic cable. Glass-fiber or plastic-fiber cables can be used.
- The structure of the SIMOLINK is a fiber-optic-cable ring. Each node in the ring acts as a signal amplifier.
- Depending on the selected medium, the following distances are possible:
  - max. 40 m between each node with plastic-fiber cable, or
  - max. 300 m between each node with glass-fiber cable.
- A maximum of 201 nodes can be linked with each other via SIMOLINK
- The nodes are synchronized by means of a SYNC telegram which is generated by a node with a special function, namely the dispatcher function, and simultaneously received by all other nodes. The SYNC telegram is generated with absolute time-equidistance and is jitter-free. The time between two SYNC telegrams is the bus circulating time of the SIMOLINK and, at the same time, corresponds to the common system clock for synchronization of all connected nodes.
- Data transfer between the nodes is strictly cyclical and takes place in the clock of the bus cycle. This means that all data which the nodes read or write are transferred between two SYNC telegrams. This ensures that the latest data are available to all nodes on the bus at the same time.



SIMOLINK (continued)

Method of operation

The SLB board is the link between the converter/inverter and the SIMOLINK. It can be used as a SIMOLINK dispatcher or as a SIMOLINK transceiver. The changeover between the two functions is determined by parameterization.

Peer-to-peer functionality

The peer-to-peer functionality with the SIMOLINK is, in principle, the same as peer-to-peer connection known from the MASTERDRIVES and SIMOREG systems. With SIMOLINK, the exchange of process data between the MASTERDRIVES Vector Control units has the following advantages:

- Very high speed (11 Mbit/s; 100 items of 32-bit data in 0.63 ms)
- Free choice, i.e. each MASTERDRIVES Vector Control unit can send process data to or receive them from any other MASTERDRIVES Vector Control.
- Max. 16 items of 32-bit process data per MASTERDRIVES Vector Control is possible via the SIMOLINK; i.e. each MASTERDRIVES Vector Control can receive up to 8 process data (32-bit values) or send up to 8 process data to other MASTERDRIVES Vector Control units.

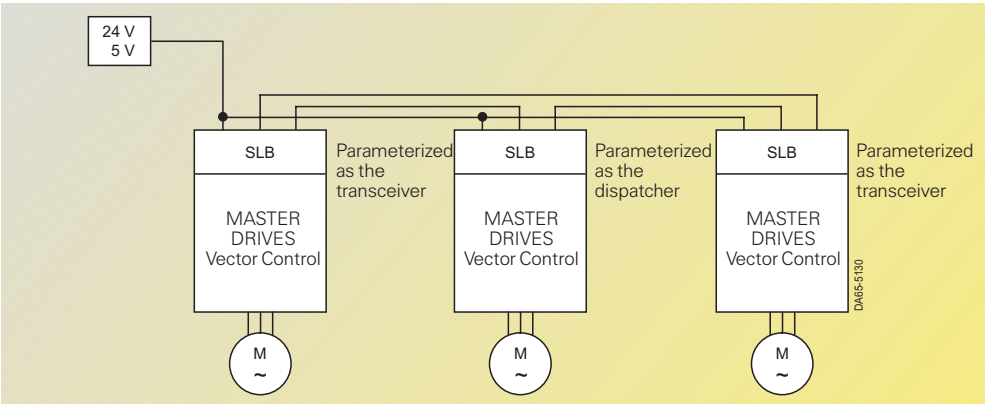


Fig. 6/69
Peer-to-peer functions with the SIMOLINK

Parameterization

Data traffic is parameterized solely by means of the parameters of the base MASTERDRIVES Vector Control unit. An additional configuration tool is not needed. For configuration of the SLB, the following parameter settings are basically necessary:

- Specification of the bus address:
  - 0 to 200, whereby the following applies: 0 = simultaneously to the dispatcher function
  - 1 to 200 = simultaneously to the transceiver function
- Transmission power
- Bus cycle time
- Number of nodes and telegrams per node
- Monitoring time for fault messages in the event of communications failure.

The BICO system is used for configuring which process data are to be sent by a MASTERDRIVES Vector Control unit. The BICO system is also used to determine at what position in the control system the process data are to act. The SLB can be parameterized with the PMU, the OP1S or the PC-based Drive ES or DriveMonitor tools.

Voltage supply

The option board can be supplied with the necessary operating voltage either internally by the converter/inverter or externally. Priority is given to external power supply. The changeover takes place automatically on the option board.

Note

The external power supply must not be changed over during bus operation. If the power supply is automatically changed over, a reset signal is generated on the board, thus causing several telegrams to be lost.

Technical Data of the SLB board	Designation	Value
	Size (length x width)	90 mm x 83 mm
	External voltage supply	24 V DC
	Current requirement from the external power supply	Max. 200 mA
	Voltage supply from the basic unit	5 V DC
	Current requirement from the power supply of the base unit	Max. 600 mA
	Changeover of the power supply	Automatic; the external supply has priority
	Node address	Can be set in the parameter
	Data transfer rate	11 Mbit/s
	Run-time delay	Max. 3 clock times
	Fiber-optic cable	Plastic (preferable); glass fiber
	Cable length at 0 °C to 70 °C	Max. 40 m (plastic) between 2 nodes 300 m (glass fiber) between 2 nodes
	Display	3 LED: yellow: data exchange with the basic unit; green: SIMOLINK in operation; red: board in operation

EB1 terminal expansion board

With the EB1 (*E*xpansion *B*oard 1), it is possible to expand the number of digital and analog inputs and outputs.

The EB1 terminal expansion board has the following:

- 3 digital inputs
- 4 bidirectional digital inputs/outputs
- 1 analog input with differential signal which can be used as a current/voltage input
- 2 analog inputs (single-ended), which can also be used as digital inputs
- 2 analog outputs
- 1 connection for the external 24 V power supply for the digital outputs

The EB1 terminal expansion board is built into the electronics box. The slots for this board are indicated in the description on page 6/55.

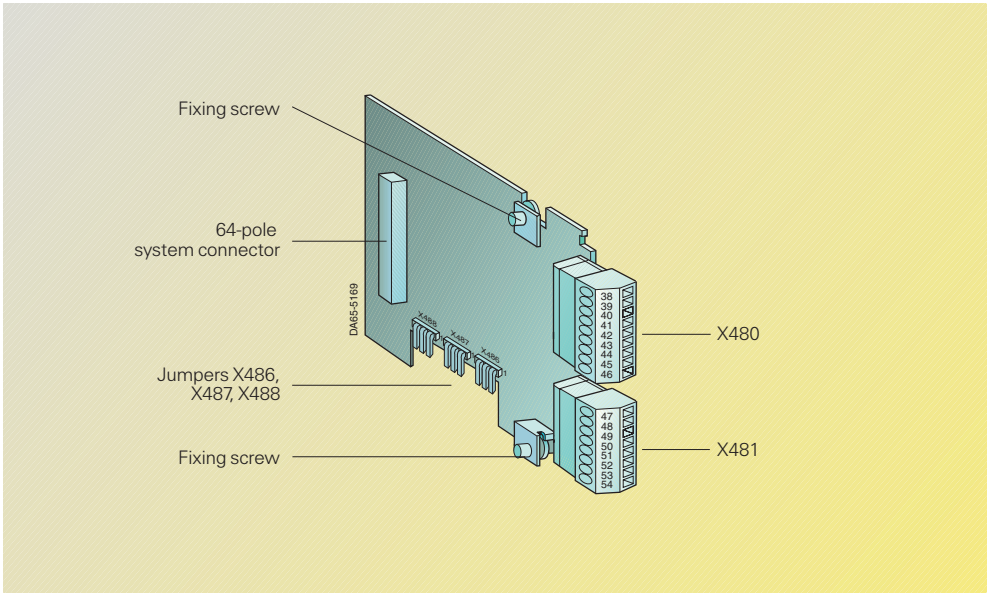


Fig. 6/70
EB1 terminal expansion board

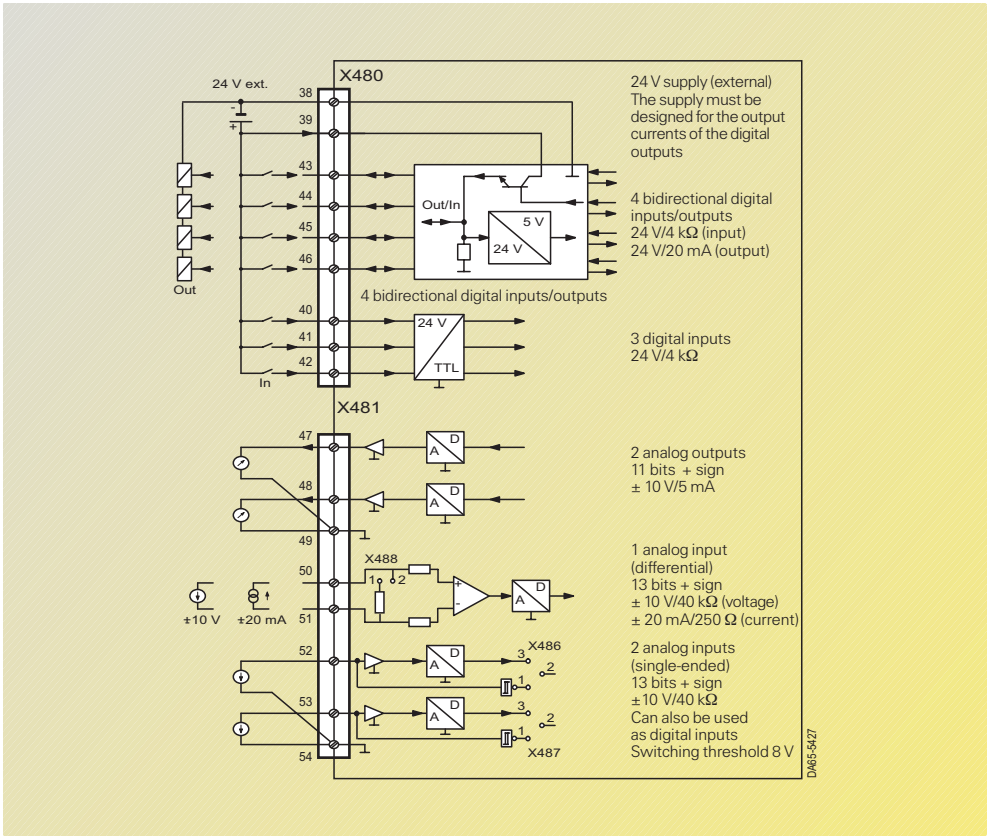
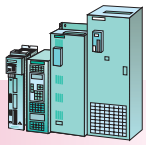


Fig. 6/71
Circuit diagram of the EB1 terminal expansion board



EB1 terminal expansion board (continued)

Connection X480

The following connections are provided on the terminal strip:

- 3 digital inputs
- 4 bidirectional digital inputs/outputs

The ground cables are protected by a reactor. Terminal 46 is at the top when installed.

Note

The external 24 V power supply is necessary and must be dimensioned for the currents of the digital outputs.

Terminal	Designation	Description	Range
38	M	Ground digital	0 V
39	P24 ext.	Ext. 24 V supply	20 V to 33 V
40	DI1	Digital input 1	24 V, R_i = 4 kΩ
41	DI2	Digital input 2	24 V, R_i = 4 kΩ
42	DI3	Digital input 3	24 V, R_i = 4 kΩ
43	DIO1	Digital input/output 1	As input: 24 V, 4 kΩ
44	DIO2	Digital input/output 2	
45	DIO3	Digital input/output 3	As output: Output voltage P24 ext. –2.5 V, 20 mA
46	DIO4	Digital input/output 4	

Connectable cross-section: 0.14 mm² to 1.5 mm² (AWG 16)

Connection X481

The following connections are provided on the terminal strip:

- 1 analog input with differential signal, which can be used as a current and voltage input
- 2 analog inputs (single-ended), can also be used as digital inputs
- 2 analog outputs

The ground cables are protected by a reactor. Terminal 47 is at the top when installed.

Terminal	Designation	Description	Range
47	AO1	Analog output 1	±10 V, 5 mA
48	AO2	Analog output 2	±10 V, 5 mA
49	AOM	Ground analog output	0 V
50	AI1P	Analog input 1 +	Voltage: ± 10 V, 40 kΩ
51	AI1N	Analog input 1 –	Current: ± 20 mA, 250 Ω
52	AI2	Analog input 2	±10 V, 40 kΩ
53	AI3	Analog input 3	±10 V, 40 kΩ
54	AIM	Ground analog input	0 V

Connectable cross-section: 0.14 mm² to 1.5 mm² (AWG 16)

Technical Data

Designation	Value
Digital inputs	DI1, DI2, DI3
• Voltage range LOW	0 V (–33 V to +5 V)
• Voltage range HIGH	+24 V (13 V to 33 V)
• Input resistance	4 kΩ
• Smoothing	250 µs
• Electrical isolation	None
Bidirectional digital inputs/outputs	DIO1, DIO2, DIO3, DIO4
As input	
• Voltage range LOW	0 V (–33 V to +5 V)
• Voltage range HIGH	+24 V (13 V to 33 V)
• Input resistance	4 kΩ
As output	
• Voltage range LOW	< 2 V
• Voltage range HIGH	> P24 ext. –2.5 V
Analog input (differential input)	AI1P, AI1N
• Input range	
Voltage	±11 V
Current	±20 mA
• Input resistance	
Voltage	40 kΩ to ground
Current	250 Ω to ground
• Hardware smoothing	220 µs
• Resolution	13 bits + sign
Analog input (single-ended)	AI2, AI3, AIM
• Input range	±11 V
• Input resistance	40 kΩ to ground
• Hardware smoothing	220 µs
• Resolution	13 bits + sign
Analog output	AO1, AO2, AOM
• Voltage range	±10 V
• Input resistance	40 kΩ to ground
• Hardware smoothing	10 µs
• Resolution	11 bits + sign

EB2 terminal expansion board

With the EB2 (*E*xpansion *B*oard 2), the number of digital and analog inputs and outputs can be expanded.

The EB2 terminal expansion board has

- 2 digital inputs
- 1 relay output with changeover contacts
- 3 relay outputs with make contact
- 1 analog input with differential signal which can be used as current input or voltage input
- 1 analog output
- 24 V power supply for the digital inputs

The EB2 terminal expansion board is built into the electronics box. The slots for this board are indicated in the description on page 6/55.

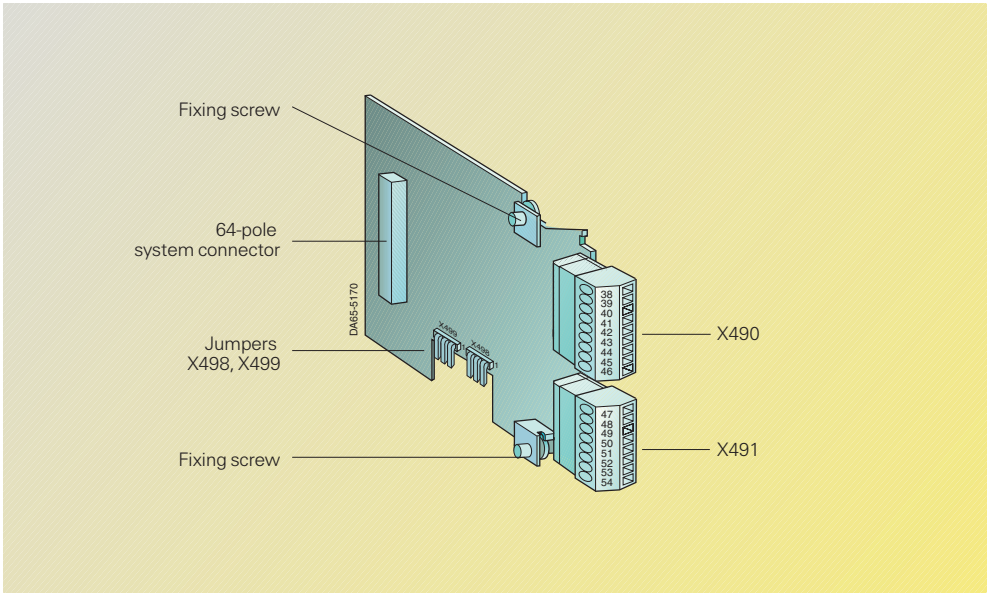


Fig. 6/72
EB2 terminal expansion board

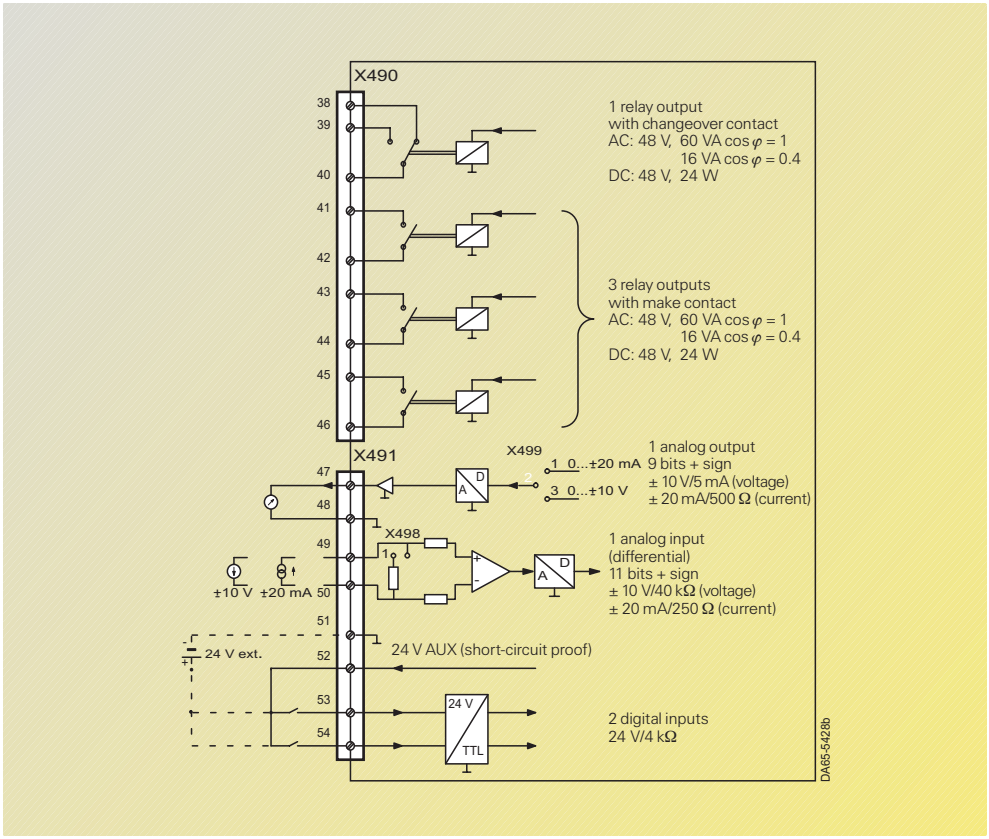
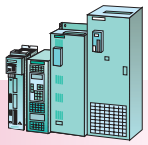


Fig. 6/73
Circuit diagram of the EB2 terminal expansion board



EB2 terminal expansion board (continued)

Connection X490

Load capability of the relay contacts

Type of contact	Changeover contact
Maximum switching voltage	60 V AC, 60 V DC
Maximum switching output	16 VA at 60 V AC ($\cos\varphi = 0.4$) 60 VA at 60 V AC ($\cos\varphi = 1.0$) 3 W at 60 V DC 24 W at 60 V DC

Terminal	Designation	Description
38	DO13	Relay output 1, break contact
39	DO12	Relay output 1, make contact
40	DO11	Relay output 1, reference contact
41	DO22	Relay output 2, make contact
42	DO21	Relay output 2, reference contact
43	DO32	Relay output 3, make contact
44	DO31	Relay output 3, reference contact
45	DO42	Relay output 4, make contact
46	DO41	Relay output 4, reference contact

Connectable cross-section: 0.14 mm^2 to 1.5 mm^2 (AWG 16)

Connection X491

The ground cables are protected by a reactor.

Note

The analog input can be used as a voltage or current input. A jumper is used for switching over.

Terminal	Designation	Description	Range
47	AO	Analog output	±10 V, 5 mA
48	AOM	Ground analog output	0 V
49	AI1P	Analog input +	Differential input: ±11 V/R_i = 4 kΩ
50	AI1N	Analog input –	
51	DIM	Ground digital input	0 V
52	P24AUX	24 V supply	24 V
53	DI1	Digital input 1	24 V, R_i = 4 kΩ
54	DI2	Digital input 2	24 V, R_i = 4 kΩ

Connectable cross-section: 0.14 mm^2 to 1.5 mm^2 (AWG 16)

Technical Data

Designation	Value
Digital inputs	DI1, DI2, DIM
• Voltage range LOW	0 V (– 33 V to +5 V)
• Voltage range HIGH	+24 V (13 V to 33 V)
• Input resistance	4 kΩ
• Smoothing	250 µs
• Electrical isolation	None
Digital outputs (relays)	DO1., DO2., DO3., DO4.
• Type of contact	Changeover contact
• Max. switching voltage	60 V AC, 60 V DC
• Max. switching capacity	
– at 60 V AC:	16 VA ($\cos\varphi = 0.4$) 60 VA ($\cos\varphi = 1.0$)
– at 60 V DC:	3 W 24 W
• Min. permissible load	1 mA, 1 V
Analog input (differential input)	AI1P, AI1N
• Input range	
Voltage	±11 V
Current	±20 mA
• Input resistance	
Voltage	40 kΩ to ground
Current	250 Ω to ground
• Hardware smoothing	220 µs
• Resolution	11 bits + sign
Analog output	AO, AOM
• Voltage range	±10 V, ±0 – 20 mA
• Input resistance	40 kΩ to ground
• Hardware smoothing	10 µs
• Resolution	9 bits + sign

SBP option board for incremental encoders

The SBP option board (*S*ensor *B*oard *P*ulse) enables an incremental encoder or a frequency generator to be connected to the converter and inverter for presetting the frequency or speed setpoint for SIMOVERT MASTERDRIVES.

Connectable incremental encoders and frequency generators

The SBP option board can also be used to evaluate an external encoder or frequency generator.

All standard available pulse encoders can be connected to the option board.

The pulses can be processed in a bipolar or in a unipolar manner as a TTL or HTL level.

The encoder signals can be evaluated up to a pulse frequency of 1 MHz.

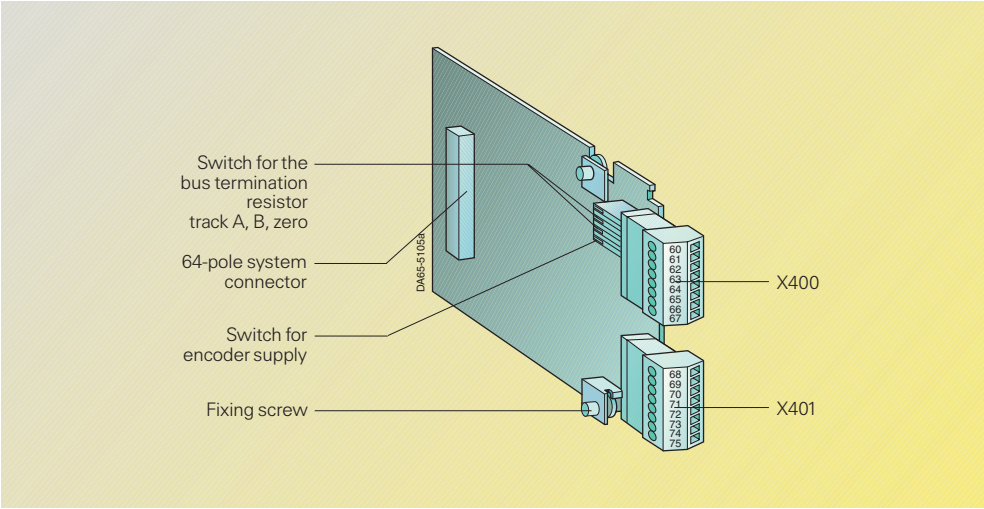


Fig. 6/74
View of the SBP option board

The supply voltage of the connected encoder or frequency generator can be set to 5 V or 15 V.

If the SBP is parameterized as a motor encoder (P130 = 5), incremental encoder evaluation via terminals X103 on the CUVC is deactivated.

Terminals

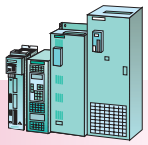
The option board has two terminal strips for the signal cables.

X400	Terminal	Designation	Description	Range
	60	$+V_{SS}$	Power supply for incremental encoder	5 V/15 V $I_{max.}$ = 250 mA
	61	$-V_{SS}$	Ground for power supply	-
	62	–temp	Minus(–) terminal KTY84/PTC100	2)
	63	+temp	Plus(+) terminal KTY84/PTC100	2)
	64	Ground coarse/fine	Ground	1)
	65	Coarse pulse 1	Digital input for coarse pulse 1	1)
	66	Coarse pulse 2	Digital input for coarse pulse 2	1)
	67	Fine pulse 2	Digital input for fine pulse 2	1)

Max. connectable cross-section: 0.14 mm² to 1.5 mm² (AWG 16)
Terminal 60 is at the top, when installed.

1) Cannot be evaluated if SIMOVERT MASTERDRIVES Vector Control is used.

2) Can only be evaluated with Compact PLUS.



SBP option board for incremental encoders

X401

Maximum encoder cable length which can be connected with compliant screening[1]):
- 100 m (TTL signals)
- 150 m with A and B track (HTL signals)
- 300 m with A+/A– and B+/B– track (HTL signals).

Terminal	Designation	Description	Range
68	A+ track	Plus(+) terminal Track A	TTL/HTL/HTL, unipolar
69	A– track	Minus(–) terminal Track A	TTL/HTL/HTL, unipolar
70	B+ track	Plus(+) terminal Track B	TTL/HTL/HTL, unipolar
71	B– track	Minus(–) terminal Track B	TTL/HTL/HTL, unipolar
72	Zero pulse +	Plus(+) terminal Zero track	TTL/HTL/HTL, unipolar
73	Zero pulse –	Minus(–) terminal Zero track	TTL/HTL/HTL, unipolar
74	CTRL +	Plus(+) terminal Control track	TTL/HTL/HTL, unipolar
75	CTRL – = M	Minus(–) terminal Control track = Ground	TTL/HTL/HTL, unipolar

Max. connectable cross-section: 0.14 mm^2 to 1.5 mm^2 (AWG 16)
Terminal 68 is at the top, when installed.

Voltage range of the encoder inputs

	RS422 (TTL)	HTL bipolar	HTL unipolar
Voltage range – Input	Max. 33 V; min. –33 V		
Voltage range + Input	Max. 33 V; min. –33 V		
Switching level of differential voltage – LOW	Min. –150 mV	Min. –2 V	Min. 4 V
Switching level of differential voltage – HIGH	Max. 150 mV	Max. 2 V	Max. 8 V

Note

If unipolar signals are connected, one ground terminal for all signals at the CTRL– terminal is sufficient. Due to possible interference susceptibility, it is recommended for cable lengths over 50 m that the four terminals A–, B–, zero pulse – and CTRL– are bypassed and connected to the encoder ground.

Voltage range of the digital inputs

	Rated value	Min.	Max.
Voltage range LOW	0 V	–0.6 V	3 V
Voltage range HIGH	24 V	13 V	33 V
Input current LOW	≤ 2		
Input current HIGH	10 mA	8 mA	12 mA

Note

The inputs are non-floating. The coarse pulse is smoothed with 0.7 ms, the fine pulse with approx. 200 ns.

6

1) See page 6/46, "Electromagnetic compatibility".

Technology applications with the T100

The T100 technology board can be installed in SIMOVERT MASTERDRIVES Vector Control and also in the rectifier/regenerative units of type of construction compact and chassis units. The T100 expands the base units with many additional drive-related technological functions such as

- Higher-level PID controller, which can be used, for example, as a tension, dancer-roll-position, flow, pressure and temperature controller
- Comfort ramp-function generator with rounding-off, parameter sets which can be toggled via a control command, d*v*/d*t* output and triggerable function
- Comfort motorized potentiometer with non-volatile output value storage
- Wobble generator with triangular wobble pattern, adjustable P steps and a synchronizing input and output for traversing drives in the textile industry
- Drive-related control, e.g. power-up/power-down control unit and brake control, velocity and speed processor.
- Terminals with 8 binary inputs, 5 binary outputs, 5 analog inputs and 2 analog outputs (see Fig. 6/76). All external signals are directly connected at the screw/plug-in terminals 50 to 92 on the T100.
- 2 high-speed serial interfaces, which can be used independently of each other (see Fig. 6/76):
  - high-speed peer-to-peer connection with a data transfer rate of up to 187.5 Kbit/s which can be used to configure a digital setpoint cascade
  - USS interface with a data transfer rate of up to 187.5 Kbit/s for creating a low-cost field-bus connection to a SIMATIC PLC or a third-party system.

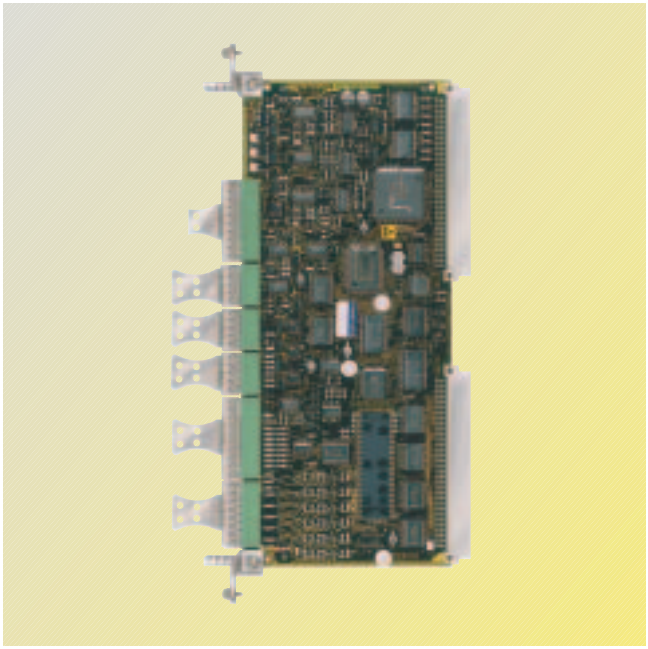


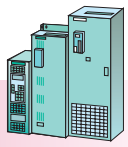
Fig. 6/75
T100 technology board

Technical Data

In addition to the functions already listed, the T100 has a series of freely-connectable control, arithmetic and logic blocks:

5	adders with 3 inputs
3	subtracters
4	sign inverters
3	dividers
4	multipliers
3	high-resolution multipliers/ dividers with 3 inputs
4	absolute-value generators with filtering
2	limiters
2	limit-value monitors with filtering
1	minimum selection with 3 inputs
1	maximum selection with 3 inputs
2	analog signal-tracking/storage elements with non-volatile storage function
2	analog-signal storage elements
1	wobble generator
10	analog-signal changeover elements
1	simple ramp-function generator
1	dead band
3	characteristic blocks
16	AND elements with 3 inputs
8	OR elements with 3 inputs
8	inverters
3	EXCLUSIVE OR elements
6	NAND elements with 3 inputs
7	RS flip flops
2	D flip-flops
5	timers
4	binary-signal changeover functions
1	parameter set changeover
1	velocity and speed computer

The block inputs and outputs, the terminals and the process-data signals of the serial interfaces can be combined with one another as required by suitable parameterization. This applies both to word formats and to binary control and status signals.



Technology applications with the T100 (continued)

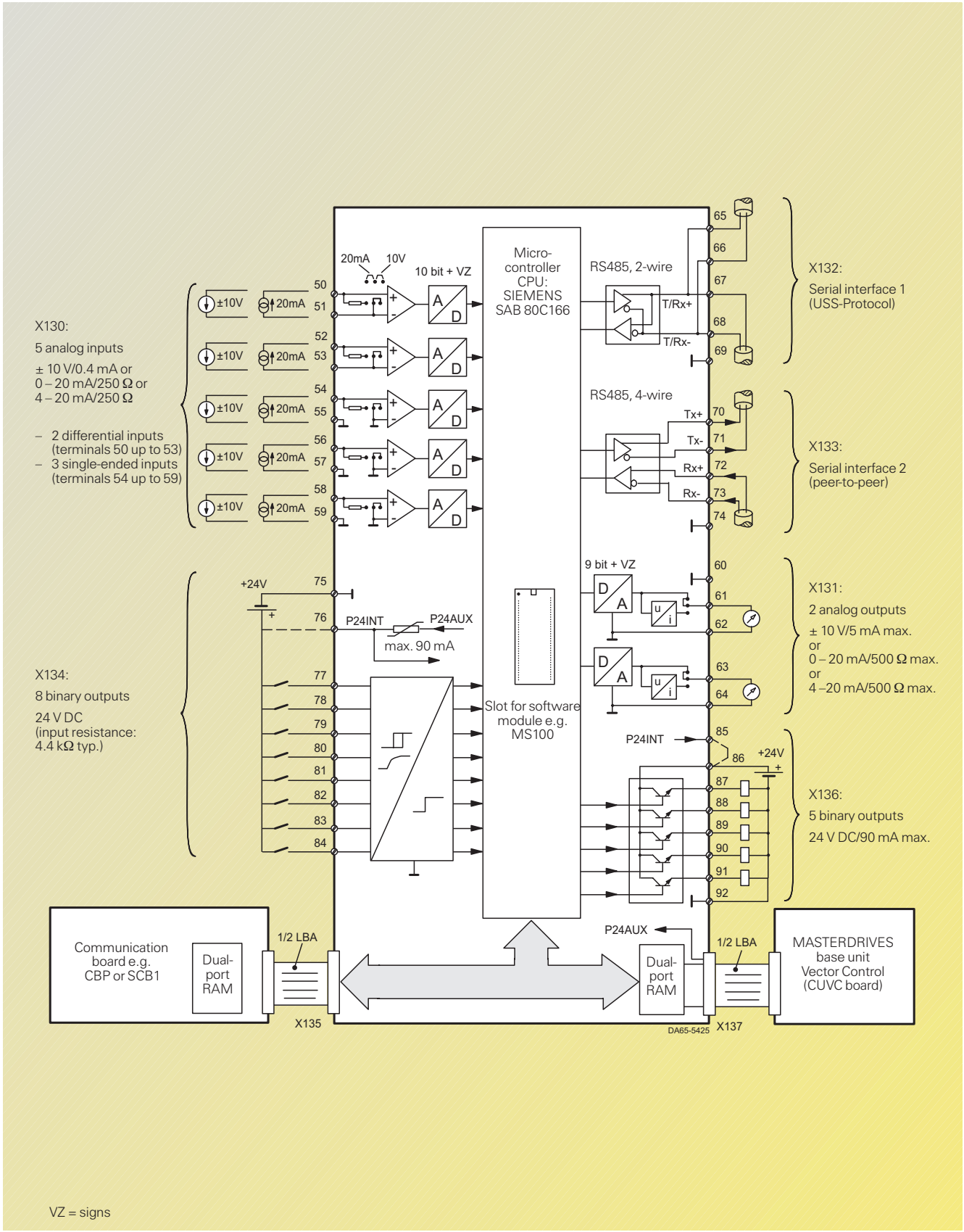


Fig. 6/76
T100 technology board connecting diagram

Communication functions of the T100 technology board

5 analog inputs	• Possible input signal / level resistance □ –10 V to +10 V/24 kΩ typ. □ 0 mA to ±20 mA/250 Ω typ. □ 4 mA to 20 mA/250 Ω typ. • 2 differential inputs • 3 single-ended inputs • Non-floating • Resolution: 10 bits + sign
2 analog outputs	• Possible output level / drive capability □ –10 V to +10 V/5 mA max. □ 0 mA to 20 mA/500 Ω max. □ 4 mA to 20 mA/500 Ω max. • Non-floating • resolution: 9 bits + sign
8 binary inputs	• Input level: 24 V DC, SIMATIC-compatible: LOW = –33 V to +5 V, HIGH = +13 V to +33 V • No electrical isolation • Input resistance: 4.4 kΩ typ. • Signal status indication to PMU and OP1S
5 binary outputs	• Transistor switch, switches 24 V DC ("open emitter") • SIMATIC-compatible output level (LOW < +2 V, HIGH = +17.5 V to +33 V) • Switching capability: 90 mA max (continuously short-circuit-proof, can be connected in parallel) • Signal status indication to PMU and OP1S
24 V DC load power supply for the binary inputs / outputs	• From the MASTERDRIVES unit: A short-circuit-proof 24 V DC supply voltage is available at terminals 76 and 85, which can be loaded with a maximum of 90 mA (see the dotted-line wiring in the connecting diagram on page 6/70)[1]) • External 24 V DC supply. Permissible voltage range: +20 V to +30 V (see the continuous-line wiring in the connecting diagram on page 6/70)
1 peer-to-peer interface	• Data transfer technique: RS485, 4-wire, full-duplex • Non-floating • Cable terminating resistors can be activated using plug-in jumpers • Baud rate can be adjusted up to 187.5 Kbit/s • Adjustable telegram length 1 to 5 words • Joint operation possible with SIMOREG 6RA24 and 6RA70 units and MASTERDRIVES with SCB2 • Receive and transmit signals (also control/status bits) can be freely combined per parameter • Max. cable length: 500 m at 187.5 Kbit/s, 1000 m at other baud rates
1 serial USS interface	• Data transfer technique: RS485, 2-wire, half-duplex • Non-floating • Bus terminating resistors can be activated by means of plug-in jumpers • Baud rate can be adjusted up to 187.5 Kbit/s • Max. cable length: 500 m at 187.5 Kbit/s, 1000 m at other baud rates

Communication functions of the T100 technology board

The relevant internal signals and parameters both of the base unit and the T100 can be accessed via the USS interface of the T100.

The T100 has its own parameter memory and can be parameterized via the PMU operator control and parameterizing unit, the optional OP1S operator control unit or a PC loaded by means of Drive ES or DriveMonitor (see pages 2/10 to 2/15).

The PC with Drive ES or DriveMonitor is connected to the USS interface of the SIMOVERT MASTERDRIVES.

All relevant internal T100 signals can be monitored by means of display parameters (multimeter functions).
The T100 has 3 diagnostic LEDs, which indicate the following operating statuses:

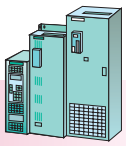
1. The T100 is operating error-free in cyclical mode
2. Data exchange between the T100 and SIMOVERT MASTERDRIVES is OK
3. Data exchange between the T100 and the communication board is OK

Note

All the software functions described here are contained in the MS100 software module "Universal Drive". The software module is a 40-pin EPROM device, which must be ordered separately and is inserted in the dedicated plug-in socket on the T100. The T100 cannot be used without a software module.

For selection and ordering data for the T100 technology board and its components, see Section 3.

1) The total load of the base unit and the technology board must not exceed 150 mA. An external 24 DC power supply must be used if this value is exceeded (to be connected at terminals 76 and 86).



Technology applications with the T300

The T300 can be used to provide additional technological functions for compact and chassis units (e.g. for closed-loop tension and position control, coilers, winders, closed-loop synchronous and positioning controls, transverse cutters, hoisting equipment and drive-related control functions). Supplementary technological functions which are often requested are offered as standard software packages on pre-programmed memory modules.

The T300 and SIMADYN® D are fully compatible with each other.
Users who wish to create special applications or who wish to market their own technological know-how can create their own technological design on the T300 by using the graphics-oriented STRUC® planning language known from the SIMADYN D system (See also ordering data in Section 3).

Fig. 6/78 shows the most important hardware functions of the T300.
The technological functions are configured with STRUC and cyclically executed by the processor. The closed-loop control sampling time is a minimum of 1 ms (see Catalog ST DA).

An overview of the hardware and software components of the T300 is provided in Fig. 6/79.

An almost delay-free parallel interface (dual-port RAM) permits data transfer between the basic unit and the T300.

The serial connections can be directly connected to terminals on the T300. All other external signals can be connected at the SE300 terminal block outside the base unit. 15 V / 100 mA for supplying pulses is available at SE300 (see Fig. 6/78).

An external 24 V DC power supply must be provided if binary inputs and outputs have to be controlled. The base unit can also provide this voltage supply as long as the total current at terminals X101.13, 23 of the base unit is < 150 mA.

The software package is parameterized – irrespective of which software package is used – with the help of the following:

- a Drive ES or DriveMonitor PC (for a description see pages 2/10 to 2/15)
- the PMU operator control and parameterizing unit
- the OP1S user-friendly control unit
- an interface board (CBP, SCB1, SCB2)
- via an interface of the T300 with the service start-up program (see selection table on page 3/88).

Altered parameters can be stored in the EEPROM (non-volatile).

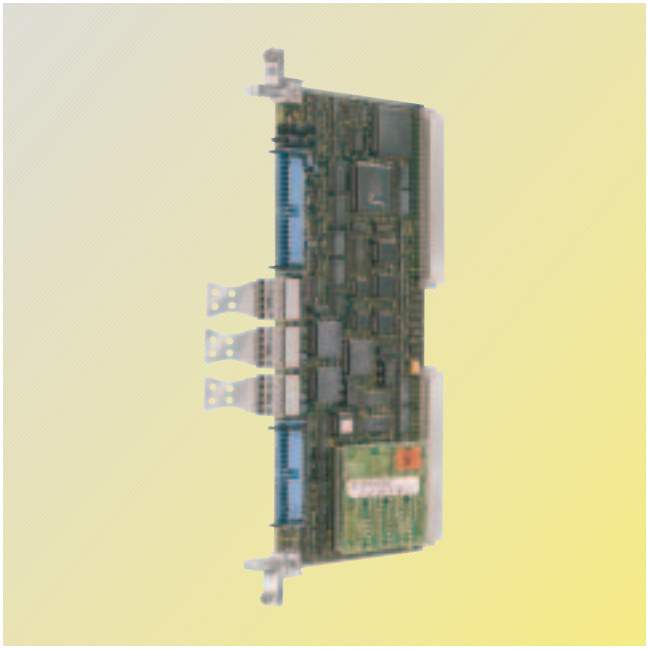
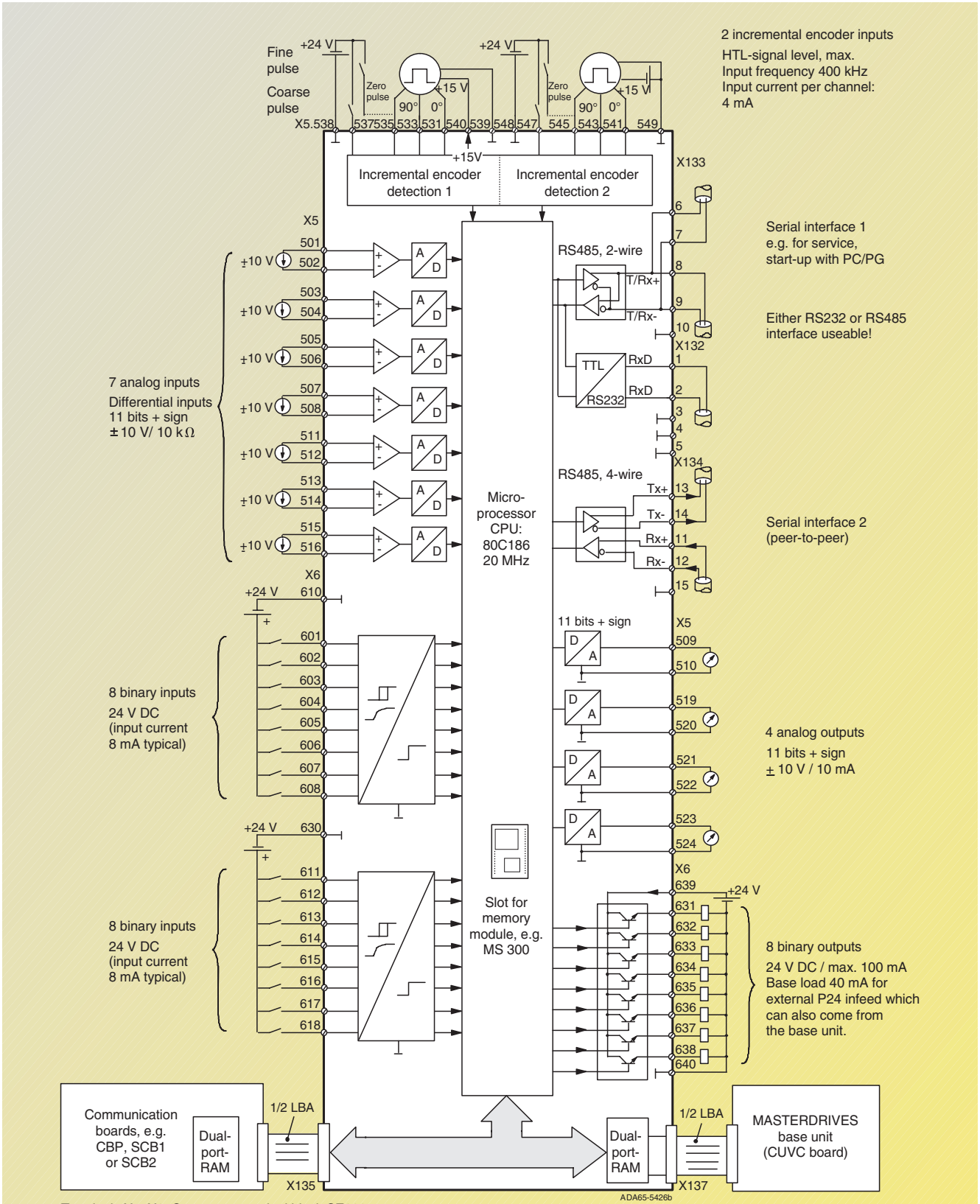


Fig. 6/77
T300 board with memory module



Terminals X5, X6: Connect to terminal block SE300.
Terminals X132, X133, X134: Connect to the T300.

Fig. 6/78
T300 technology board connection diagram

Technology applications with the T300 (continued)

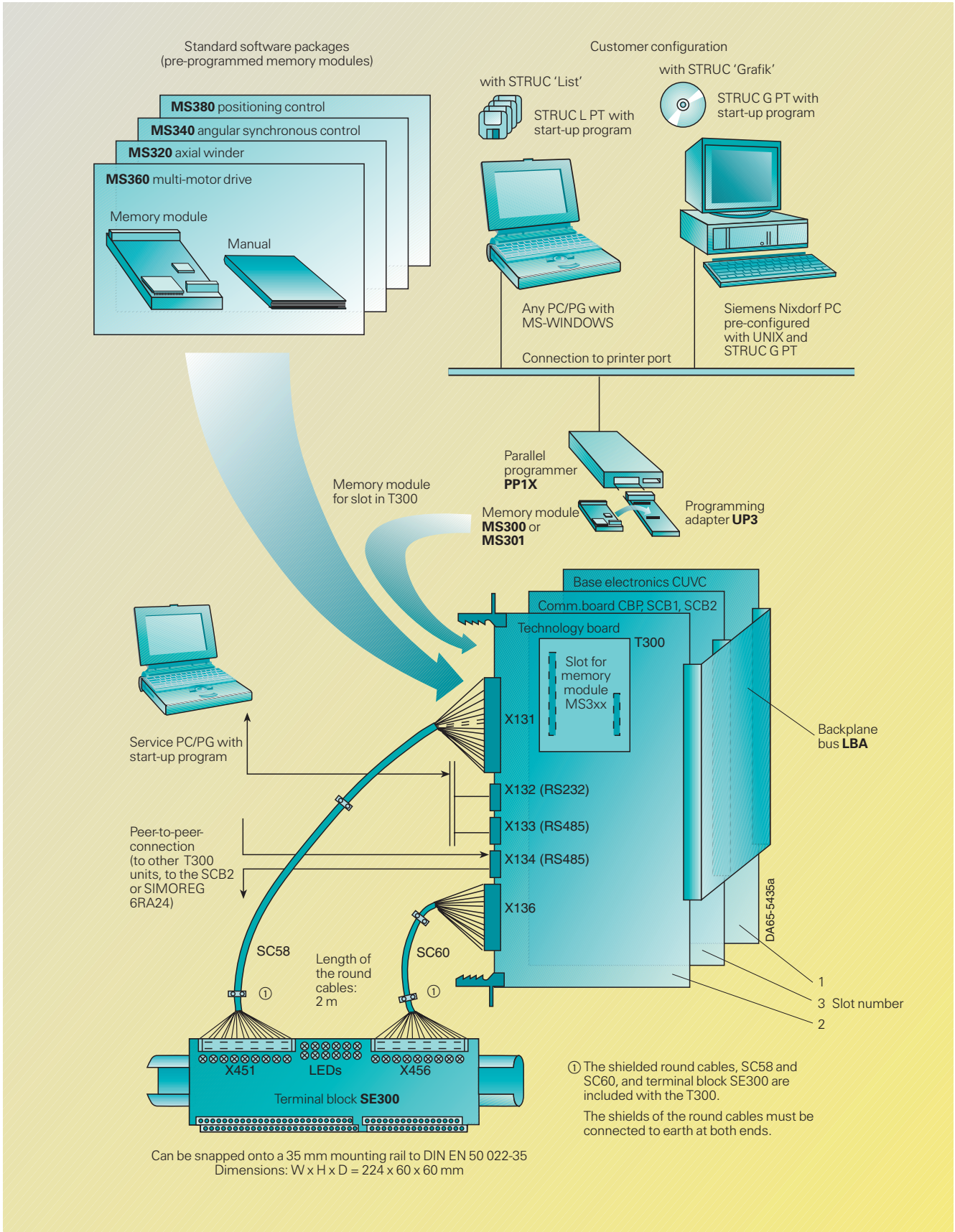


Fig. 6/79
Hardware and software components of the T300 technology board

Terminals of the T300 technology board

7 analog inputs	Differential inputs, non-floating, ±10 V, 11 bits + sign
4 analog outputs	Non-floating, ±10 V, 11 bits + sign
16 binary inputs	Non-floating, 24 V, signal status display via LEDs on the terminal block
8 binary outputs	Non-floating, 24 V, signal status display via LEDs on the terminal block, max. 100 mA. When used: 40 mA base load at terminal 639.
Detection of speed, position and position difference	Inputs for 2 incremental encoders, non-floating, HTL signal level (15 V to 24 V, rated voltage 15 V), max. frequency < 400 Hz, 4 mA input current per channel, signal status display of the incremental encoder inputs via LEDs on the terminal block. 15 V / 100 mA are available at terminal X5.540 for supplying the incremental encoders. This can be taken from the basic unit, in addition to the 15 V / 150 mA of terminal X103.40.
1st serial interface	Can be toggled between RS232/ RS485, preferably used for service and start-up with the help of the STRUC start-up program, Service Start-up
2nd serial interface	RS485 for peer-to-peer connection (setpoint cascade) or USS protocol Max. adjustable baud rate: 115.2 Kbit/s

Standard configurations

are available on a memory module for frequently required applications.
The standard configuration is ready for use if the memory module has been built into the T300. The standard configuration can be adapted to the system requirements by means of parameterization.

Note:
The STRUC L PT or STRUC G PT configuring language is not needed for standard configurations.

Components and features of the standard configuration:

- Peer-to-peer communication (digital setpoint cascade).
- The T300 with standard configuration can be used with or without a communication board (CBx, SCB1 or SCB2).
  The communication board, however, enables:
  - stipulation of the control commands and setpoints for the T300 via a bus system (e.g. PROFIBUS-DP) or a point-to-point connection,
  - reading and writing of actual values and status words as well as technology parameters.
- Inputs and outputs as well as process data can be entered in a DPRAM which enables access to be made to all the important data of the SIMOVERT MASTERDRIVES. This makes configuring extremely flexible.
- Important operating data are stored in a non-volatile manner.
- All parameters can be reset to their original loading status.
- Manual with configuring information and start-up instructions.
- Parameter upreading and downloading with DriveMonitor.

Notes on DriveMonitor can be found in Section 2.

Available standard configurations for:

- multi-motor drives
- axial winders
- angular synchronous control
- position control.

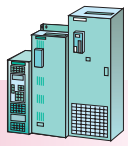
Standard configuration for multi-motor drives with the T300 (MS360)

Applications:

- Higher-level tension or position control for multi-motor drives, which can include foil production systems, paper machines, paper finishing machines and wire drawing machines.
- Load equalization control for tension groups or motors which are mechanically coupled or are coupled via the material web.
- Higher-level control for single-motor drives as a function of pressure, flow etc., e.g. for pumps and extruders.

Features:

- Ramp-function generator for rpm / speed, for local and plant operation.
- Setting of speed ratios or stretch ratios.
- Higher-level PID controller (technology controller) and adaptive P-gain as a function of the control deviations.
- Adaptation of the speed controller's P-gain as a function of the deviation from the set speed or other selectable sources.
- Flexible setting of several internal setpoints, such as inching, crawl and take-up/slack-off.
- Setting to web speed by means of a ramp-up generator.
- Smooth shutdown of the drive, without overshoot, by means of the braking characteristic.
- Drive-related control with evaluation of alarms and faults.
- Load equalization by means of the droop and compensation or torque limits.
- Brake control.
- Two freely-usable motorized potentiometers.
- Stipulation of setpoints (speed setpoint) also possible by means of incremental encoder, for example when a speed setpoint is not available via a terminal or an interface.
- Free components for arithmetic and logic.



Technology applications with the T300 (continued)

Standard configuration for axial winders with the T300 (MS320)

Applications:

- Foil production systems,
- Paper machines,
- Paper finishing systems,
- Coating systems,
- Textile machines,
- All types of printing machine (foil, paper),
- Wire drawing machines,
- Coilers in metal working (e.g. aligning machines, strip handling systems etc.).

Features:

- Suitable for winders and unwinders, with and without flying roll change.
- Direct and indirect closed-loop tension control.
- Dancer roll and tension measuring transducers can be connected.
- Diameter calculation with "Set diameter" and "Hold"; the diameter value can be stored in the event of a power failure.
- Adaptation of tension and speed controller as a function of the diameter.
- Winding hardness control by means of a parameterizable polygon characteristic as a function of the diameter.
- Friction compensation by means of a polygon characteristic, speed-dependent.
- Inertia compensation, as a function of the diameter, web width and gearbox stage.
- Ramp-function generator for ramping-up during flying roll change with subsequent shutdown.
- Incremental encoder for measuring web speed can be connected.
- Measurement of the initial diameter by means of a pulse encoder possible.
- Tension controller can either act on the speed controller or, directly, on the closed-loop torque control system.
- Constant v-control possible.
- Winder-related control with evaluation of alarms and faults.
- Inching and crawl operation.
- Two freely usable motorized potentiometers.
- Smooth drive shutdown, without overshoot, by means of a braking characteristic.

Standard configuration for closed-loop angular control with the T300 (MS340)

Applications:

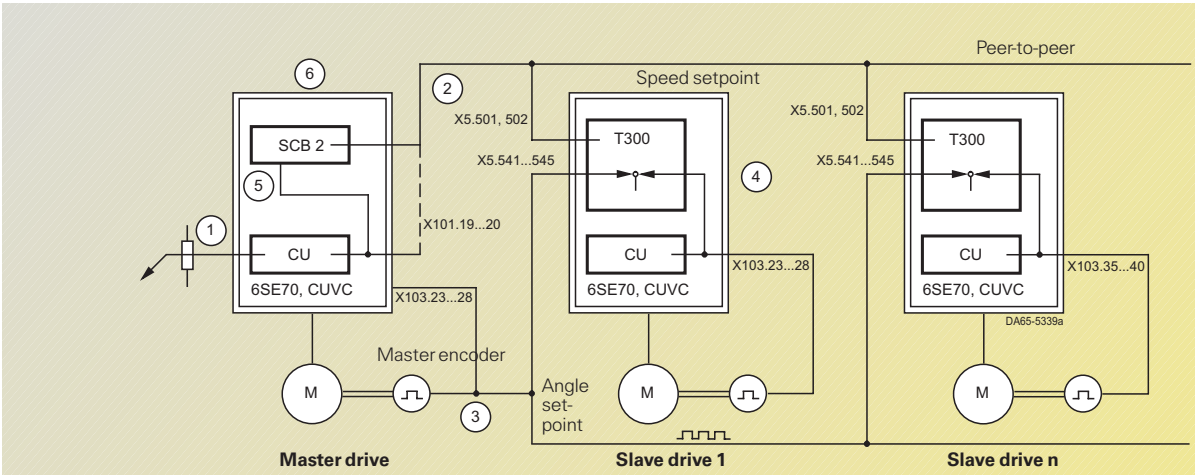
- Replacing mechanical and electrical shafts; for example, on gantry traversing units, loading and discharge equipment for furnaces and looms.
- Replacing gearboxes with a fixed or changeable ratio; e.g. changeover gearboxes for transition points on conveyor belts or at the transition from one machine section to another, such as on packing machines and book-binding machines.
- Accurate angular synchronism; used also when two machine components mesh, e.g. when napping and carding (dress) fabric. It can also be used for printing or folding bags, round materials etc.

Features:

- Transmission ratio of master drive to slave drive; can be dynamically stipulated as a process data from +16.380 to – 16.380 (smallest step range: 0.005) or as a setting parameter, whereby nominator and denominator are resolved separately, each with 15 bits + sign.
- Offset angular settings between drives, as a function of coarse-pulse and fine-pulse marks for detecting the angular position (synchronizing).
- Synchronizing signals can be generated by proximity switches (e.g. BEROs) or by pulse encoders (zero pulse).
- Offset angle can be set dynamically by means of the setpoint from –32768 to +32767 pulse edges.
- Different offset angles can be stipulated for both directions of rotation (automatic changeover for a changed direction of rotation). This is required during synchronizing if the switching positions of the fine-pulse mark for clockwise and counterclockwise rotation of the drive (or the machine component which has to be synchronized to) are different and must be compensated. An additional example is a crane track with surface-mounted fine pulse marks.
- Reverse inhibit.
- Protection against overspeed and stalling.
- Inching.
- Adaptation of the position controller to match the transmission ratio.
- Setpoint specification (speed setpoint) also possible via incremental encoder; for example when there is no speed setpoint via a terminal or interface.
  - Maximum 10 slave drives can be connected when
  - pulse encoder cable < 100 m
  - n < 3000 rpm
  - encoder pulse number < 1024 pulses per rotation and output current of encoder ≥ 100 mA.

Note

For further explanations regarding angular synchronous control, see Fig. 6/80.



① The whole speed setpoint, in this example, is stipulated as an analog signal by a potentiometer or a PLC.

② The speed setpoint is passed on to the slave drives via a serial peer-to-peer link. An SCB2 board is needed for the master drive (see Point 5). The peer-to-peer cable can be directly connected to the T300 at the slave drives.
If only medium requirements are placed on the control qualities, the speed setpoint can be passed on by means of analog signals instead of with the peer-to-peer method (output at master drive, e.g. via terminals X101.19 and .20).
It is not necessary to pass on the speed setpoint if the accelerating torque is negligibly small, e.g. due to long ramp-up or ramp-down.

③ A maximum of 10 slave drives can be connected without pulse amplifier if the 1PX8001 incremental encoder with 1024 pulses per rotation is used and the maximum speed is < 3000 rpm. The master encoder is connected both to the master drive and to the T300 boards of the slave drives. An incremental encoder which is located at a preceding part of the machine and is driven there by a shaft can also be used as the master encoder.

④ The incremental encoders of the slave drives are usually connected only to the CUVC. Setpoints are then passed on to the T300 internally via the LBA backplane bus. A built-on encoder can also be directly connected to the T300 (T300 terminals X5.531 to 535) if the motor encoder cannot be used for process-engineering reasons.

⑤ Transfer of speed setpoint with the peer-to-peer method: The setpoints are transferred in a way similar to that described in Point 2. The master drive must be fitted with an SCB2 board; the T300 is equipped as standard with the peer-to-peer function (terminals X134.13 and 14). The peer-to-peer connection (fast setpoint stipulation and transfer) can also be combined with the PROFIBUS DP (for stipulating machine speed, gear ratios, control commands etc.).

⑥ A T300 is not needed for the master drive.

Fig. 6/80
Schematic illustration of angular synchronous control

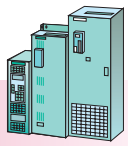
Standard configuration for closed-loop position control with the T300 (MS380)

Applications:

- For closed-loop position control systems with high demands regarding precise motion; for example, in high-bay racking systems, transfer devices, loading and unloading equipment, as well as machining centers, charging and discharging equipment for furnaces, crane gantries, processing machines etc.
- Can be used for cycle times of > 100 ms.

Features:

- Can be used for linear axes and rotary axes as well as for simple roll feeding or infinitely rotating rotary axes.
- Exact positioning without overshoot by pre-controlling of speed.
- 6 data sets for controller optimization, compensation of play, speed and reverse time, maximum speed, can be changed over by means of binary signals or control word.
- 100 position setpoints can be stored and called by means of binary signals or control word.
- Automatic reference-point approaching, taking into account possible system play.
- Absolute positioning possible, in relation to the reference point and relative to the instantaneous position.
- Inching, speed and position controlled.
- Rapid stipulation of important setpoints as process data (e.g. position setpoint, max. speed) via serial interface.
- For positioning purposes, the incremental encoder mounted on the motor as well as an incremental encoder mounted directly on the component to be positioned can be used.
- Multiturn absolute encoder with incremental serial interface (ISI) can be connected (e.g. type CE-65-151 manufactured by
T+R-Electronic,
D-78647 Trassingen,
Germany
Tel.: ++49 74 25/2 28-0).



Technology applications with the T300 (continued)

Configurations created on the T300 by the user

Configuring with STRUC:

Technology functions can be easily created with the function-block oriented STRUC configuring language. It has more than 250 function blocks for open and closed-loop control and arithmetic operations (e.g. PI controllers, ramp-function generators, multipliers and logic gates).

An easy-to-use start-up program which runs on a PG or PC supports start-up and service.

Configuring tools

STRUC L PT, version 4.2.5 and higher

is used to configure the T300 in a list form (see Fig. 6/79).

It is supplied on a 3½" set of floppy disks, either with German or English menu texts as required.

The scope of supply includes the Service start-up program which allows any 10 values in software package to be simultaneously visualized and any input values to be changed at the function blocks. Most of the connections between the function blocks can be changed and displayed.

System platform requirements for STRUC L PT:

- AT-compatible PC, min. 386 CPU, 4 Mbyte RAM
- parallel printer interface
- $3^1/_2$" floppy disk drive, 8 Mbyte permanent WINDOWS virtual memory must be set-up on the hard disk
- 8 Mbyte memory on the hard disk for STRUC L PT
- 4 Mbyte memory on the hard disk for application software (experienced value)
- MS-DOS, version 5.0 and higher
- MS-WINDOWS, version 3.1 and higher or WINDOWS 95.

STRUC G PT, version 4.2.5 and higher

graphically configures the T300 (see Fig. 6/79). It is supplied on CD-ROM, either with German or English menu texts as required.

We recommend ordering a SIEMENS-NIXDORF STRUC configuring PC with installed UNIX operating system SCO-UNIX and a run-time version of STRUC PT (see minimum SNI-PC requirements). STRUC requires approximately 250 Mbyte on the hard disk, including the reserve for STRUC G application software. The PC, preconfigured with STRUC G PT, has, in addition to the UNIX partition, a DOS partition in which all of the DOS and Windows applications are run.

The scope of supply includes the Service start-up program which allows any 10 values (max.) in a software package to be simultaneously visualized and any input values to be changed at the function blocks. Most of the connections between the function blocks can be changed and displayed.

Minimum SNI-PC requirements

- the hardware must comply with the SCO hardware compatibility manual
- floppy disk drive $3^1/_2$", 3-button mouse
- German or English keyboard
- 16 Mbyte working memory
- graphics card compatible to SCO V 5.0, 1280 · 1024 pixels
- 520 Mbyte hard disk, CD-ROM drive
- color monitor, 43 cm (17").

MS300 or MS301 memory module

is empty and is plugged onto the T300, is programmed with a user application software created by the user.

The MS300 or MS301 are not needed for standard software packages.

They differ from each other only with regard to the size of the EEPROM which is used for storing parameters in the case of standard software packages.

MS300: EEPROM 2 Kbytes, allows storage of 250 altered parameters (experienced value).

MS301: EEPROM 8 Kbytes, allows storage of 1000 altered parameters (experienced value).

External, parallel PP1X programming unit for PG7x0 or PC

is connected to the printer interface of a PG or PC. The MS300 or MS301 memory module can be programmed with the PP1X. For PG and PC hardware requirements, see STRUC L PT.

The scope of supply includes the UP3 programming adapter which is needed for programming the MS300 or MS301.

For selection and ordering data of the T300 technology board and its components, see Section 3.

T400 technology board

Application

The T400 technology board is a 32-bit CPU board for highly dynamic, technological closed-loop and open-loop control functions. It is supplied with extensive integrated peripheral units.

Configuration tool: SIMATIC STEP 7 / CFC V 4.0

For use in the electronics box of the SIMOVERT MASTERDRIVES Vector Control units.

Standard configurations

for frequently occurring applications such as synchronism, winders, positioning are available as a CFC source code. The T400 board is ready for immediate use with the standard configurations. It simply has to be parameterized and does not require configuration with STEP7/CFC.

If the T400 is configured with CFC, function-block terminals can also be defined as parameters in order to observe or alter them, for example, through the following interfaces:

- the PMU parameterizing unit or the OP1S operator control panel
- the T400 USS interface with the OP1S operator control panel or the Drive ES Basic and DriveMonitor programs for PCs
- PROFIBUS DP (via the CBP communication board).

Characteristics (inputs/outputs)

- 2 analog outputs
- 5 analog inputs
- 2 binary outputs
- 8 binary inputs
- 4 bidirectional binary inputs or outputs.
- 2 incremental-encoder inputs with zero pulse – Encoder 1 for HTL (15 V) encoders.
  The encoder pulses of an encoder connected to the SIMOVERT MASTERDRIVES unit can also be used. They are fed to the T400 via the backplane bus.
- A coarse pulse input for each incremental encoder for masking the zero pulse.
- No electrical isolation of the inputs/outputs.
- Serial interface 1
  with RS232 and RS485 transmission format and via switches using a protocol which can be selected on the board:
  – DUST1 service protocol with 19.2 Kbit/s and RS232 transmission format
  – USS protocol, 2-wire, with selectable RS232 or RS485 transmission format, max. 38.4 Kbit/s; can be configured as slave for parameterization with the OP1S, Drive ES Basic or DriveMonitor.
- Serial interface 2
  with RS485 transmission format and a protocol which can be selected by configuration of the corresponding function block:
  Baud rates (Kbit/s):
  9.6/19.2/38.4/93.75/187.5
  – USS protocol
  can be configured as a slave for parameterization with the OP1S, Drive ES Basic or DriveMonitor (2-wire or 4-wire)
  – peer-to-peer
  for rapid process coupling, 4-wire.

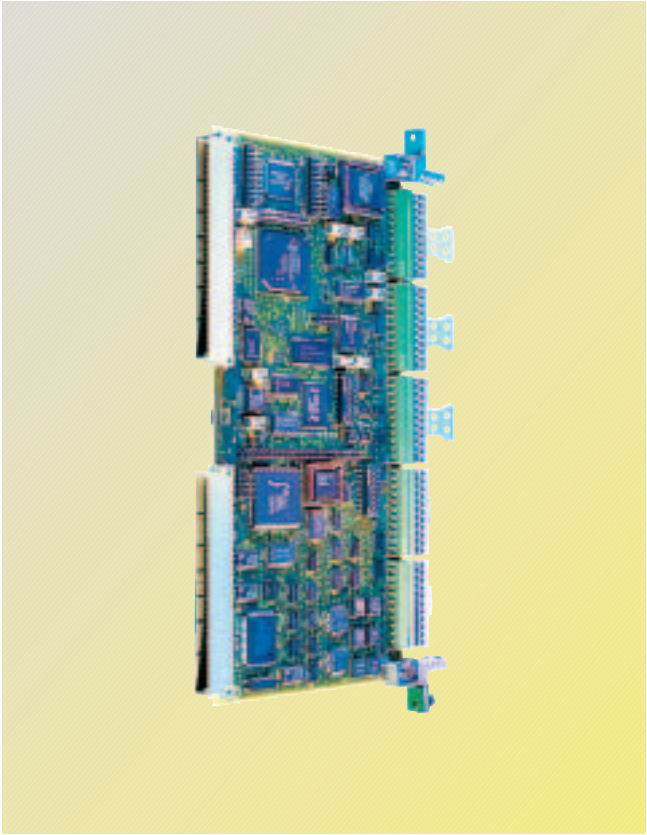


Fig. 6/81
T400 technology board

Note

If serial interface 2 is used (peer-to-peer, USS), absolute-value encoder 2 cannot be operated, as the same terminals are used for both applications!

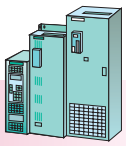
- Absolute-value encoder 1 with SSI or EnDat protocol (RS485) for positioning applications.
- Absolute-value encoder 2 with SSI or EnDat protocol (RS485) for positioning applications.

Note

If absolute-value encoder 2 is used, serial interface 2 (peer-to-peer, USS) cannot be operated, as the same terminals are used for both applications!

- Numerous possibilities of synchronization:
  – synchronization of the T400 with MASTERDRIVES units or second T400 or vice versa.

For a more detailed description and ordering data, see Catalog ST DA.



SCB1 interface board [1]

The SCB1 interface board (*S*erial *C*ommunication *B*oard 1) has a fiber-optic cable connection and enables the creation of a:

- peer-to-peer connection between several units with a max. data transfer rate of 38.4 Kbits/s.
- serial I/O system (see Fig. 6/82) in conjunction with the SCI1 and SCI2 serial interface boards (see page 6/82).

The following is thus made possible:

1. Expansion of the binary and analog inputs and outputs of the base units
2. Customized assignment of the terminals for the inputs and outputs (e.g. NAMUR).

The following board combinations are possible:

SCB1 with one SCI1 or SCI2

SCB1 with two SCI1 or SCI2

SCB1 with one SCI1 and one SCI2.

The interface board is built into the electronics box (description see page 6/55).

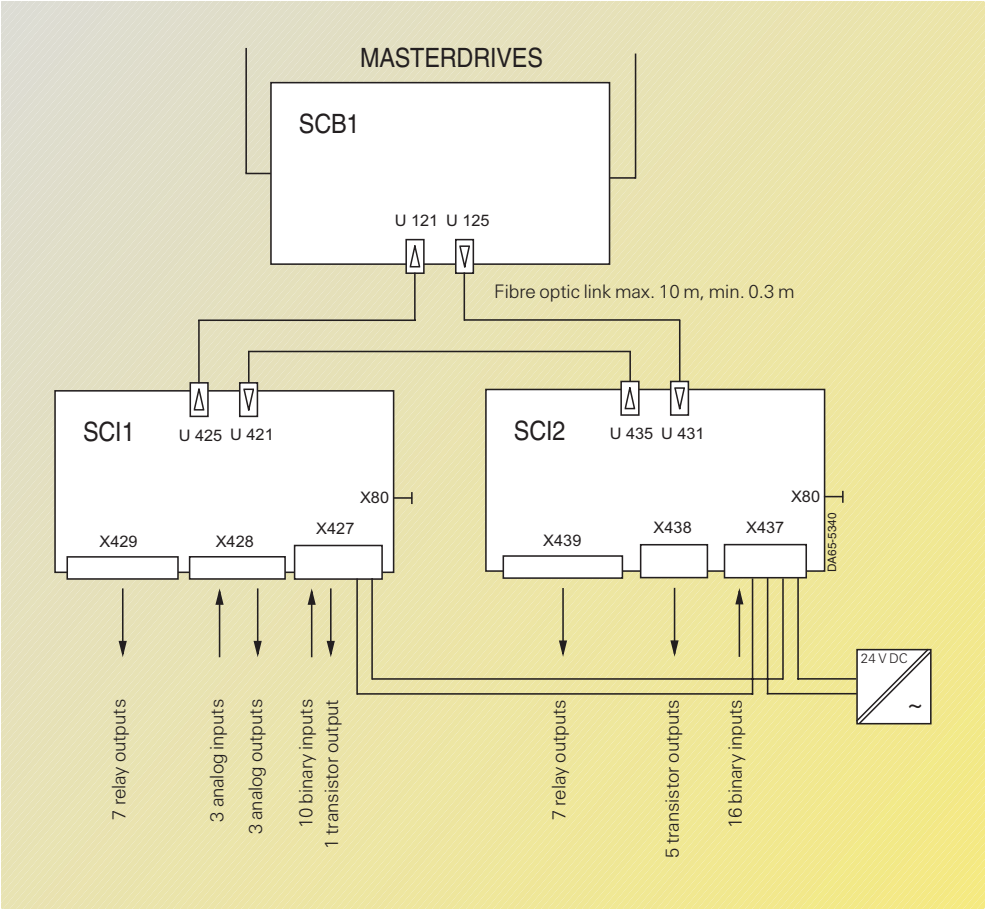


Fig. 6/82
Example of connecting a serial I/O system with SCB1, SCI1 and SCI2

SCB2 interface board [1]

The SCB2 interface board (*S*erial *C*ommunication *B*oard 2) has a floating RS485 interface and enables the following alternatives:

- Peer-to-peer connection between several converters via the RS485 interface (see Fig. 6/83).
- Bus connection with a maximum of 31 slaves connected to a master (e.g. SIMATIC) via the RS485 interface, using the USS protocol (see Fig. 6/85). The maximum data transfer rate is 187.5 Kbits/s.

Note

The SCB2 interface board always operates as a slave.

The SCB2 interface board is inserted at slot 2 or 3 of the electronics box (description see page 6/55).

1) Not for Compact PLUS units.

SCB2 interface board

Peer-to-peer connection

The serial peer-to-peer connection operates via a 4-wire connection (see Fig. 6/83).

A peer-to-peer connection can also be created in parallel with the SCB2, i.e. the corresponding slave drives are controlled by the master drive via a parallel cable (see Fig. 6/84).

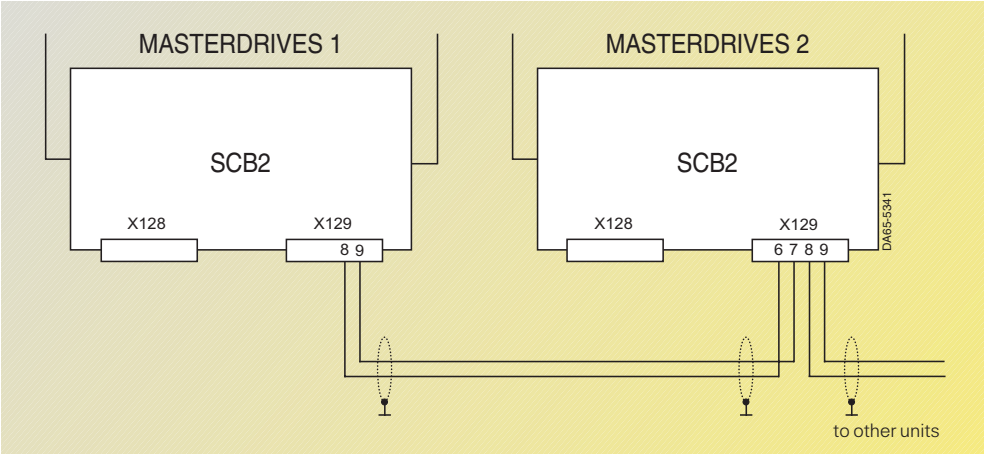


Fig. 6/83
Example of a serial peer-to-peer connection via RS485

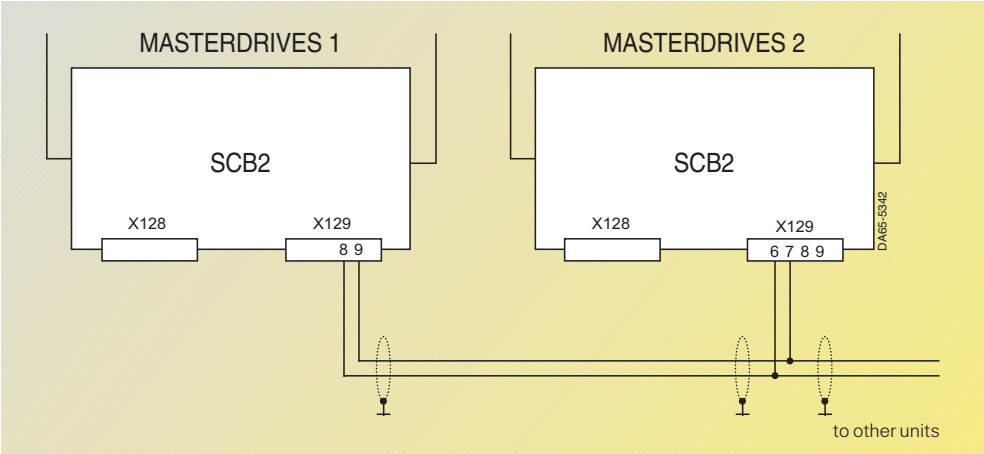


Fig. 6/84
Example of a parallel peer-to-peer connection via RS485

Bus connection with USS protocol

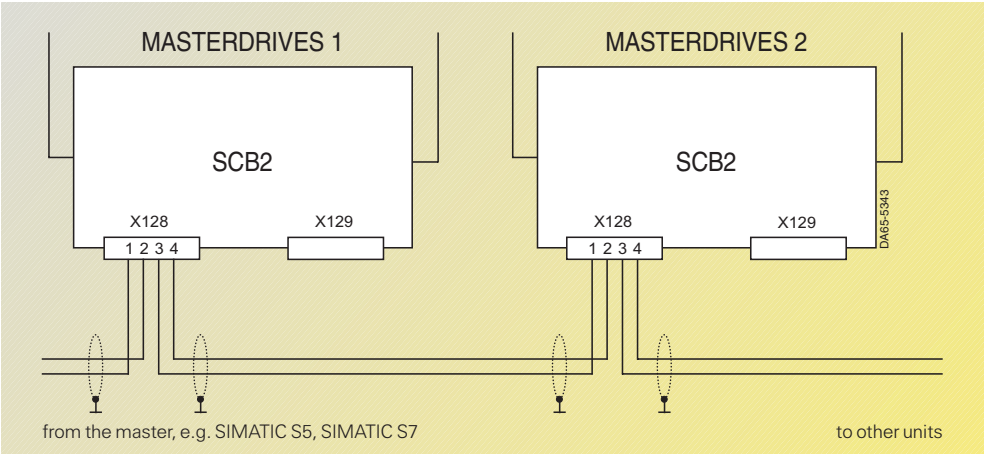
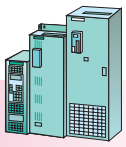


Fig. 6/85
Example of a bus connection with USS protocol via RS485



SCI1 and SCI2 interface boards [1]

A serial I/O system using fiber-optic cables can be established with the SCI1 and SCI2 (*S*erial *C*ommunication /nterface 1 or 2) interface boards and the SCB1 interface board. This allows the number of binary and analog inputs and outputs to be considerably expanded. In addition, the fiber-optic cables safely decouple the units in accordance with DIN VDE 0100 and DIN VDE 0160 (PELV function, e.g. for NAMUR).

The fiber-optic cables, which can be a maximum of 10 m long and a minimum of 0.3 m, connect the boards in a ring structure. Both the SCI1 and the SCI2 require an external 24 V power supply (each 1 A).

All the inputs and outputs of the interface boards can be parameterized.

The SCI1 and SCI2 interface boards can be snapped onto a DIN rail at a suitable place in the control cabinet.

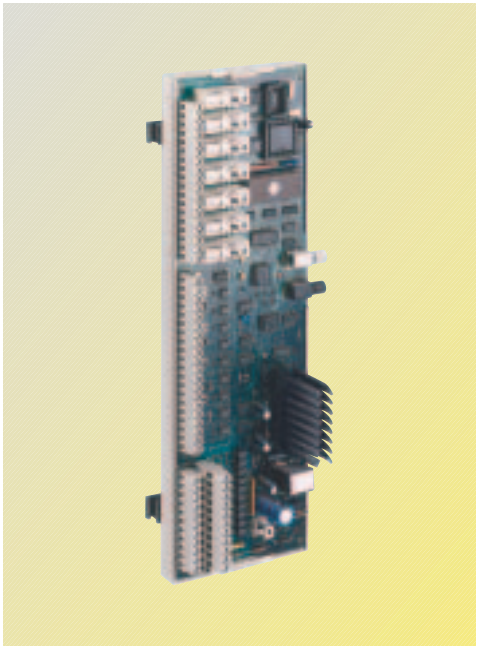


Fig. 6/86
SCI1 interface board

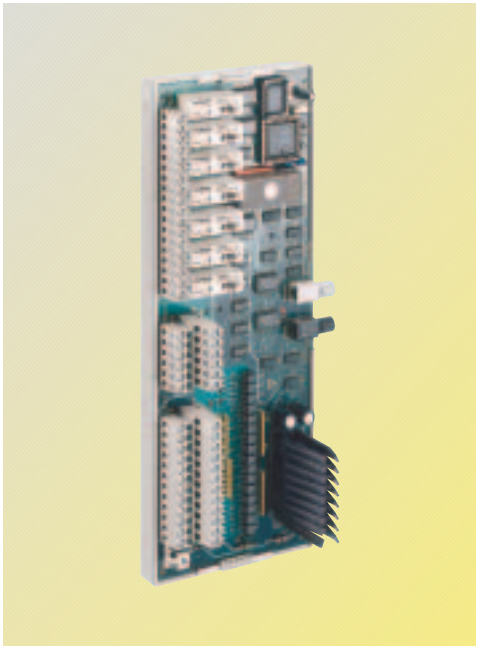


Fig. 6/87
SCI2 interface board

Inputs and outputs Functions	SCI1	SCI2	Description
Binary inputs	10	16	Floating optocoupler inputs in 2 circuits 24 V DC, 10 mA
Binary outputs including: Relay changeover contacts Relay make contacts Transistor outputs	8 4 3 1	12 4 3 5	 Load capability: 250 V AC, 2000 VA (cos φ = 1) 100 V DC, 240 W 24 V DC, max. 100 mA, short-circuit proof, open-emitter for driving the optocouplers or relay
Analog inputs	3	–	Voltage signals: 0 V to ±10 V Current signals: 0 mA to ±20 mA; 4 mA to 20 mA; 250 Ω load Non-floating inputs
Analog outputs	3	–	Output signals: 0 V to ±10 V, 0 mA to ±20 mA, 4 mA to 20 mA, non-floating max. cable length with shielded cable is 100 m, max. load 500 Ω
Supply voltage: Reference voltage +10 V – 10 V 24 V DC	 1 1 2	 2	 5 mA load capability, short-circuit proof 5 mA load capability, short-circuit proof Short-circuit proof output for binary inputs or outputs, load capability 280 mA

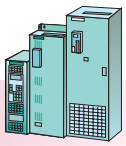
Technical Data	
Mounting	DIN mounting rail (see Section 3)
External rated input voltage	24 V DC (–17 %, +25 %), 1 A
Degree of protection	IP00
Dimensions H x W x D	SCI1: 95 mm x 300 mm x 80 mm SCI2: 95 mm x 250 mm x 80 mm

1) Not for Compact PLUS units.

Control terminal strip on the SCI1 interface board for cabinet units with PMU or OP1S and the option, "NAMUR terminal strip"

Terminal	No.	Type	Preassignment	Notes
X427	A1	P24		
	A2	M		
	A3	BE6	Setpoint lower	
	A4	BE7	Acknowledge	
	A5	BE8	Off 2	
	A6	BE9	Select counter-clockwise-rotating field	
	A7	BE10	None	
	A8	M		
	A9	M		
	A10	M		
	A11	M		
X427	B1	P24		
	B2	BA8	None	Transistor output
	B3	BE1	On/Off 1	
	B4	BE2	Select BICO data set 2	Local/remote operation
	B5	BE3	None	
	B6	BE4	None	
	B7	BE5	Setpoint higher	
	B8	M		
	B9	P24		
	B10	P24		
	B11	P24		
X428	1	+10 V stab		
	2	–10 V stab		
	3	AE1 ±10 V	Main setpoint	Analog input 1
	4	M		
	5	AE1 ±20 mA		Shunt resistor 250 Ω
	6	AE2 ±10 V	None	Analog input 2
	7	M		
	8	AE2 ±20 mA		Shunt resistor 250 Ω
	9	AE3 ±10 V	None	Analog input 3
	10	M		
	11	AE3 ±20 mA		Shunt resistor 250 Ω
	12	AA1 ±10 V	Speed	Analog output 1
	13	M		
	14	AA1 0-20 mA		Shunt resistor max. 500 Ω
	15	AA2 ±10 V	Output current	Analog output 2
	16	M		
	17	AA2 0-20 mA		Shunt resistor max. 500 Ω
	18	AA3 ±10 V	Torque	Analog output 3
	19	M		
	20	AA3 0-20 mA		Shunt resistor max. 500 Ω
X429	1	BA1	Ready for power-on	Relay contact
	2			
	3	BA2	Setpoint reached	Relay contact
	4			
	5	BA3	Off 2 signal	Relay contact
	6			
	7	BA4	Fault	Changeover contact: common
	8			break contact
	9			make contact
	10	BA5	None	Changeover contact: common
	11			break contact
	12			make contact
	13	BA6	None	Changeover contact: common
	14			break contact
	15			make contact
	16	BA7	None	Changeover contact: common
	17			break contact
	18			make contact

Relay contacts, maximum loading 100 V DC, 2.4 A or 250 V AC, 8 A



TSY synchronizing board [1)]

The TSY (*T*achometer *S*ynchronizing *B*oard) synchronizing board can be used to synchronize two converters or inverters to a common load (e.g. running up for operation with main converters).

Preconditions:

1. Both converters have a TSY synchronizing board.
2. Both converters operate in the *V/f* characteristic mode for textile applications.
3. The *V/f* characteristics, the setpoint and the rotating field of both converters are identical.

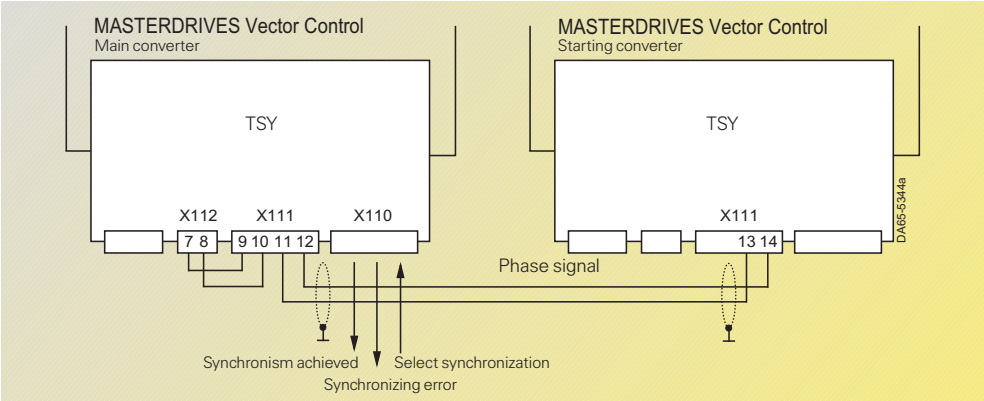


Fig. 6/88
Example of connecting the synchronization board between the starting converter and the main converter

Synchronization can be activated by means of a command, e.g. from a binary input. After synchronization, the "synchronism achieved" signal is output, e.g. via a binary output. The TSY synchronizing board has two floating binary outputs and one binary input for inputting and outputting binary signals.

1) Not for Compact PLUS units.

DTI digital tachometer interface [1)]

Digital tachometers with different voltage levels can be connected at the DTI board. The inputs are floating.

The board allows the following signals to be connected:

- HTL encoders with differential outputs (Fig. 6/90)
- floating HTL encoders (Fig. 6/91)
- TTL encoders at X401 (Fig. 6/93)
- encoder cables > 150 m
- TTL output at X405 (Fig. 6/92)
- level converter, HTL to TTL

The DTI interface can be connected to:

- the CUVC board
- the T300 board and SE300 terminal block.

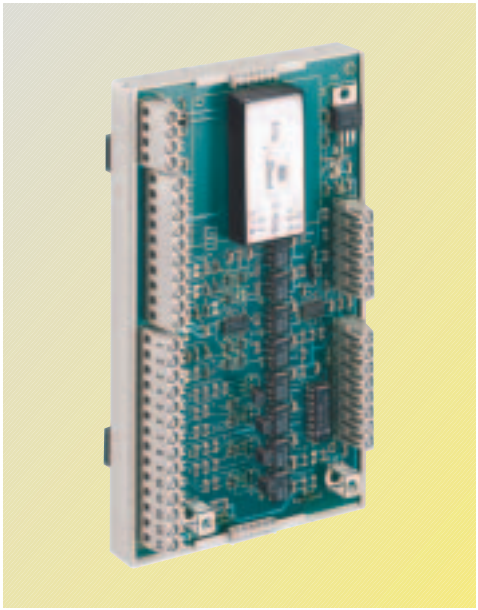


Fig. 6/89
DTI digital tachometer interface

Technical data of the DTI digital tachometer interface

Mounting	DIN mounting rail
External supply voltage necessary	24 V DC 300 mA for HTL encoder 150 mA for TTL encoder
Load capability	15-V-encoder 300 mA 5-V-encoder 400 mA
Input current	12 mA for HTL encoder 42 mA for TTL encoder
Output driver current	15 mA for HTL encoder 20 mA for TTL encoder
Limiting frequency f_{max}	400 kHz
Degree of protection	IP00
Dimension H x W x D	96 mm x 160 mm x 46 mm

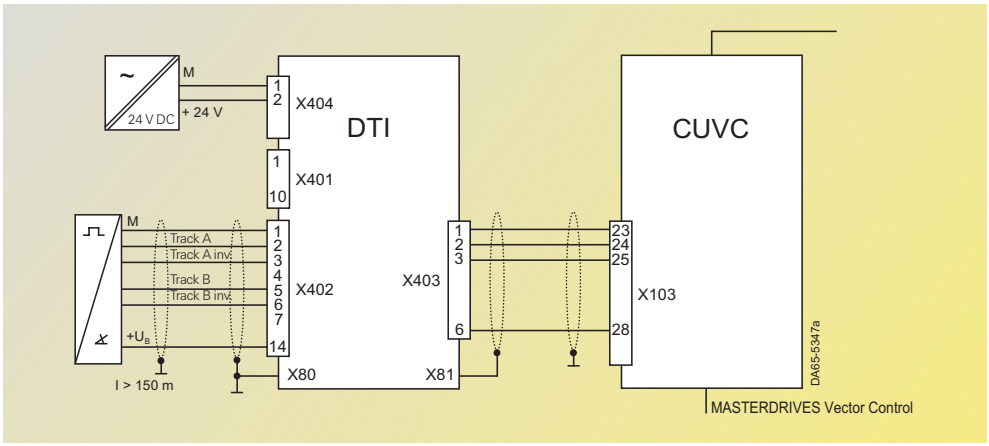


Fig. 6/90
Example of connecting a HTL encoder with differential outputs (e.g. 1XP8001–1) and 15 V encoder voltage

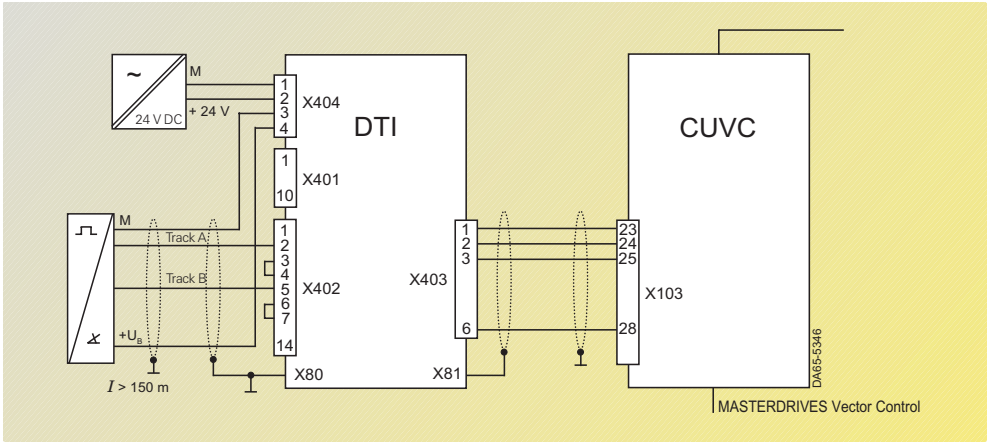
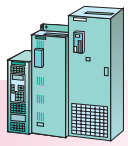


Fig. 6/91
Example of connecting a HTL encoder (e.g. 1XP8001–1) to an external 24 V supply

1) Not for Compact PLUS units.



DTI digital tachometer interface (continued)

Connection X405	Terminal	Designation
	1	Reference potential M5 SYT
	2	Track A
	3	Track, inverted
	4	Track B
	5	Track B, inverted
	6	Zero pulse
	7	Zero pulse, inverted
	8	Supply voltage 5 V

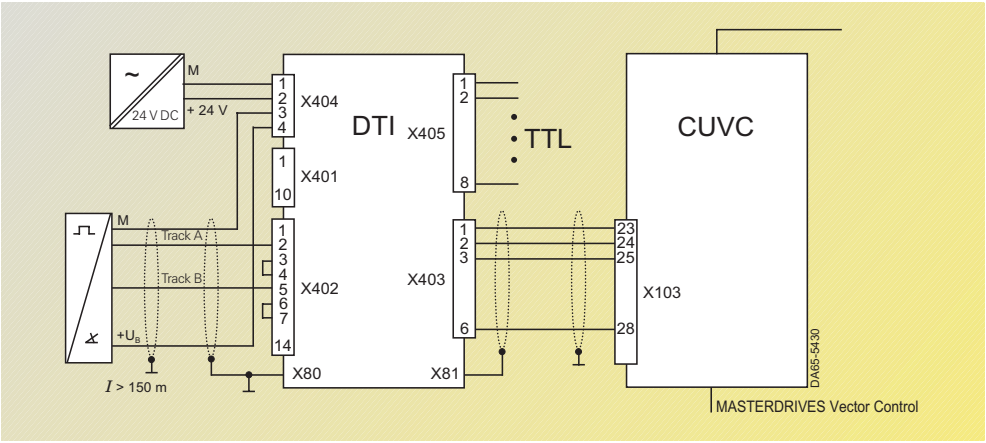


Fig. 6/92
Example of connecting a HTL encoder (e.g. 1XP8001-1) to an external 24 V supply with TTL output

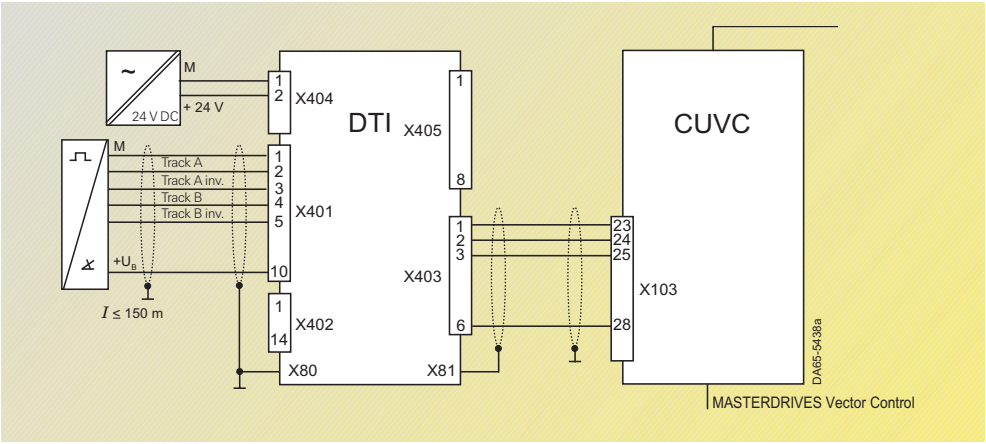
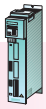


Fig. 6/93
Example of connecting a TTL encoder

Vector Control
Dimension Drawings

Dimension Drawings

Compact PLUS units



Converters

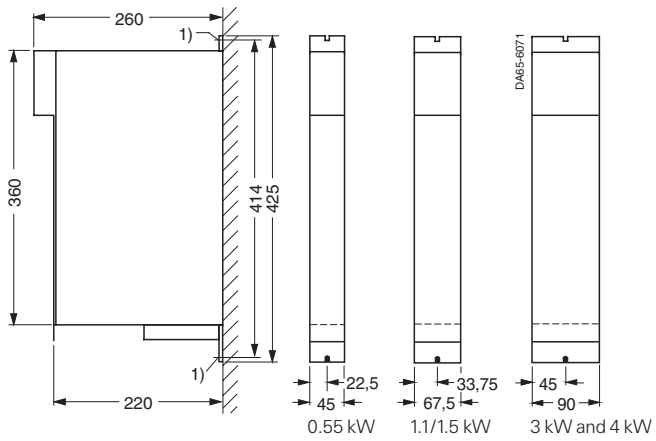


Fig. 1

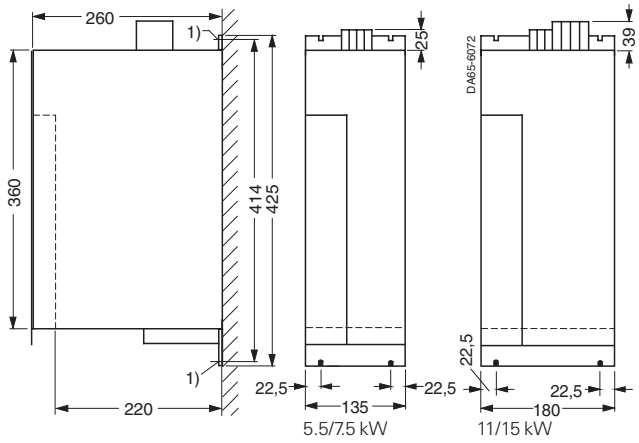


Fig. 2

Inverters

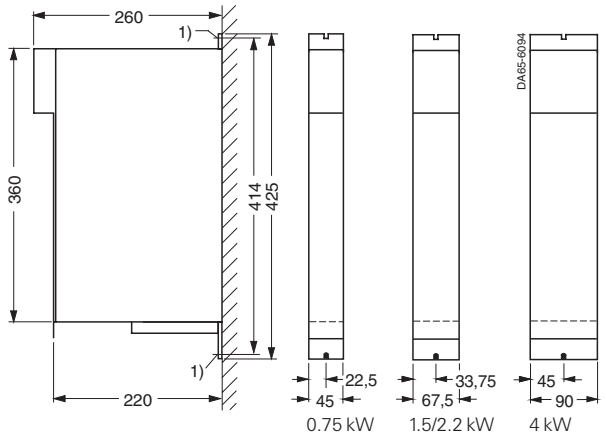


Fig. 3

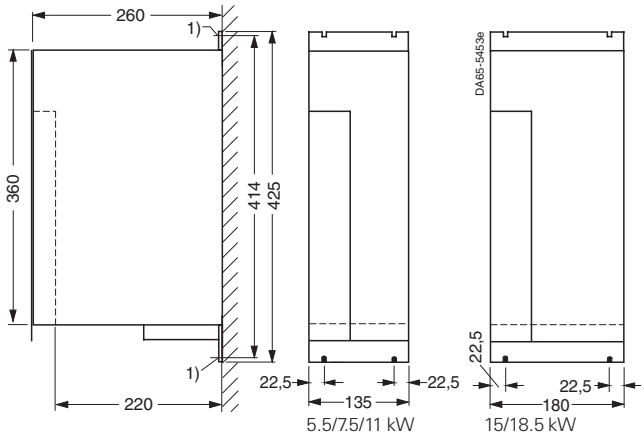


Fig. 4

Rectifiers units

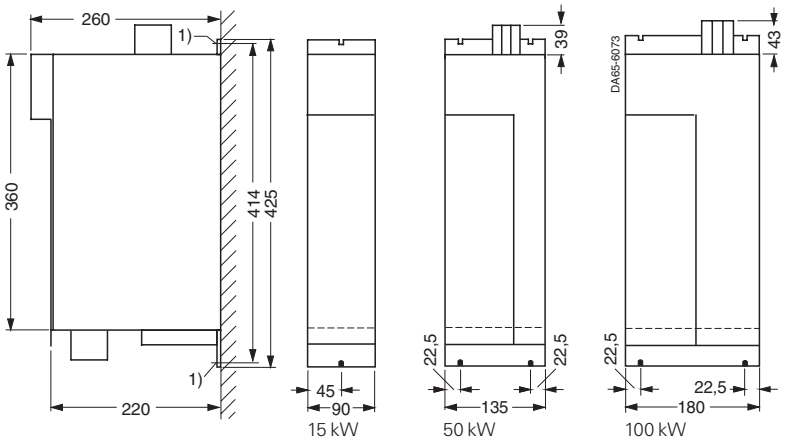


Fig. 5

1) Retaining bolts: M 5.

Compact and chassis units

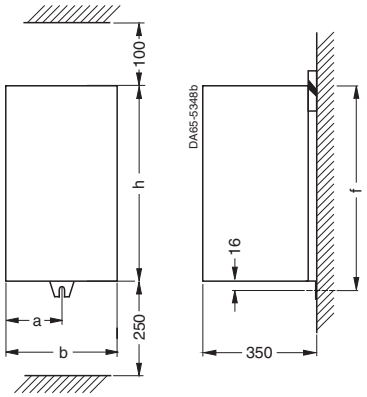


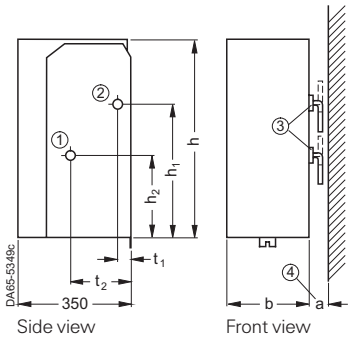
Fig. 6

Sizes A, B, C and D
converters, inverters, AFE inverters,
rectifier unit sizes B and C,
rectifier/regenerative unit size C

Type	a	b	f	h
6SE70 . . – . . A	45	90	425	425
6SE70 . . – . . B	67.5	135	425	425
6SE70 . . – . . C	90	180	600	600
6SE70 . . – . . D	45[1)]	270	600	600

1) For size D two lugs left and right.

Compact units



① Feed
② Return
③ Threaded elbow joint (enclosed)
④ Space for water connections at the side

Notes

Return: upper connection
Feed: Lower connection
Supply of water:
G 1/2 male thread, flat sealing
Working pressure: max. 1 bar

Fig. 7

Sizes B, C and D
water-cooled converter and inverter
position of the water connections

Type	a	b	h	h_1	h_2	t_1	t_2
6SE70 . . – . . B	65	135	425	380	140	85	140
6SE70 . . – . . C	65	180	600	500	290	105	43
6SE70 . . – . . D	65	270	600	390	254	35	220

Chassis units · Converter/inverter

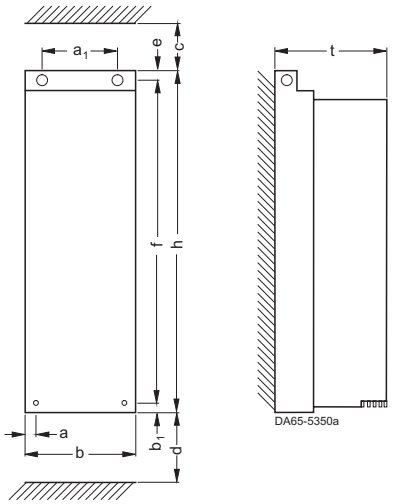
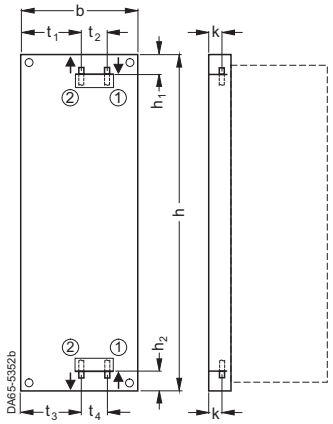


Fig. 8

Sizes E, F and G
Converter, inverter, AFE inverter



① Feed
② Return

Notes

Seal-off unused water connections with screw and seal (enclosed).

Water supply:
Size E and F,
male thread G 1/2", flat proof

Size G,
male thread G 3/4", flat proof

Working pressure:
max. 1 bar

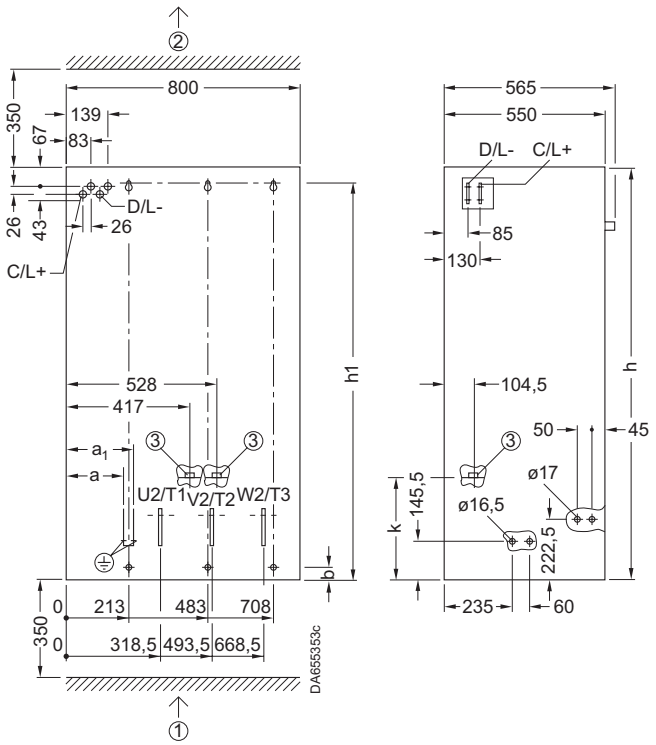
Fig. 9

Sizes E, F and G
water-cooled converter and inverter
position of the water connection

Further dimensions, see fig. 3.

Type	a	a_1	b	b_1	c	d	e	f	h	t
Converter/ inverter										
6SE70 . . – . . E	45	180	270	10	350	400	15	1025	1050	365
6SE70 . . – . . F	45	270	360	10	350	400	15	1025	1050	365
6SE70 . . – . . G	119	270	508	25	350	320	50	1375	1450	465

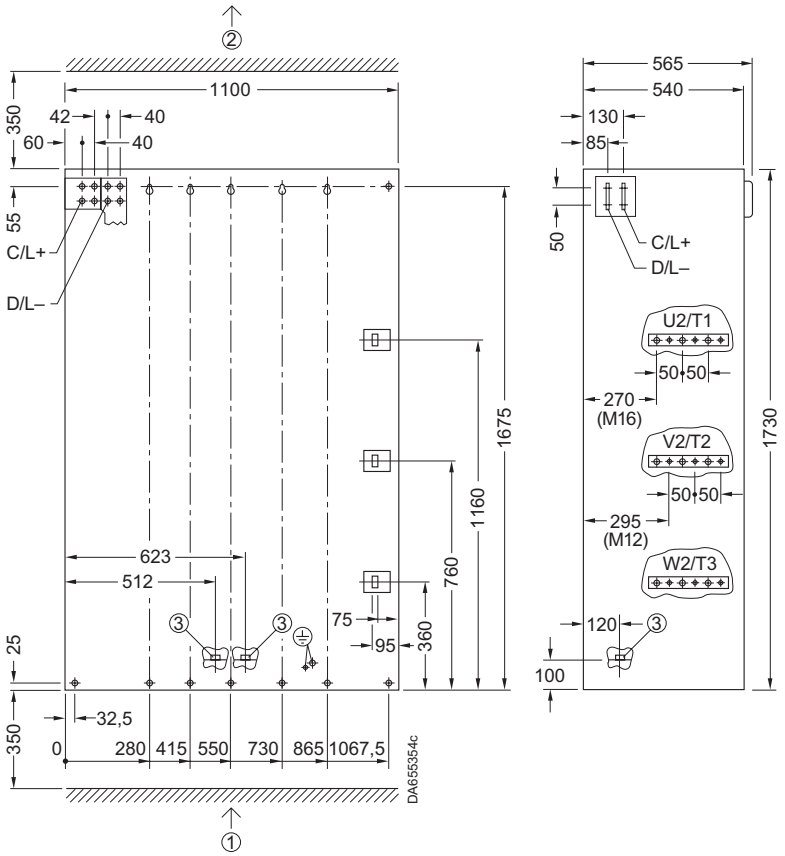
Type	b	h	h_1	h_2	t_1	t_2	t_3	t_4	k
Converter/ inverter									
6SE70 . . – . . E	270	1050	42	25	117	56	91	56	30
6SE70 . . – . . F	360	1050	42	25	207	56	181	56	30
6SE70 . . – . . G	508	1450	31	40	233	66	191	66	40



① Air inlet
② Air outlet
③ With water cooling, connection for cooling circuit directly at the heatsink, 1" internal thread (R1")

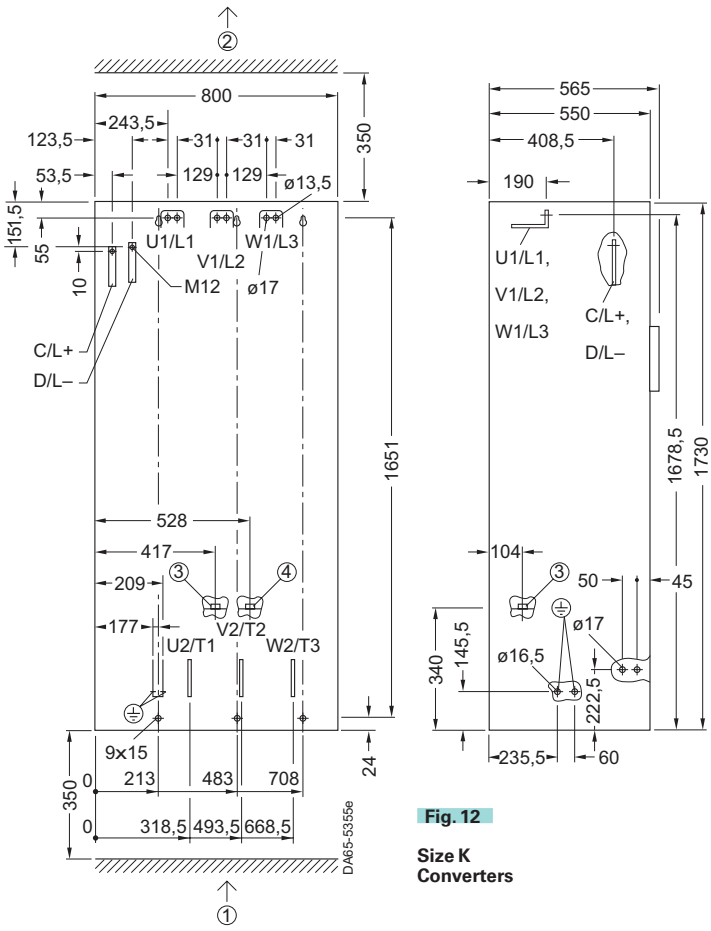
Type	a	a_1	b	h	h_1	k
6SE70 . . – . . J	170.5	207.5	45	1400	1345	340
6SE70 . . – . . K	177	209	25	1790	1675	220
6SE70 . . – . . Q	2 x chassis units for size K, side-by-side					

Fig. 10 **Sizes J, K Inverters**



① Air inlet
② Air outlet
③ With water cooling, connection for cooling circuit directly at the heatsink, 1" internal thread (R1")

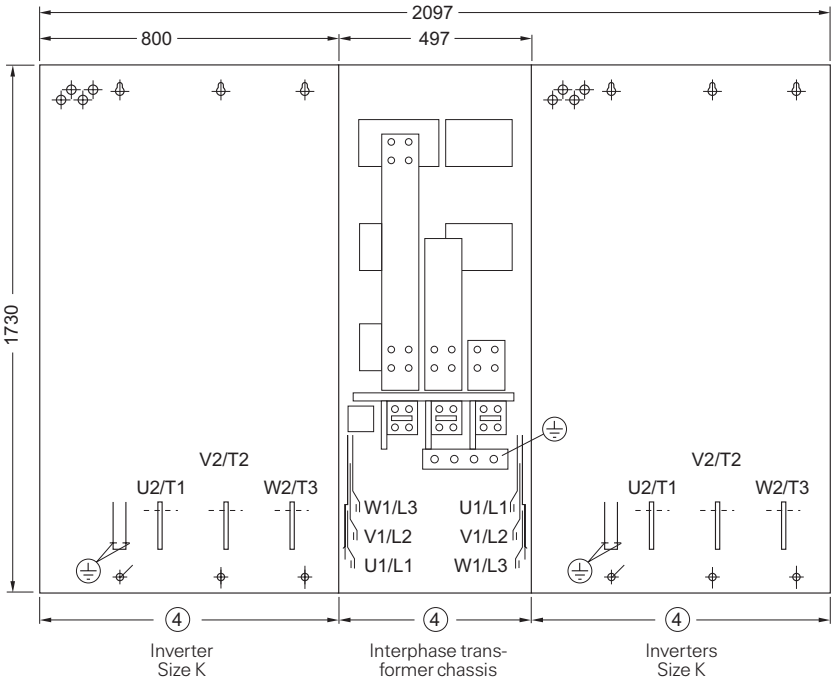
Fig. 11 **Size L Inverters**



① Air inlet
② Air outlet
③ With water cooling, connection inlet for cooling circuit directly at the heatsink, 1" internal thread (R1")
④ With water cooling, connection return

Fig. 12

Size K
Converters



① Air inlet
② Air outlet
④ Transport unit

Fig. 13

Size M
Inverter with interphase transformer chassis

7

Dimension Drawings

Chassis units
Rectifier units and rectifier/regenerative units

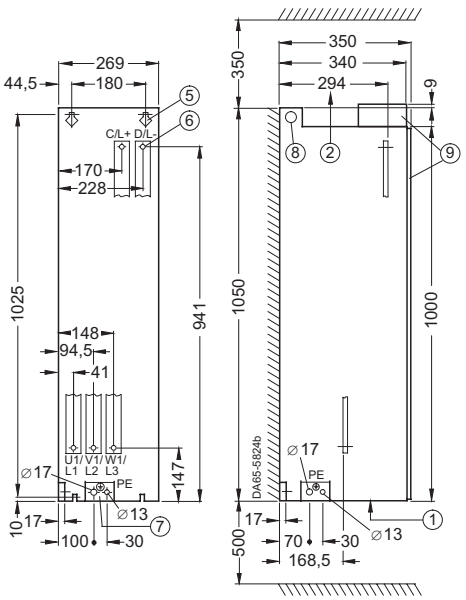


Fig. 14

Size E
Rectifier unit,
rectifier/regenerative unit

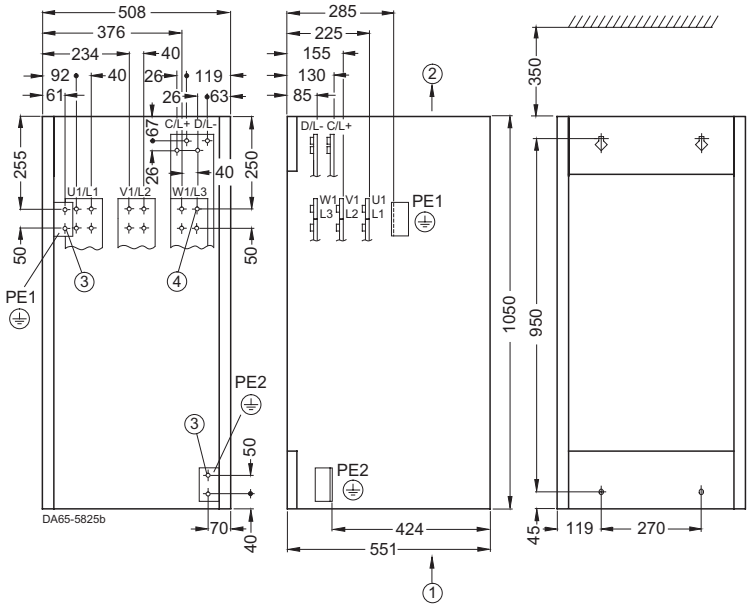


Fig. 15

Size H
Rectifier unit

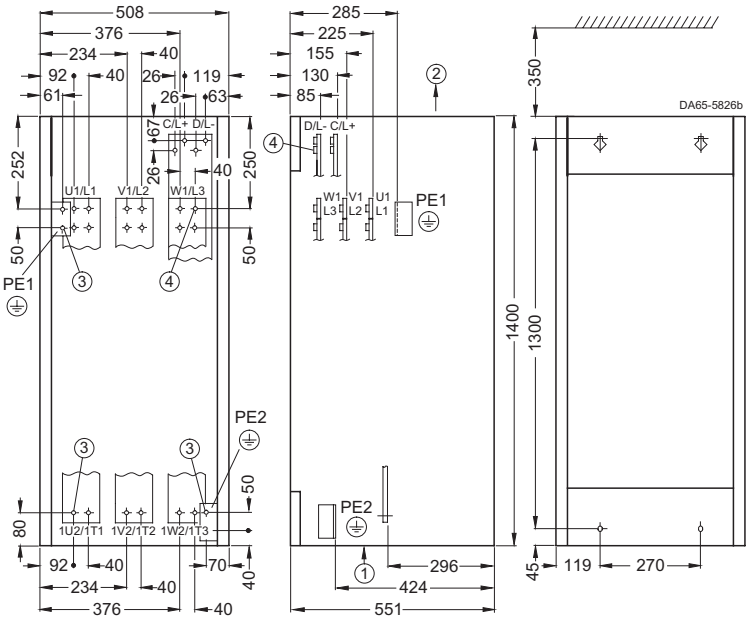


Fig. 16

Size H
Rectifier/regenerative unit

① Air inlet, e.g. up to the closed cabinet base or cable duct
② Air outlet up to a reflecting surface, e.g. ceiling or closed roof
③ Through-hole for M 12 bolt
④ M 12 thread
⑤ Through-hole for M 8 bolt
⑥ Through-hole for power connections
M 16 for 6SE7036–1EE85–0AA0, 6SE7034–2FE85–0AA0, 6SE7035–4FE85–0AA0, 6SE7034–2HE85–0AA0 and 6SE7035–4HE85–0AA0
M 12 for all other units
⑦ Pre-fitted terminal for PE
M 16 for 6SE7036–1EE85–0AA0, 6SE7034–2FE85–0AA0, 6SE7035–4FE85–0AA0, 6SE7034–2HE85–0AA0 and 6SE7035–4HE85–0AA0
M 12 for all other units
⑧ Lifting eye Ø 30 mm
⑨ Front cover (doors) and terminal cover, only with IP20 version

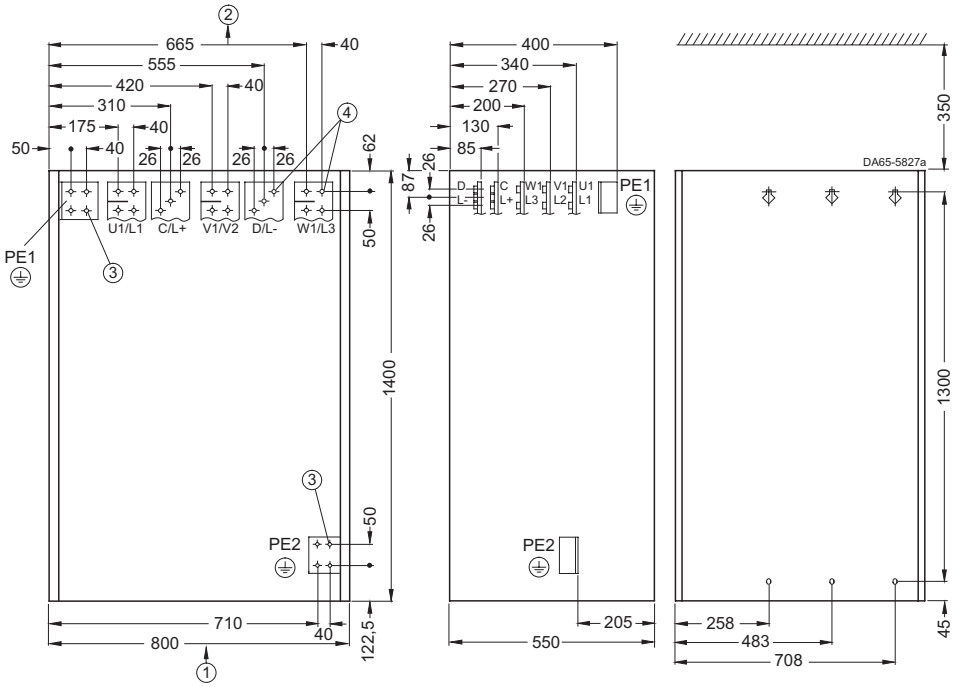


Fig. 17

Size K
Rectifier unit

Fig. 18

Size K
Rectifier/regenerative units

Overcurrent protector units (OCP)

Compact and chassis units

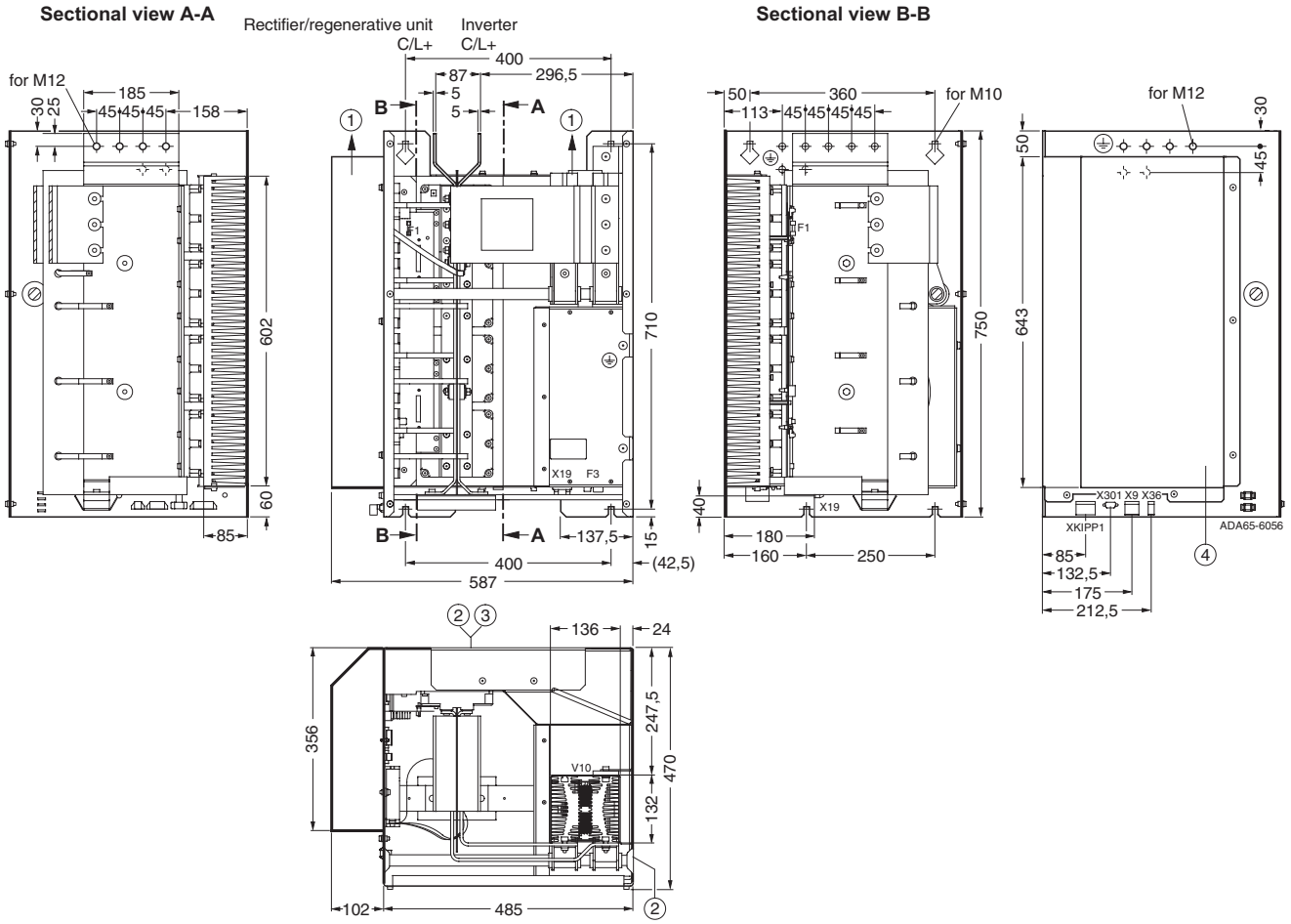


Fig. 19

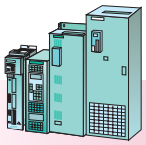
① Air outlet
② Optional mounting surfaces for wall mounting
③ Optional mounting surfaces for horizontal mounting

④ Optional air duct
(Mounting 5 x M 6)
If operated without an air conduit, it must be ensured that air can escape unhindered.
Circulation of exhaust air must be excluded.

Max. wire cross-section for cable with cable lug to DIN 46 234:
8 x 250 mm²

Tightening torque for customer connections:
C/L + = 44 Nm
⏚ = 60 Nm

7



Compact PLUS/compact and chassis units · cabinet units

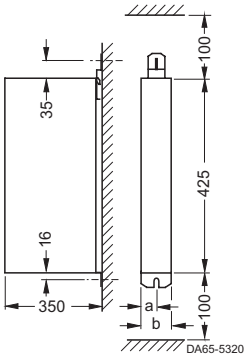


Fig. 20

Braking units, sizes S, A and B

Type	a	b
6SE70 . . – . . S	22.5	45
6SE70 . . – . . A	45	90
6SE70 . . – . . B	67.5	135

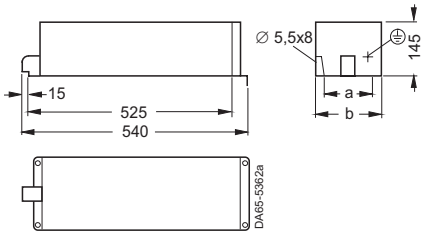
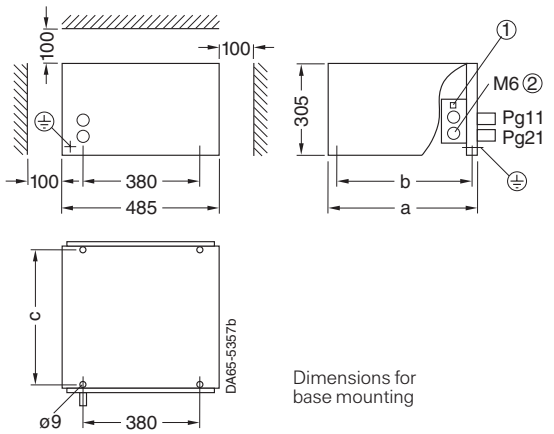


Fig. 22

Braking resistor 5 kW and 10 kW

Type	a	b
6SE70 16–4FS87–2DC0	150	180
6SE70 18–0ES87–2DC0	150	180
6SE70 21–6CS87–2DC0	150	180
6SE70 21–3FS87–2DC0	330	360
6SE70 21–6ES87–2DC0	330	360
6SE70 23–2CS87–2DC0	330	360



Dimensions for base mounting

Fig. 24

Braking resistor 20 kW and 50 kW

1) 6SE7013–2ES87–2DC0: AWG 16 (1.3 mm²)
6SE7016–3ES87–2DC0: AWG 14 (2.1 mm²)

Braking units and braking resistors

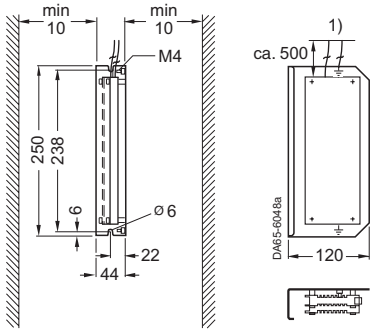


Fig. 21

Braking resistor 2 kW and 4 kW

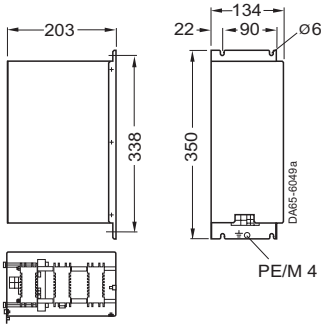
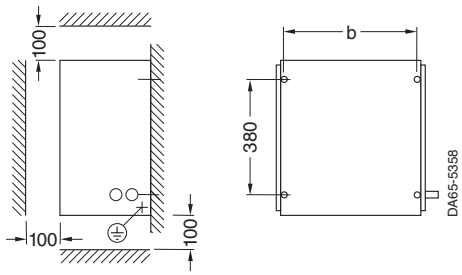


Fig. 23

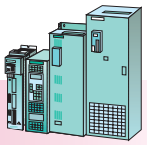
Braking resistor 12 kW

Wall mounting possible



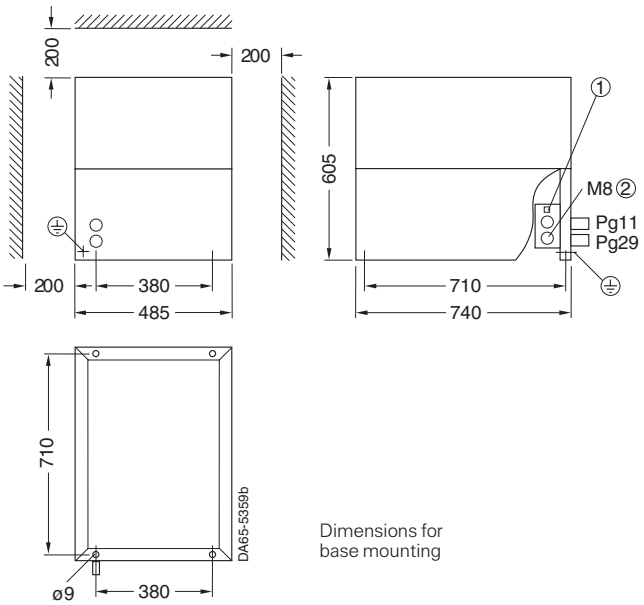
Type	a	b	c
6SE70 23–2ES87–2DC0	430	400	400
6SE70 26–3CS87–2DC0	430	400	400
6SE70 25–3HS87–2DC0	740	710	710
6SE70 26–4FS87–2DC0	740	710	710
6SE70 28–0ES87–2DC0	740	710	710

7



Braking units and braking resistors

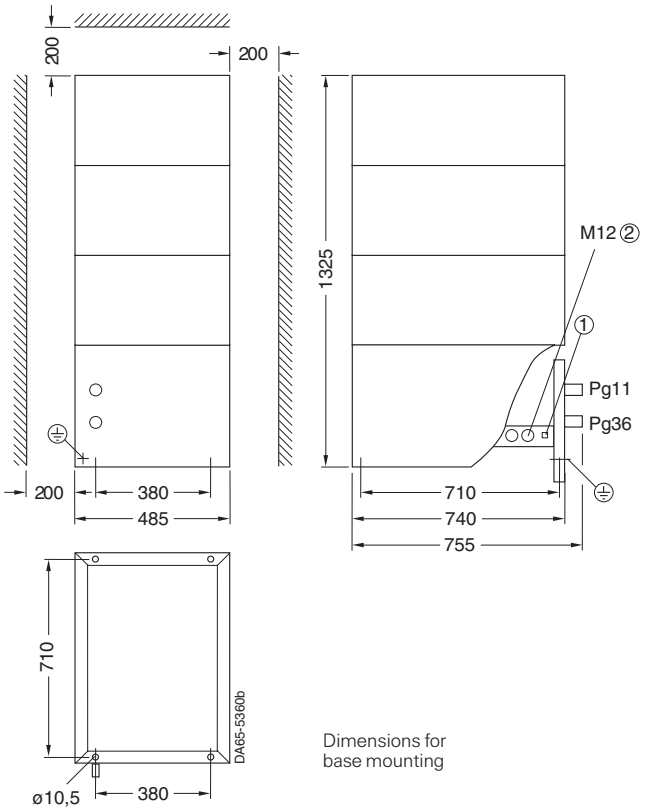
Compact PLUS/compact and chassis units · cabinet units



Dimensions for base mounting

Fig. 25

Braking resistor 100 kW
6SE7031–3FS87–2DC0
6SE7031–6ES87–2DC0

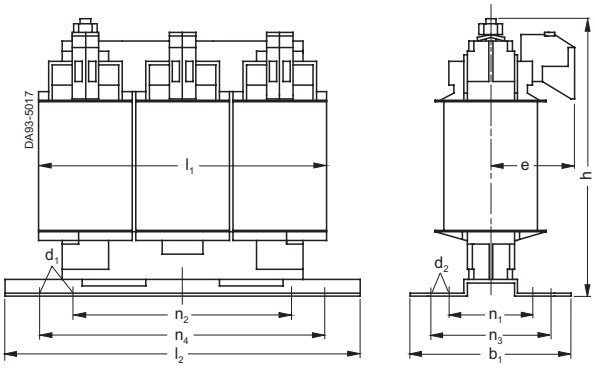


Dimensions for base mounting

Fig. 26

Braking resistor 170 kW and 200 kW
6SE7032–1HS87–2DC0
6SE7032–5FS87–2DC0
6SE7032–7ES87–2DC0

① T1/T2 socket type screw terminal
② Stud terminal



n_3 and n_4 mounting hole acc. to EN 60 852-4
n_1 and n_2 mounting hole acc. to DIN 41 308

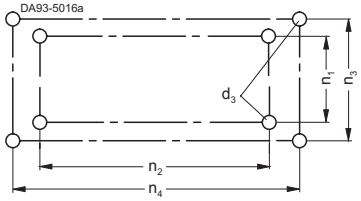


Fig. 27

Commutating reactor 4EP, $I_{LN} \leq 35.5$ A
with terminal connection for any mounting position

Type	b_1	d_1	d_2	d_3	e	h	l_1	l_2	n_1	n_2	n_3	n_4	Weight approx. kg
4EP32	57.5	4.8	9	M 4	56	108	78	88.5	34	1)	42.5	79.5	0.7
4EP33	64	4.8	9	M 4	55	122	96	124	33	1)	44	112	0.9
4EP34	73	4.8	9	M 4	59	122	96	124	42	1)	53	112	1.4
4EP35	68	4.8	9	M 4	57	139	120	148	39	90	48	136	1.9
4EP36	78	4.8	9	M 4	62	139	120	148	49	90	58	136	2.8
4EP37	73	5.8	11	M 5	60	159	150	178	49	113	53	166	3.7
4EP38	88	5.8	11	M 5	67	159	150	178	64	113	68	166	5
4EP39	99	7	13	M 6	62	181	182	219	56	136	69	201	6.1
4EP40	119	7	13	M 6	72	181	182	219	76	136	89	201	8.8

Terminal 8WA9 200
(for $I_{LN} \leq 15$ A)

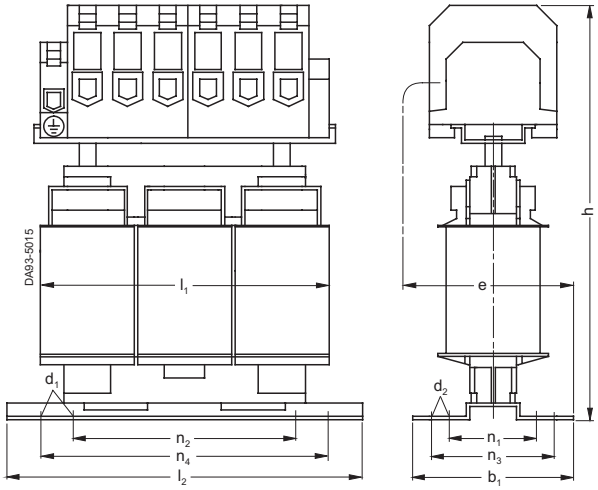
solid	0.5 mm² to 6.0 mm²
finely stranded	1.5 mm² to 4.0 mm²

Terminal RKW 110 or TRKSD 10
(for I_{LN} 16 A to 35.5 A)

solid	1.0 mm² to 16.0 mm²
finely stranded	1.0 mm² to 10.0 mm²

Earthing stud M 6 x 12

solid	2.5 mm² to 10.0 mm²
finely stranded	4.0 mm² to 10.0 mm²



n_3 and n_4 mounting hole acc. to EN 60 852-4
n_1 and n_2 mounting hole acc. to DIN 41 308

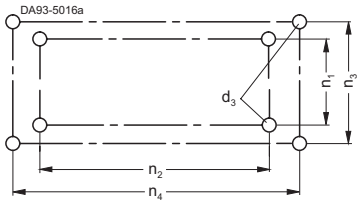


Fig. 28

Commutating reactor 4EP, I_{LN} 36 A to 50 A
with terminal connection for any mounting position

Type	b_1	d_1	d_2	d_3	e	h	l_1	l_2	n_1	n_2	n_3	n_4	Weight approx. kg
4EP38	88	5.8	11	M 5	86	193	150	178	64	113	68	166	5
4EP39	99	7	13	M 6	91.5	220	182	219	56	136	69	201	6.1
4EP40	119	7	13	M 6	101.5	220	182	219	76	136	89	201	8.8

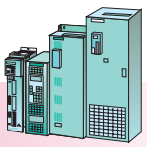
Terminal 8WA1 304
(for I_{LN} 40 A to 50 A)

solid	1.0 mm² to 16.0 mm²
stranded	10.0 mm² to 25.0 mm²
finely stranded	2.5 mm² to 16.0 mm²

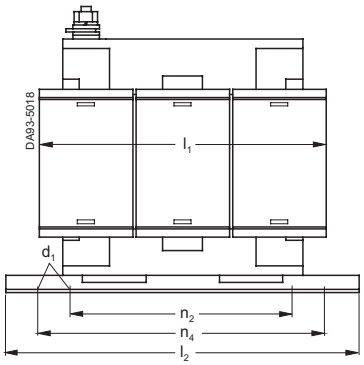
Earthing terminal
EK 16/35

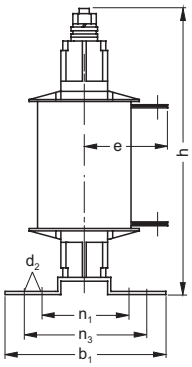
solid	2.5 mm² to 16.0 mm²
finely stranded	4.0 mm² to 16.0 mm²

1) Fixing hole in the center of the foot.

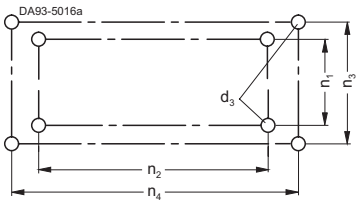


Commutating reactor 4EP and 4EU





n_3 and n_4 mounting hole acc. to EN 60 852-4
n_1 and n_2 mounting hole acc. to DIN 41 308



Flat terminals

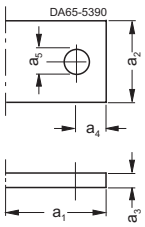


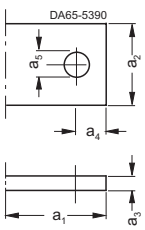
Fig. 29

Commutating reactor 4EP, $I_{LN} \geq 51$ A
with flat terminals, for any mounting position

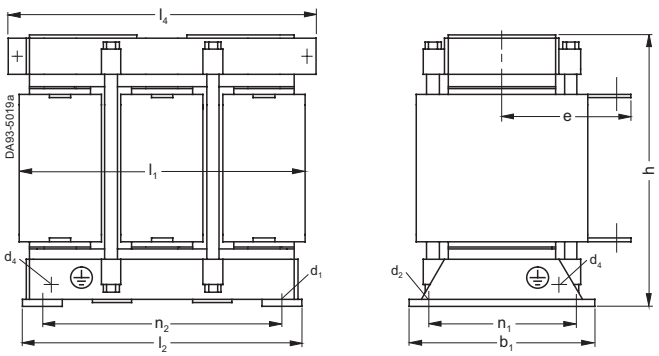
Type	b_1	d_1	d_2	d_3	e	h	l_1	l_2	n_1	n_2	n_3	n_4	Weight approx. kg
4EP38	88	5.8	11	M 5	76	153	150	178	64	113	68	166	5
4EP39	99	7	13	M 6	73	179	182	219	56	136	69	201	6.5
4EP40	119	7	13	M 6	83	179	182	219	76	136	89	201	10

Rated current I_{LN} A	a_1	a_2	a_3	a_4	a_5
51 to 80	30	20	3	10	9
81 to 200	35	25	5	12.5	11

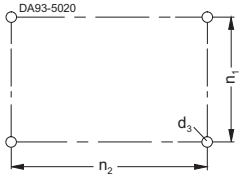
Flat terminals

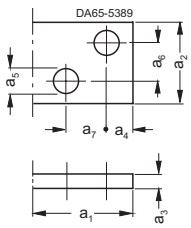


I_{LN} 45 A to 1000 A



Mounting hole





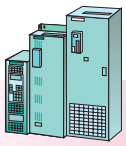
I_{LN} 1001 A to 1600 A

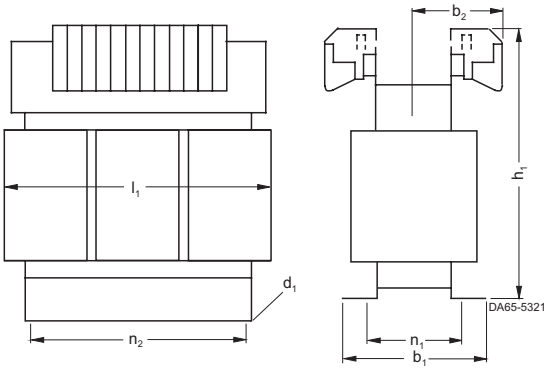
Fig. 30

Commutating reactors 4EU
with flat terminals, for arrangement on horizontal surfaces

Type	b_1	d_1	d_2	d_3	d_4	e max.	h max.	l_1	l_2	l_4	n_1	n_2	Weight approx. kg
4EU24	91	7	13	M 6	M 6	102	210	225	190	–	70	176	11.9
4EU25	115	7	13	M 6	M 6	119	210	225	190	–	94	176	18
4EU27	133	10	18	M 8	M 6	142	248	260	220	270	101	200	28.2
4EU30	148	10	18	M 8	M 6	147	269	295	250	300	118	224	40.3
4EU36	169	10	18	M 8	M 8	197	321	357	300	350	138	264	61
4EU39	174	12	18	M 10	M 6	197	385	405	366	410	141	316	78
4EU43	194	15	22	M 12	M 6	212	435	458	416	460	155	356	117
4EU45	221	15	22	M 12	M 6	211	435	458	416	460	182	356	140
4EU47	251	15	22	M 12	M 6	231	435	458	416	460	212	356	160
4EU50	195	12.5	12.5	M 10	M 12	220	565	533	470	518	158	410	182
4EU52	220	12.5	12.5	M 10	M 12	242	565	533	470	518	183	410	216

Rated current I_{LN} A	a_1	a_2	a_3	a_4	a_5	a_6	a_7
45 to 80	20	20	3	10	9	–	–
81 to 200	25	25	5	12.5	11	–	–
201 to 315	30	30	6	15	14	–	–
316 to 800	40	40	6	20	14	–	–
801 to 1000	40	40	8	20	14	–	–
1001 to 1600	60	60	12	17	14	26	26





Mounting hole acc. to DIN 41 308

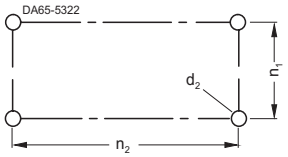


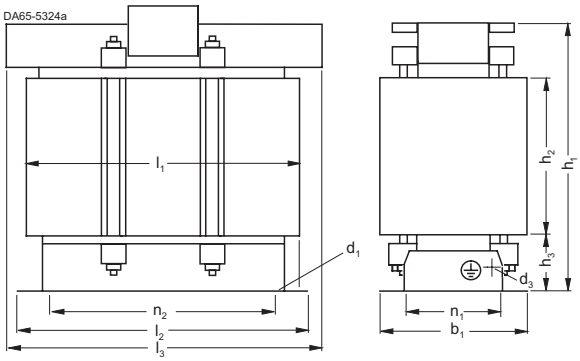
Fig. 31

Autotransformers 4AP25 to 4AP30
for any mounting position

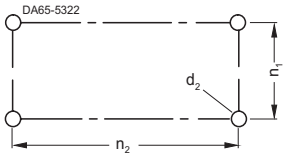
Type	Designation acc. to DIN 41 302	b_1	b_2	d_1	d_2	h_1	l_1	n_1	n_2	Weight approx. kg
4AP25	3UI 114/62	115	85	7.4	M 6	214	229	94	176	19
4AP27	3UI 132/70	133	89	10	M 8	241	264	101	200	26
4AP30	3UI 150/75	148	92	10	M 8	270	300	118	224	37

Screw terminals

24 A:	solid	0.5 to 6 mm²
	finely stranded	0.5 to 4 mm²
58 A:	solid or stranded	1 to 25 mm²
	finely stranded	2.5 to 16 mm²
94 A:	solid or stranded	4 to 50 mm²



Mounting hole acc. to DIN 41 308



Flat terminals

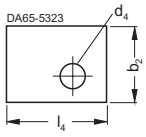


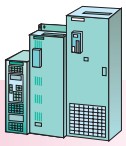
Fig. 32

Autotransformers 4AU36 to 4AU39
with flat terminals, for any mounting position

Permissible constant load for mounting position on vertical surfaces:
$0.95 \cdot P_s$ at $t_a = 55$ °C
P_s at $t_a = 45$ °C

Form	Nominal current A	b_2	d_4	l_4
A	100	16	7	25
A	200	20	9	35
A	400	25	11	35

Type	Designation acc. to DIN 41 302	b_1	d_1	d_2	d_3	h_1	h_2	h_3	l_1	l_2	l_3	n_1	n_2	Weight approx. kg
4AU36	3UI 180/75	169	10	M 8	M 6	320	150	60	360	314	360	138	264	59
4AU39	3UI 210/70	174	12	M 10	M 6	370	180	66	420	366	410	141	316	81



Autotransformers for regenerative feedback with 25 % and 100 % power-on duration

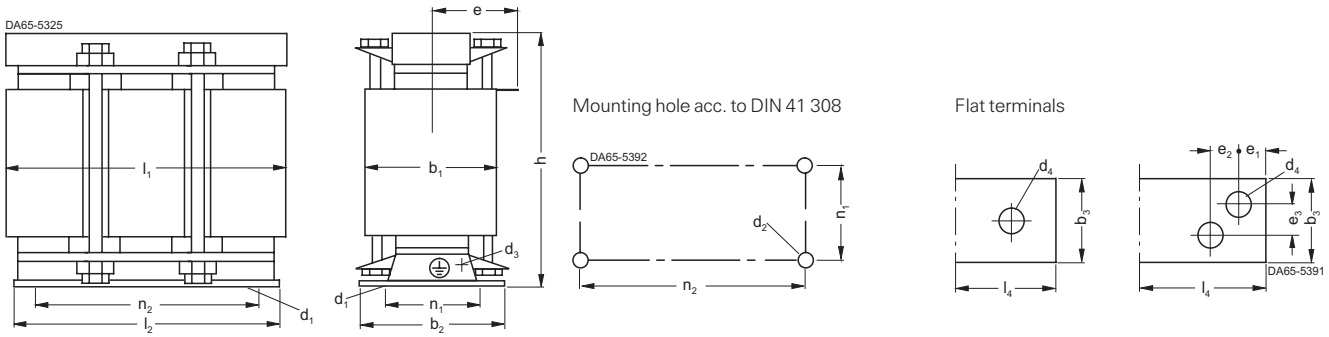


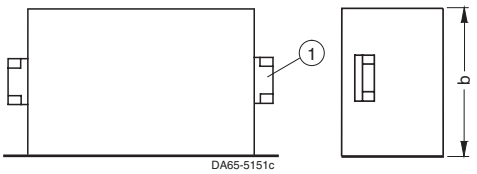
Fig. 33

Autotransformers 4BU
with flat terminals, for arrangement on horizontal surfaces

Form	Nominal current A	b_3	d_4	e_1	e_2	e_3	l_4
A	200	20	9	–	–	–	35
A	400	25	11	–	–	–	35
A	630	30	11	–	–	–	40
A	800	30	14	–	–	–	40
A	1000	40	14	–	–	–	50
C	1250	50	14	14	22	22	60
C	1600	60	14	17	26	26	70

above 1600 A on request

Type	Designation acc. to DIN 41 302	b_1	b_2	d_1	d_2	d_3	h	l_1	l_2	n_1	n_2	Weight approx. kg
4BU43	3UI 240/ 80	194	194	15 x 22	M 12	M 6	420	480	416	155	356	108
4BU45	3UI 240/107	221	221	15 x 22	M 12	M 6	420	480	416	182	356	135
4BU47	3UI 240/137	251	251	15 x 22	M 12	M 6	420	480	416	212	356	170
4BU51	3UIS 265/107	267	207	12.5	M 10	M 12	515	555	470	170	410	180
4BU52	3UIS 265/120	280	220	12.5	M 10	M 12	515	555	470	183	410	200
4BU53	3UIS 265/135	295	235	12.5	M 10	M 12	515	555	470	198	410	220
4BU54	3UIS 305/125	295	245	15	M 12	M 12	585	630	540	198	470	280
4BU55	3UIS 305/140	310	260	15	M 12	M 12	585	630	540	213	470	310
4BU56	3UIS 305/160	330	280	15	M 12	M 12	585	630	540	233	470	370
4BU58	3UIS 370/150	330	290	15	M 12	M 12	665	780	660	241	580	440
4BU59	3UIS 370/170	350	310	15	M 12	M 12	665	780	660	261	580	480
4BU60	3UIS 370/195	375	335	15	M 12	M 12	665	780	660	286	580	600
4BU62	3UIS 455/175	405	315	21	M 16	M 12	760	975	820	261	720	720
4BU63	3UIS 455/200	430	340	21	M 16	M 12	760	975	820	298	720	860
4BU64	3UIS 455/230	460	370	21	M 16	M 12	760	975	820	323	720	1040
4BU65	3UIS 455/260	490	400	21	M 16	M 12	760	975	820	353	720	1170



Type	a	b	h	h_1	h_2
6SE7012–0EP87–0FB0	44.5	110	290	250	275
6SE7016–0EP87–0FB0	67	130	310	270	295

Fig. 34

Radio-interference suppression filter
6SE7012–0EP87–0FB0, 6SE7016–0EP87–0FB0,
6SE7012–0EP87–0FB1, 6SE7016–0EP87–0FB1

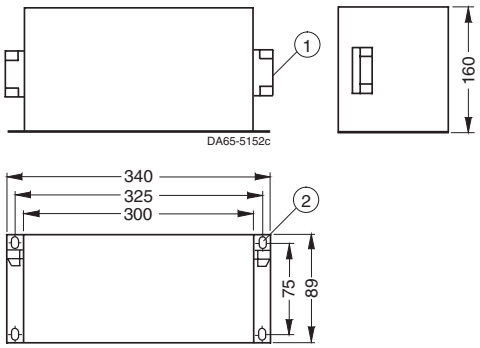
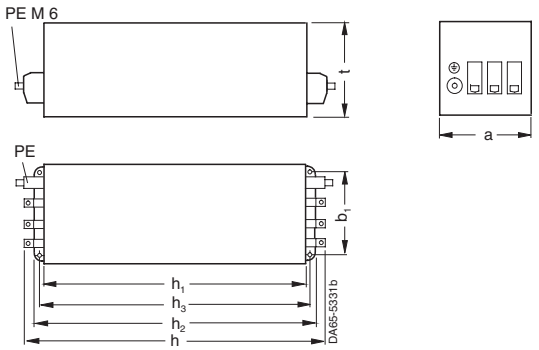


Fig. 35

Radio-interference suppression filter
6SE7021–2EP87–0FB0, 6SE7021–8EP87–0FB0,
6SE7021–2EP87–0FB1, 6SE7021–8EP87–0FB1



Type	a	b_1	h	h_1	h_2	h_3	t	Terminals	Earthing stud	Weight approx. kg
6SE7021–0ES87–0FB1	90	75	215	166	196	182	81	4 mm² 1)	M 6	2.5
6SE7021–8ES87–0FB1	90	75	215	166	196	182	81	4 mm² 1)	M 6	2.5
6SE7023–4ES87–0FB1	101	85	231	166	196	182	86	16 mm²	M 6	4
6SE7027–2ES87–0FB1	141	120	308	221	256	240	141	50 mm²	M 10	9

Fig. 36

Radio-interference suppression filter
6SE7021, 6SE7023, 6SE7027

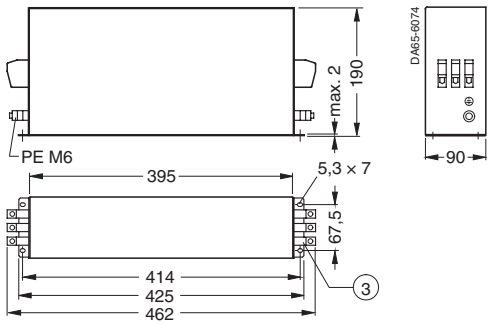
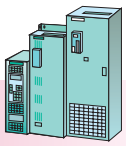


Fig. 37

Radio-interference suppression filter
6SE7023–8EP87–0FB0, 6SE7023–8EP87–0FB1

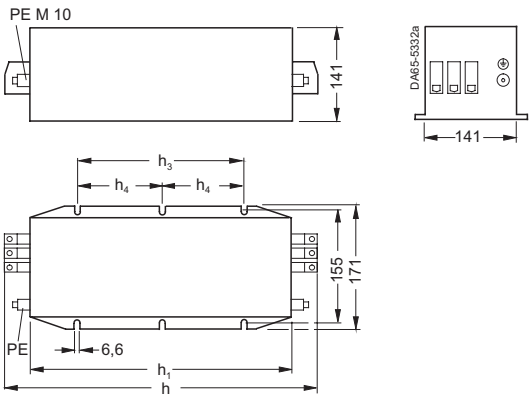
① Power COMBICON
② Oblong hole 5.5 x 7.5
③ Terminals 16 mm²

1) Dependent on the manufacturer 6 mm² also possible.



Radio-interference suppression filter

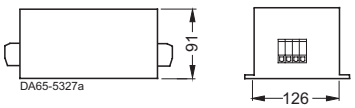
Compact and chassis units
Cabinet units



Type	h	h_1	h_3	h_4	Terminals	Earthing Stud	Weight approx. kg
6SE7031–2ES87–0FA1	348	261	115	–	50 mm²	M 10	10
6SE7031–8ES87–0FA1	404	301	165	82.5	95 mm²	M 10	10

Fig. 38

Radio-interference suppression filter 6SE7031



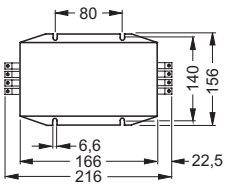
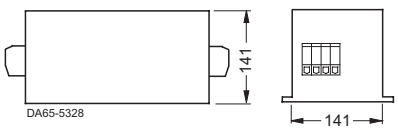


Fig. 39

Radio-interference suppression filter
B84143–A25–R21/A36–R21/A50–R21
Terminals 10 mm²



Type	h	h_1	Terminals	Weight approx. kg
B8143–A80–R21	300	221	25 mm²	10
B8143–A120–R21/A150–R21	348	261	50 mm²	10

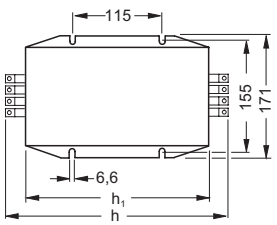
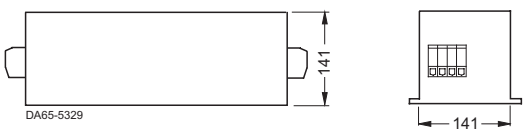


Fig. 40

Radio-interference suppression filter
B84143–A80–R21
B84143–A120–R21/A150–R21



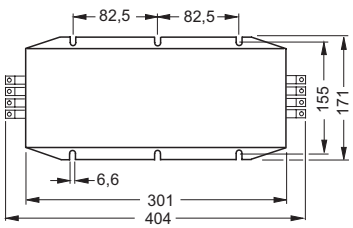
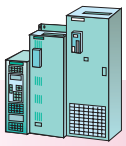


Fig. 41

Radio-interference suppression filter
B84143–A180–R21
6SE7031–8ES87–0FA1
Terminals 95 mm²



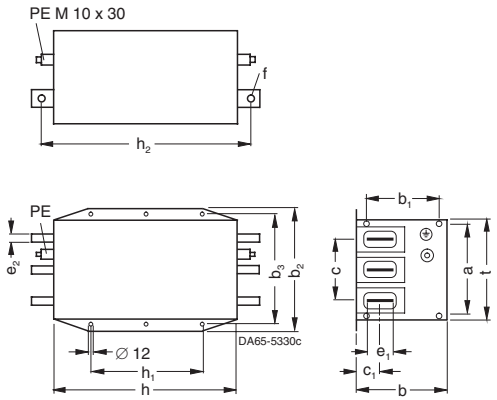


Fig. 42

Radio-interference suppression filter
B84143–B250–S . . /A320–S . . /
B600–S . . /B1000–S . .
6SE7033, 6SE7036, 6SE7041

Type	a	b	b_1	b_2	b_3	c	c_1	e
B84143–B250–S . .	110	115	–	190	165	80	30	15
B84143–A320–S . . 6SE7033–2ES87–0FA1	180	116	85	260	235	120	36	15
B84143–B600–S . . 6SE7036–0ES87–0FA1	180	116	85	260	235	120	36	15
B84143–B1000–S . . 6SE7041–0ES87–0FA1	220	166	135	300	275	160	61	20

Type	e_1	e_2	f	h	h_1	h_2	Weight approx. kg
B84143–B250–S . .	25	5	Ø 11	300	240	360	15
B84143–A320–S . . 6SE7033–2ES87–0FA1	25	5	Ø 11	300	240	360	21
B84143–B600–S . . 6SE7036–0ES87–0FA1	30	5	Ø 11	350	290	410	22
B84143–B1000–S . . 6SE7041–0ES87–0FA1	40	8	Ø 14	350	290	420	28

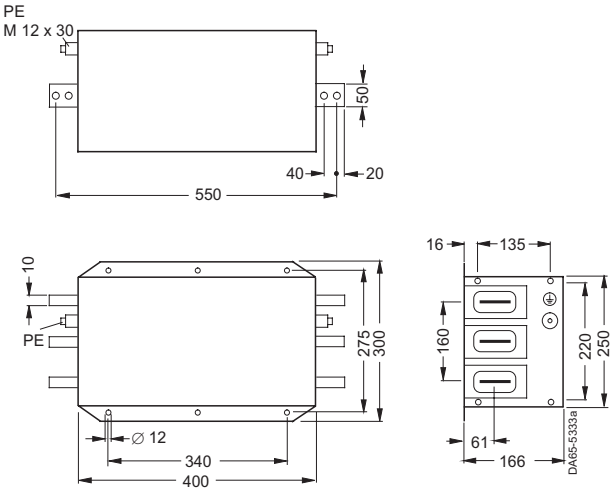


Fig. 43

Radio-interference suppression filter
B84143–B1600–S . .
6SE7041–6ES87–0FA1
Weight approx. 34 kg

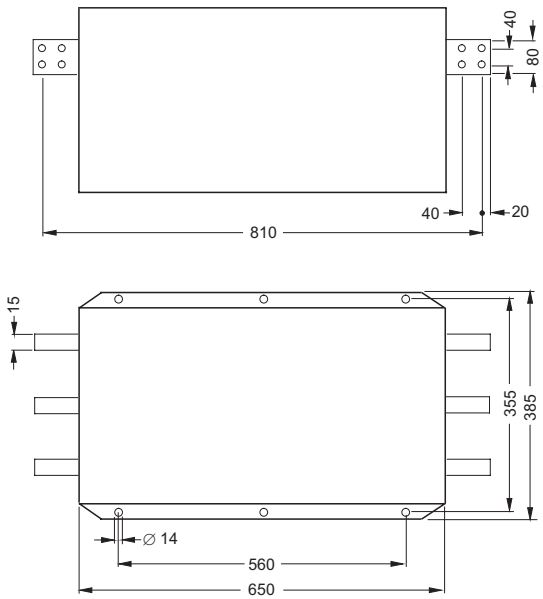
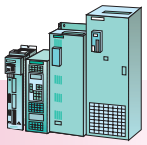


Fig. 44

Radio-interference suppression filter
B84143–B2500–S . .
Weight approx. 105 kg



DC link module and capacitor module

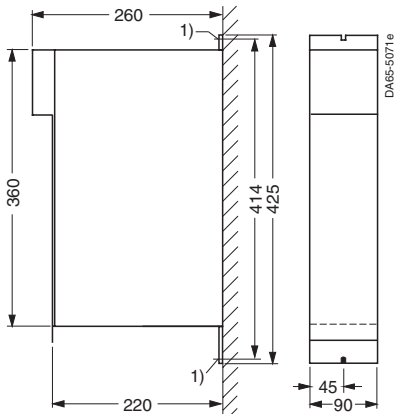


Fig. 45

Precharging resistors

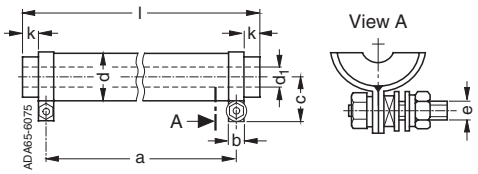


Fig. 46

Type	d	l	a	b	c	d_1	e	k	Weight approx. kg
6SX7010–0AC06	11.8 ±0.8	62 ±2	51 ±2	5	11.5	5.5	M 3 x 12	3	0.013
6SX7010–0AC07	14.8 ±0.8	100 ±2	87 ±2	5	13	5.5	M 3 x 12	4	0.033
6SX7010–0AC08	22.3 ±1.3	100 ±2	71 ±2	8	18.5	10	M 4 x 18	10.5	0.08
6SX7010–0AC10	22.3 ±1.3	165 ±2	136 ±2	8	18.5	10	M 4 x 18	10.5	0.113
6SX7010–0AC11	22.3 ±1.3	265 ±4	236 ±2	8	18.6	10	M 4 x 18	10.5	0.194

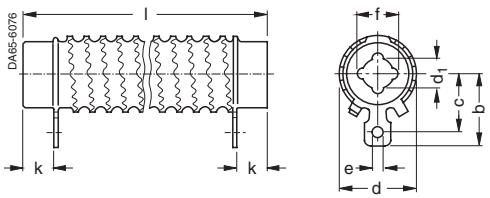


Fig. 47

Type	d	l	k	e	b	c	d_1	f	Weight approx. kg
6SX7010–0AC12	37 ±1	100 ±2.5	15	5.2	34	28	14	18.5	0.2
6SX7010–0AC13	37 ±1	215 ±5.4	15	5.2	34	28	14	18.5	0.4

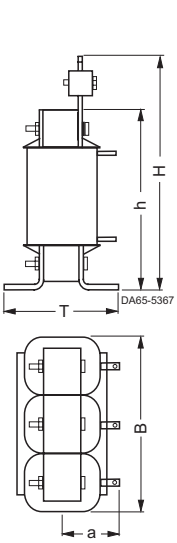


Fig. 49

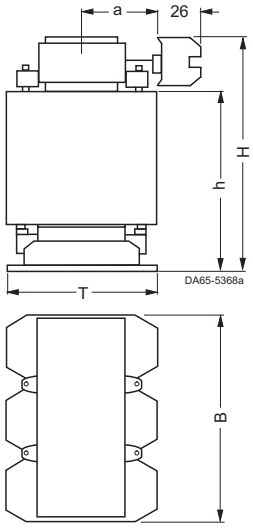


Fig. 50

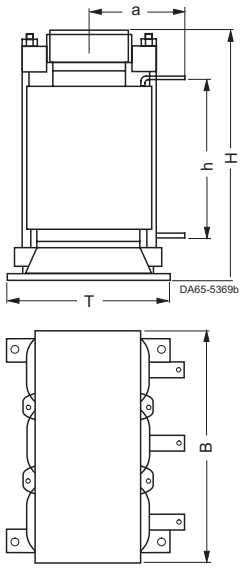


Fig. 51

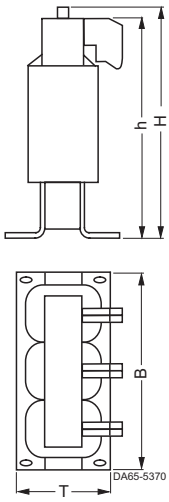
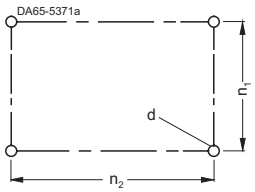


Fig. 52

Output reactors for mounting on horizontal surfaces

Type	Fig. No.	B	H	T	a	h	Weight approx. kg	n_1	n_2	d
6SE7013–0ES87–1FE0	52	124	122	73	–	–	1	42	–[1]	M 4[2]
6SE7015–0ES87–1FE0	52	148	139	78	–	–	2.2	49	90	M 4[2]
6SE7016–1ES87–1FE0	52	178	153	73	–	146	4.4	53	166	M 5[2]
6SE7016–2FS87–1FE0	52	267	221	107	–	204	14.5	77	249	M 6[2]
6SE7021–0ES87–1FE0	52	178	153	88	–	146	5.5	68	166	M 5[2]
6SE7021–5FS87–1FE0	50	207	220	104	55	–	20	70.5	176.5	M 6
6SE7021–8ES87–1FE0	52	219	180	99	–	168	8	69	201	M 6[2]
6SE7022–6ES87–1FE0	52	219	180	119	–	181	9.2	89	201	M 6[2]
6SE7023–4ES87–1FE0	52	267	221	107	–	216	11	77	249	M 6[2]
6SE7024–7ES87–1FE0	51	197	220	104	69	103	20	70	176	M 6
6SE7026–0HS87–1FE0	51	235	250	146	98	–	30	101	200	M 8
6SE7027–2ES87–1FE0	49	267	221	107	77	206	11	77	249	M 6[2]
6SE7028–2HS87–1FE0	51	264	280	155	101	–	45	18	224	M 8
6SE7031–0ES87–1FE0	49	267	221	107	77	206	17	77	249	M 6
6SE7031–2HS87–1FE0	51	314	335	169	109	–	60	138	264	M 8
6SE7031–5ES87–1FE0	51	197	220	128	81	100	25	94	176	M 6
6SE7031–7HS87–1FE0	51	314	335	169	109	–	60	138	264	M 8
6SE7031–8ES87–1FE0	51	281	250	146	98	119	30	101	200	M 8
6SE7032–3HS87–1FE0	51	367	385	174	112	–	80	141.5	316.5	M 10
6SE7032–6ES87–1FE0	51	281	250	146	111	121	30	101	200	M 8
6SE7033–2ES87–1FE0	51	311	280	155	114	139	45	118	224	M 8
6SE7033–7ES87–1FE0	51	264	280	155	101	–	45	118	224	M 8
6SE7035–1ES87–1FE0	51	310	280	155	106	150	45	118	224	M 8
6SE7037–0ES87–1FE0	51	360	335	169	114	180	60	138	264	M 8
6SE7038–6ES87–1FE0	51	410	385	174	127	210	80	141	316	M 10
6SE7022–2FS87–1FE0	50	207	220	128	66	–	25	94.5	176.5	M 6
6SE7023–4FS87–1FE0	51	197	220	104	72	114	20	70	176	M 6
6SE7024–7FS87–1FE0	51	197	220	128	81	93	25	128	176	M 6
6SE7033–0GS87–1FE0	51	417	435	194	118	–	120	155.5	356.5	M 12
6SE7033–5GS87–1FE0	51	417	435	194	118	–	120	155.5	356.5	M 12
6SE7034–5GS87–1FE0	51	417	435	251	147	240	160	212.5	356.5	M 12
6SE7035–7GS87–1FE0	51	533	565	207	–	–	170	170.5	411	M 10
6SE7036–5GS87–1FE0	51	533	565	235	–	–	220	198.5	411	M 10
6SE7038–6GS87–1FE0	51	608	650	245	–	–	280	195.5	471	M 12
6SE7041–1ES87–1FE0	51	420	380	233	160	255	100	203	316	M 10
6SE7041–2GS87–1FE0	51	608	650	310	240	385	310	213	470	M 12



Mounting hole

1) Fixing hole in the center of the foot.

2) For any mounting position.

Dimension Drawings

Output reactor (ferrite)

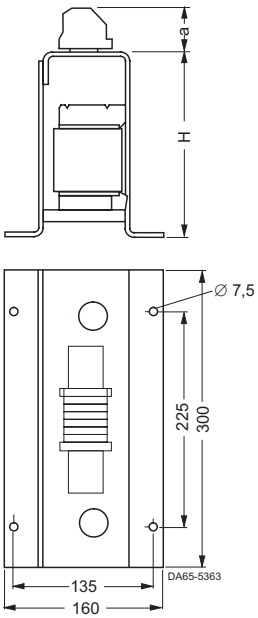


Fig. 53

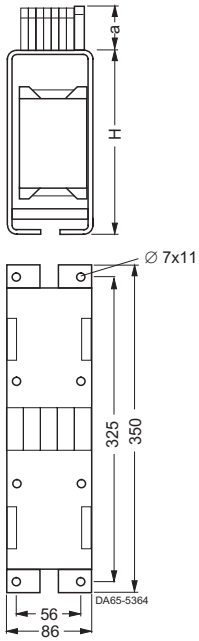
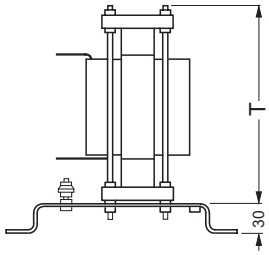


Fig. 54



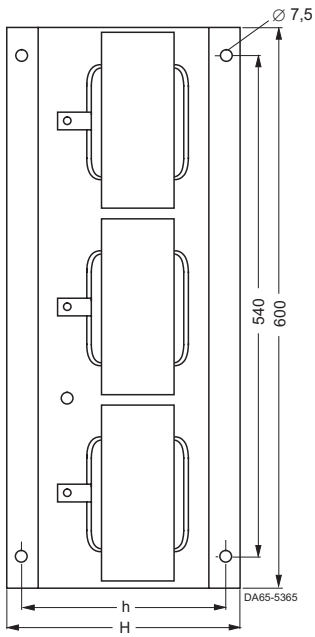
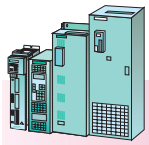
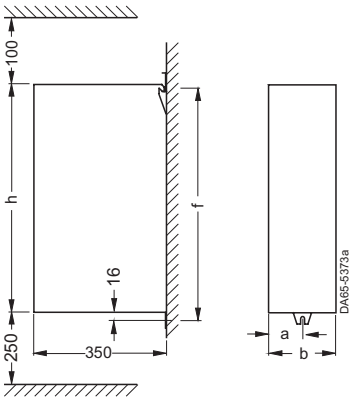


Fig. 55

Type	Fig. No.	a	H	h	D	Weight approx. kg
6SE7021–1CS87–1FF0	53	50	184	–	–	4.5
6SE7021–3CS87–1FF0	53	50	184	–	–	4.5
6SE7021–8CS87–1FF0	53	50	184	–	–	5.8
6SE7022–3CS87–1FF0	53	50	184	–	–	6
6SE7023–2CS87–1FF0	53	50	184	–	–	4.8
6SE7024–4CS87–1FF0	53	50	184	–	–	6
6SE7027–0CS87–1FF0	53	50	184	–	–	7.4
6SE7028–1CS87–1FF0	53	50	280	–	–	8.8
6SE7016–1ES87–1FF1	54	50	230	–	–	8.5
6SE7021–0ES87–1FF1	54	50	230	–	–	8.5
6SE7021–8ES87–1FF1	54	50	230	–	–	8.5
6SE7022–6ES87–1FF0	53	50	280	–	–	9.5
6SE7023–4ES87–1FF0	53	50	280	–	–	12
6SE7024–7ES87–1FF0	53	60	280	–	–	16.4
6SE7027–2ES87–1FF0	53	50	280	–	–	14
6SE7031–0ES87–1FF0	53	60	280	–	–	16.7
6SE7016–2FS87–1FF0	53	50	280	–	–	13
6SE7021–5FS87–1FF0	53	50	280	–	–	14
6SE7031–5ES87–1FF0	55	–	255	225	260	23
6SE7031–8ES87–1FF0	55	–	255	225	260	31
6SE7022–2FS87–1FF0	55	–	255	225	260	19
6SE7023–4FS87–1FF0	55	–	255	225	260	21
6SE7024–7FS87–1FF0	55	–	255	225	260	27
6SE7032–6ES87–1FF0	55	–	295	270	260	32
6SE7033–2ES87–1FF0	55	–	295	270	260	41
6SE7033–7ES87–1FF0	55	–	295	270	260	45
6SE7035–1ES87–1FF0	55	–	295	270	280	52
6SE7037–0ES87–1FF0	55	–	295	270	280	65
6SE7038–6ES87–1FF0	55	–	385	360	260	81



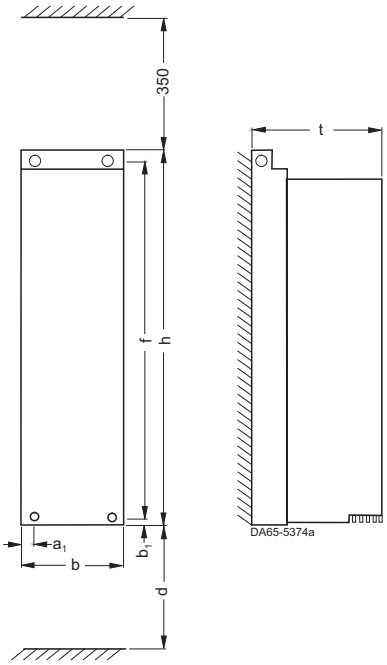
Voltage limiting filters



Type	a[1])	b	f	h	Weight approx. kg
d*v*/d*t* filter, sine filter					
6SE70 . . – . . A	45	90	425	425	13
6SE70 . . – . . B	67.5	135	425	425	20
6SE70 . . – . . C	90	180	600	600	37
6SE70 . . – . . D	45	270	600	600	56

Fig. 56

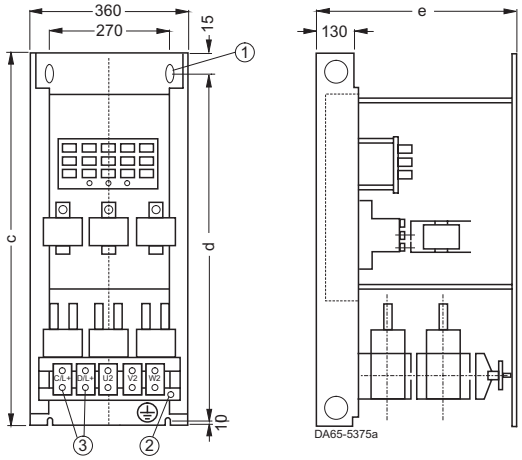
d*v*/d*t* filter and sine filter
6SE70 . . – . . A to 6SE70 . . – . . D



Type	a[2])	b	b_1	d	f	h	t	Weight approx. kg
Sine filter								
6SE70 . . – . . E	45	270	10	400	1025	1050	350	90
6SE70 . . – . . F	45	360	10	400	1025	1050	350	130
6SE70 . . – . . G	119	508	25	320	1425	1450	450	170
d*v*/d*t* filter								
6SE70 . . – . . E	45	270	10	400	1025	1050	350	55
6SE70 . . – . . S[3])	45	270	10	400	1425	1450	450	95

Fig. 57

d*v*/d*t* filter and sine filter
6SE70 . . – . . E to 6SE70 . . – . . G, 6SE70 . . – . . S



Type	c	d	e
6SE70 . 3– . . S	675	650	370
6SE70 . 4– . . S	675	650	490
6SE70 . 5– . . S	675	650	490
6SE70 . 6– . . S	1050	1025	490
6SE70 . 7– . . S	1050	1025	490
6SE70 . 8– . . S	1050	1025	490

① For M 8 screws
② Earthing stud
③ DC link

Fig. 58

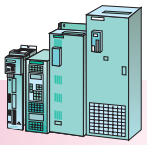
Limiting network for d*v*/d*t* filter

At rated currents ≥ 297 A,
the voltage limiting filter consists of
a limiting network and a reactor.

1) For frame size D two lugs left and right.

2) Two lugs left and right.

3) 6SE7031– . HS87–1FD0,
6SE7032– . HS87–1FD0



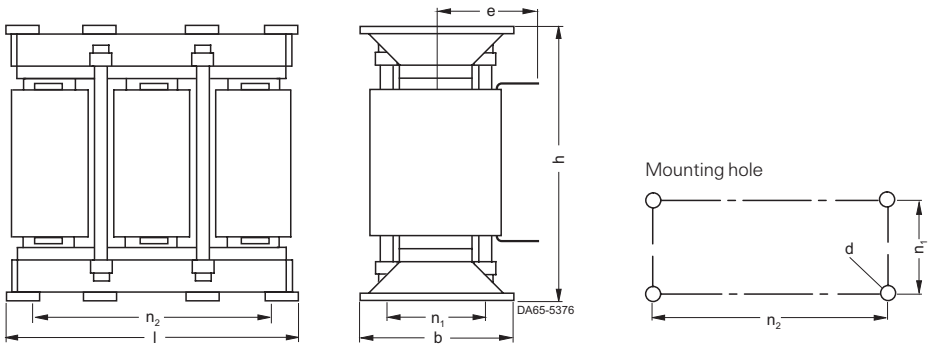


Fig. 59

6SE70 . 3– . . S reactor to 6SE70 . 8– . . S for d*v*/d*t* filter

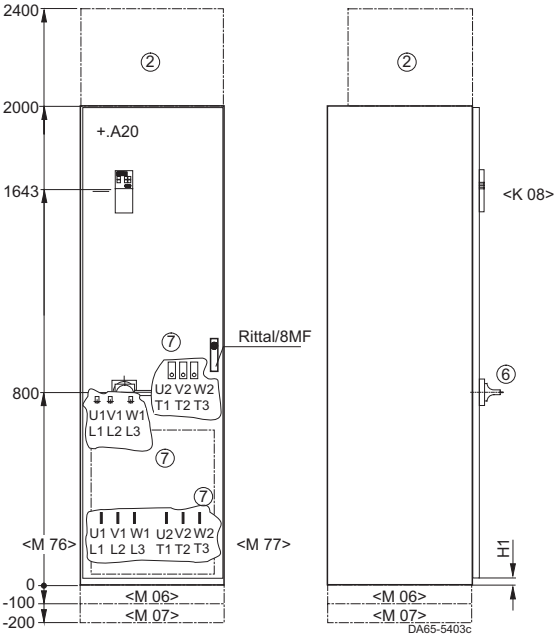
Type	b	d	e	h	l	n_1	n_2
6SE70 . 3– . . S	194	M 12	133	435	416	155	356
6SE70 . 4– . . S	251	M 12	159	435	416	212	356
6SE70 . 5– . . S	207	M 10	186	565	470	170	410
6SE70 . 6– . . S	235	M 10	212	565	470	198	410
6SE70 . 8– . . S	245	M 12	217	650	540	198	470

Cabinet units

Converter cabinet units, 37 kW to 45 kW, single-quadrant operation, 6 pulse

380 V to 480 V, 45 kW

500 V to 600 V, 37 kW to 45 kW



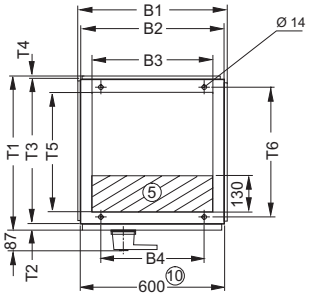
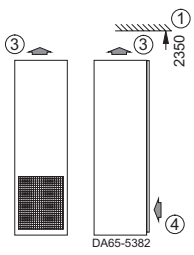
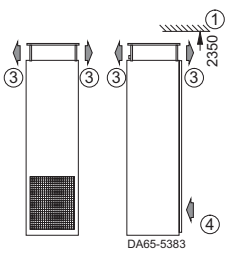


Fig. 60

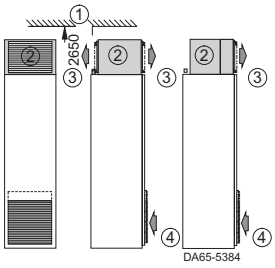
Cabinet Type	B1	B2	B3	B4	T1	T2	T3	T4	T5	T6	H1
8MF	618	600	540	450	634	25	600	9	466	510	63
Rittal	602	599	512	475	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

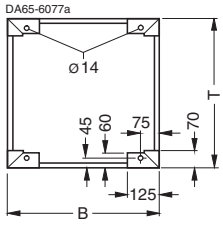


Degree of protection IP21

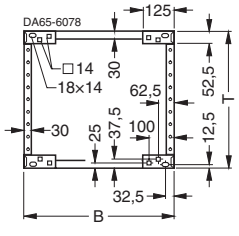


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

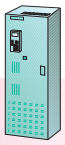
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

7

Dimension Drawings

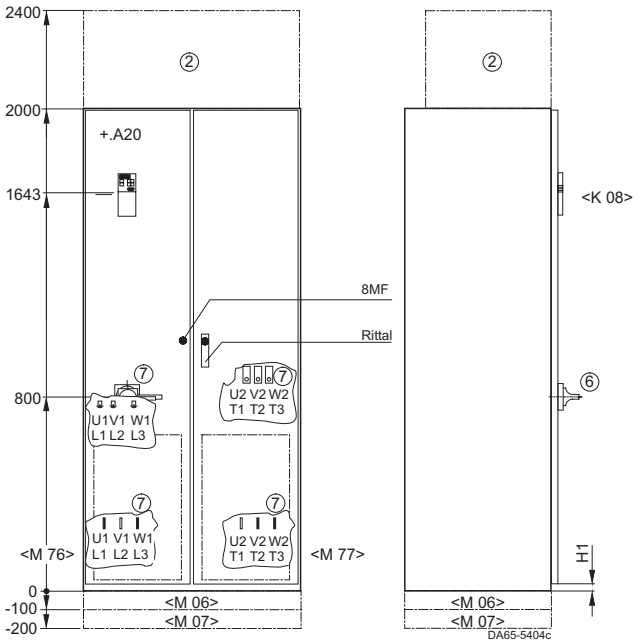
Converter cabinet units, 55 kW to 90 kW, single-quadrant operation, 6 pulse



380 V to 480 V, 55 kW to 90 kW

500 V to 600 V, 55 kW to 75 kW

660 V to 690 V, 55 kW to 75 kW



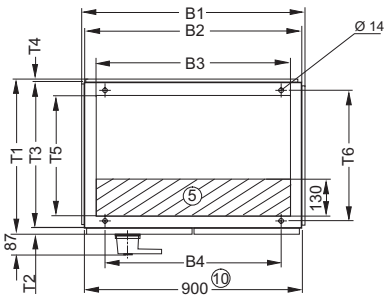
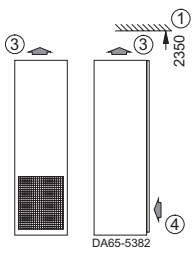
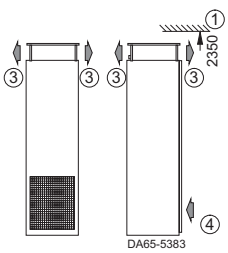


Fig. 61

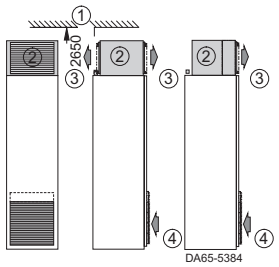
Cabinet Type	B1	B2	B3	B4	T1	T2	T3	T4	T5	T6	H1
8MF	918	900	840	750	634	25	600	9	466	510	63
Rittal	902	899	812	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

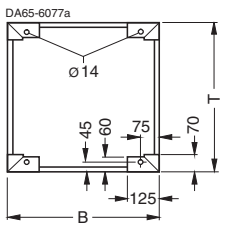


Degree of protection IP21

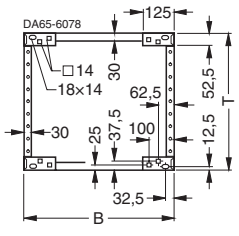


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

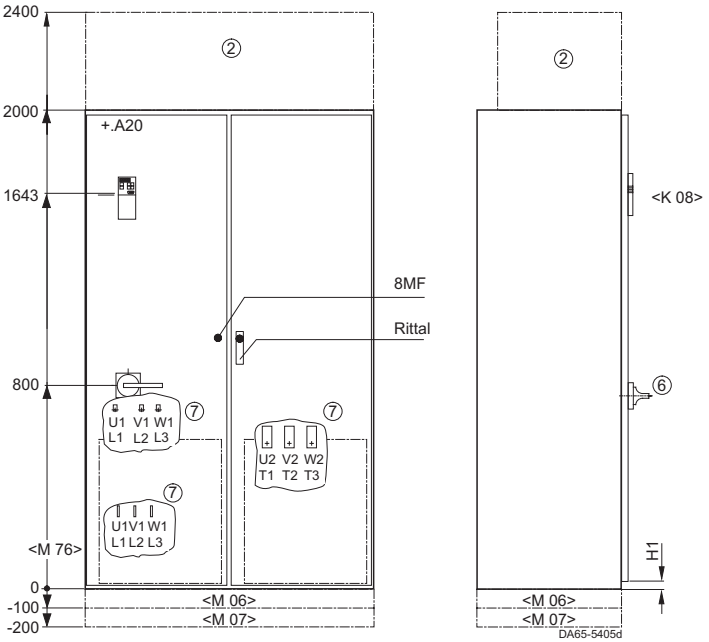
Cabinet units

Converter cabinet units, 90 kW to 200 kW, single-quadrant operation, 6 pulse

380 V to 480 V, 110 kW to 200 kW

500 V to 600 V, 90 kW to 160 kW

660 V to 690 V, 90 kW to 200 kW



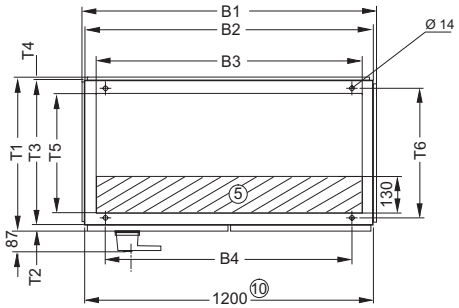
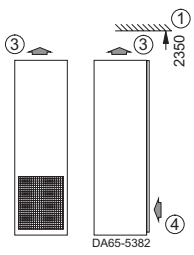
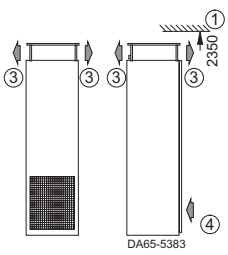


Fig. 62

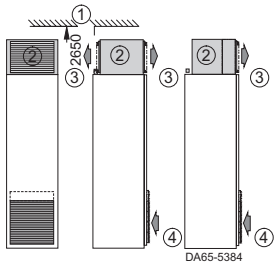
Cabinet Type	B1	B2	B3	B4	T1	T2	T3	T4	T5	T6	H1
8MF	1218	1200	1140	1050	634	25	600	9	466	510	63
Rittal	1202	1199	1112	1075	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

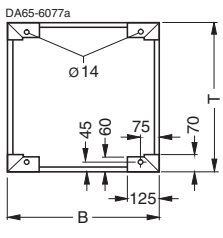


Degree of protection IP21

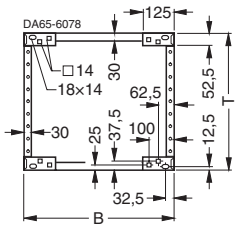


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

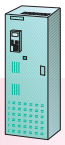
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

7

Dimension Drawings

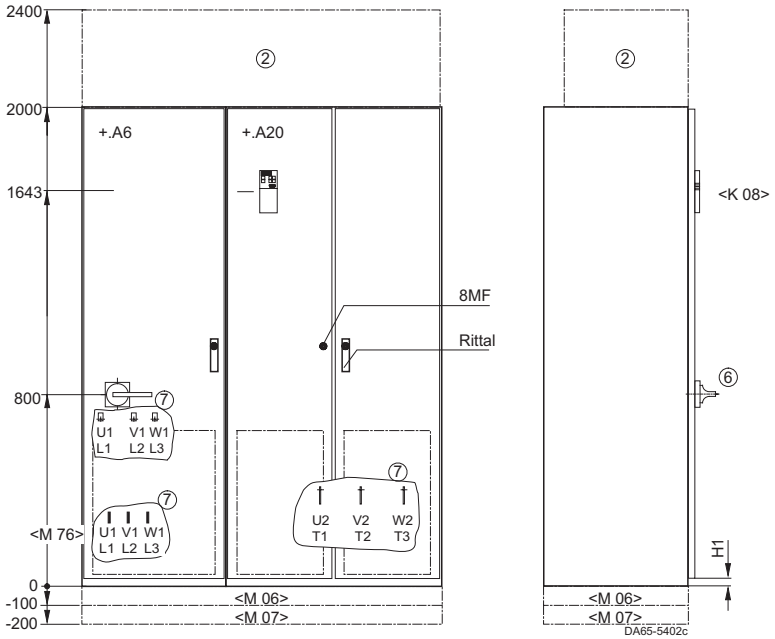
Converter cabinet units, 200 kW to 400 kW, single-quadrant operation, 6 pulse



380 V to 480 V, 250 kW to 400 kW

500 V to 600 V, 200 kW to 315 kW

660 V to 690 V, 250 kW to 400 kW



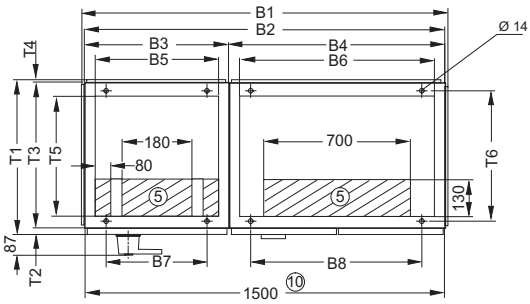
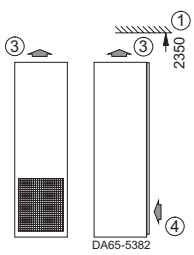
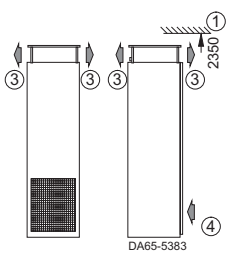


Fig. 63

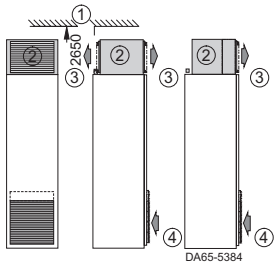
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	1518	1500	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	1502	1499	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

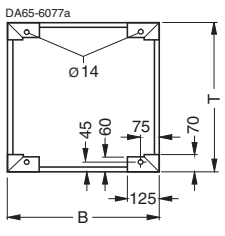


Degree of protection IP21

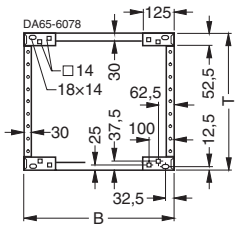


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

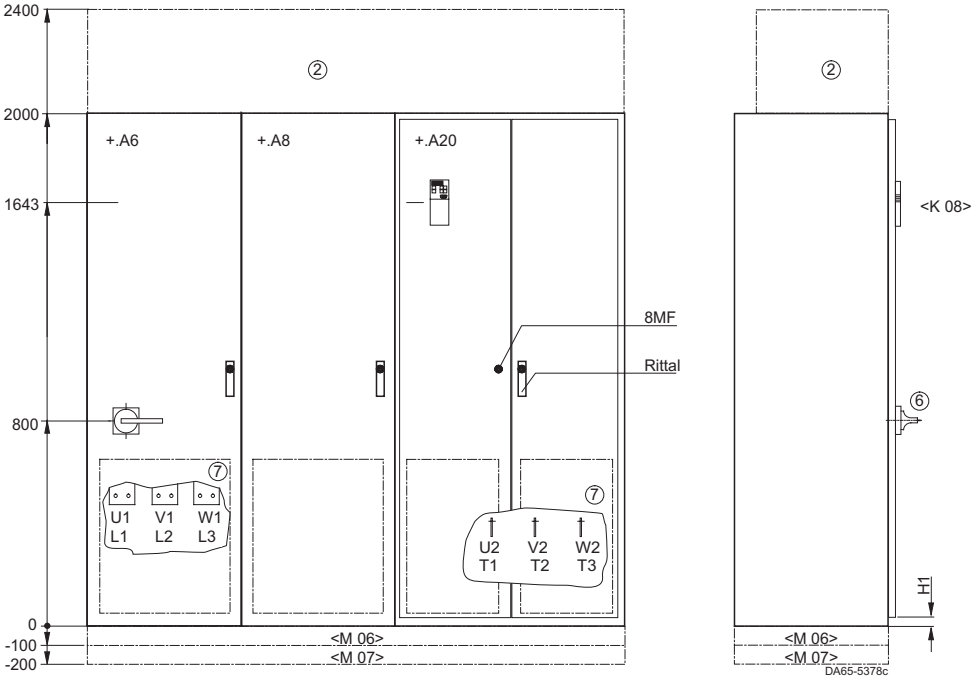
Cabinet units

Converter cabinet units, 400 kW to 800 kW, single-quadrant operation, 6 pulse

380 V to 480 V, 500 kW

500 V to 600 V, 400 kW to 630 kW

660 V to 690 V, 500 kW to 800 kW



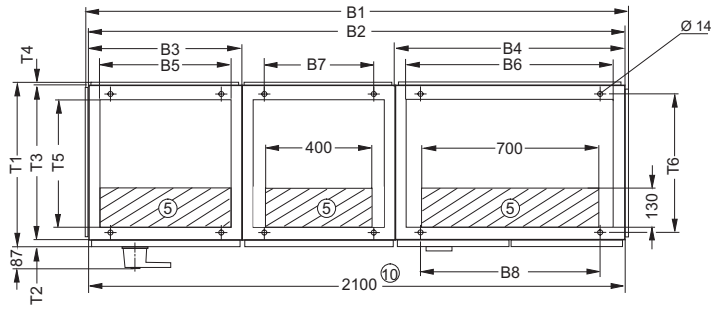
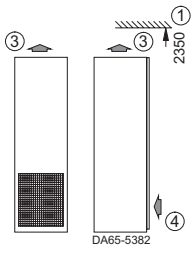
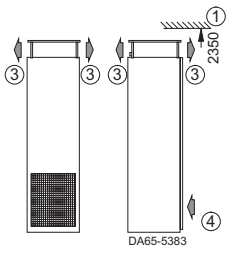


Fig. 64

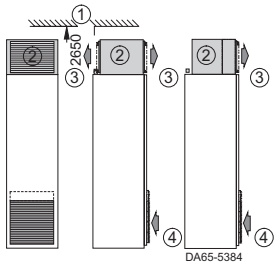
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	2118	2100	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	2102	2099	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

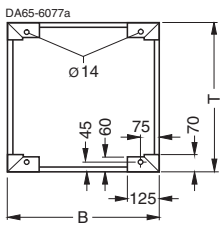


Degree of protection IP21

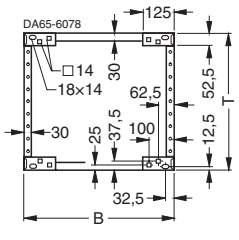


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

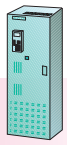
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

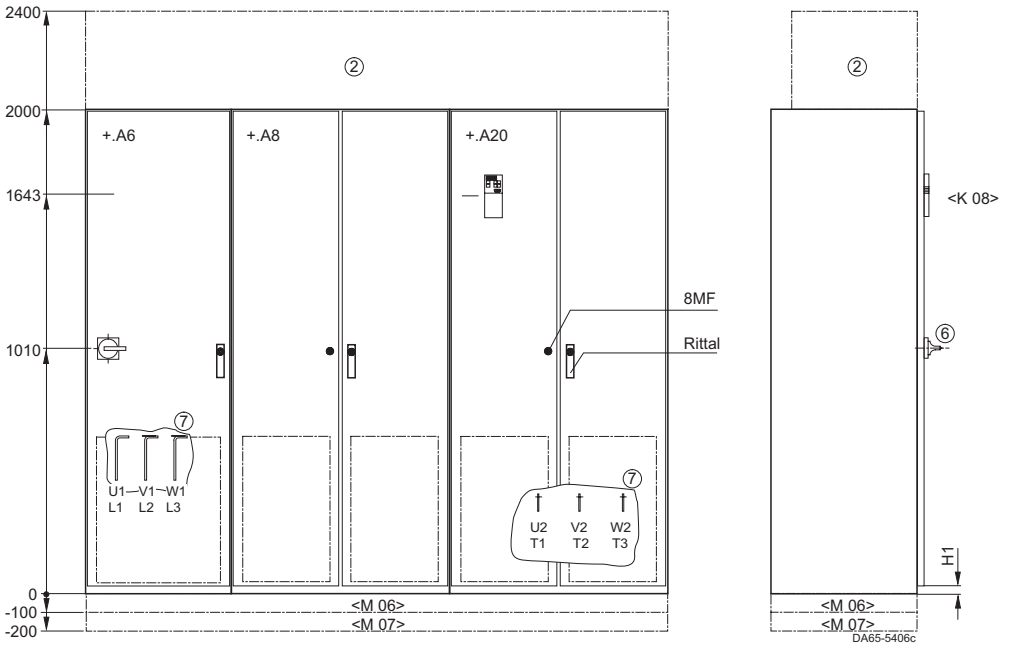
7

Dimension Drawings

Converter cabinet units, 630 kW, single-quadrant operation, 6 pulse



380 V to 480 V, 630 kW



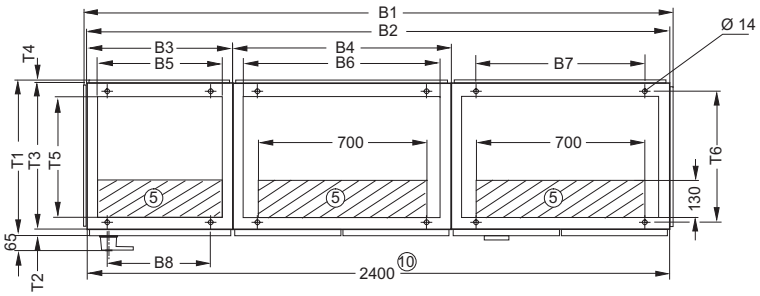
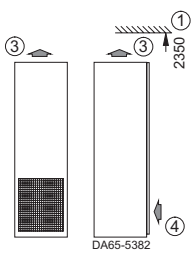
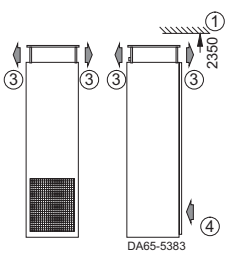


Fig. 65

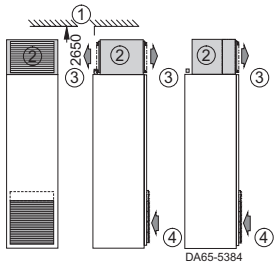
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	2418	2400	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	2402	2399	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

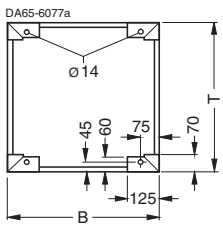


Degree of protection IP21

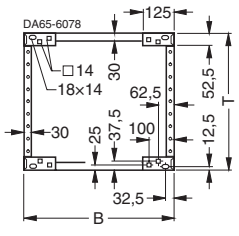


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

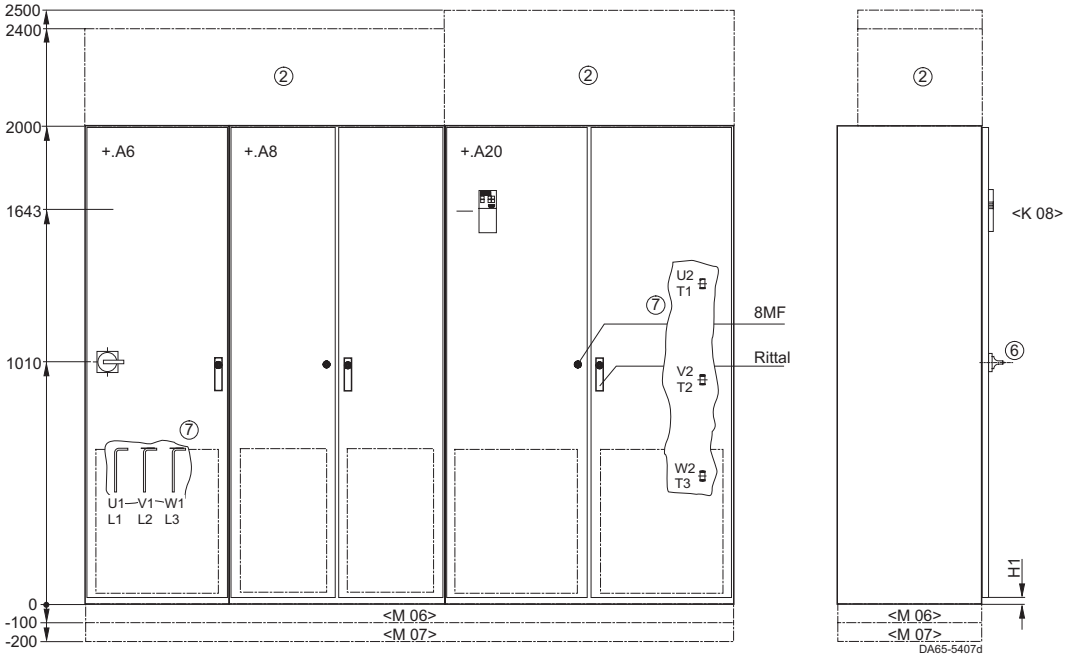
Cabinet units

Converter cabinet units, 710 kW to 1200 kW, single-quadrant operation, 6 pulse

380 V to 480 V, 710 kW

500 V to 600 V, 800 kW to 900 kW

660 V to 690 V, 1000 kW to 1200 kW



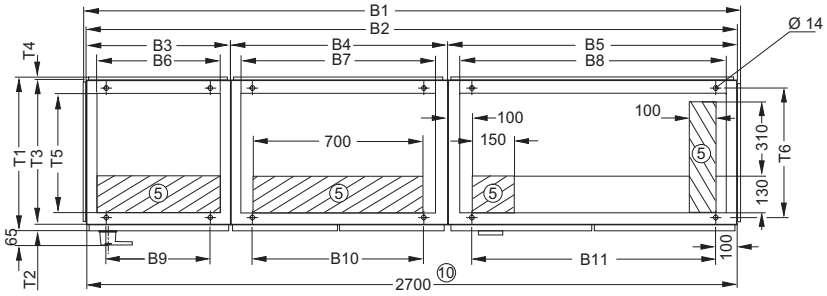
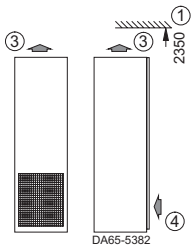
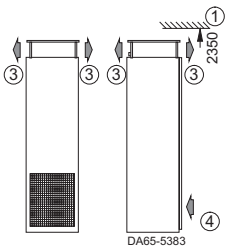


Fig. 66

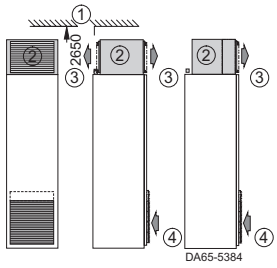
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	T1	T2	T3	T4	T5	T6	H1
8MF	2718	2700	600	900	1200	540	840	1140	450	750	1050	634	25	600	9	466	510	63
Rittal	2702	2699	599	899	1199	512	812	1112	475	775	1075	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

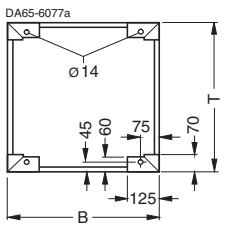


Degree of protection IP21

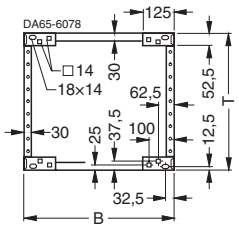


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

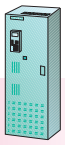
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

7

Dimension Drawings

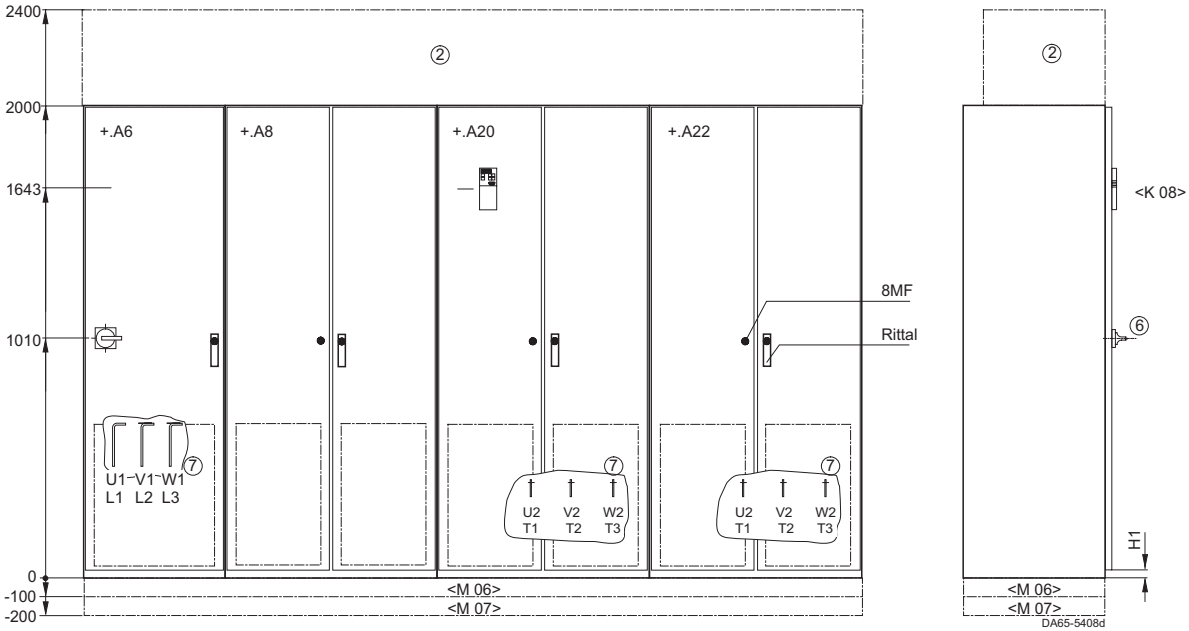
Converter cabinet units, 1000 kW to 1500 kW, single-quadrant operation, 6 pulse



500 V to 600 V, 1000 kW to 1100 kW

660 V to 690 V, 1300 kW to 1500 kW

without interphase transformer chassis



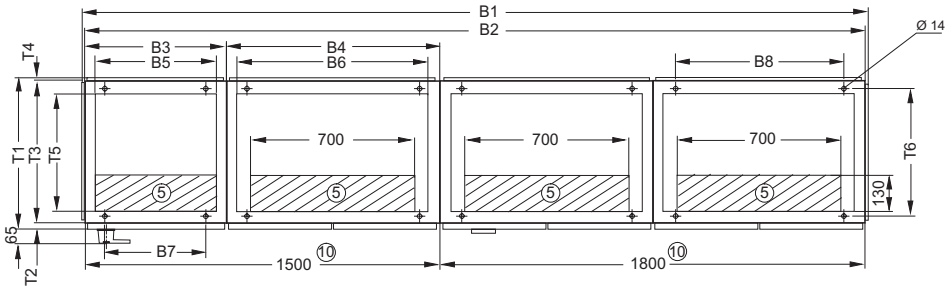
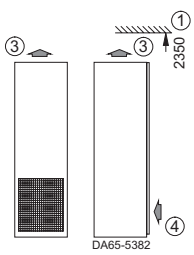
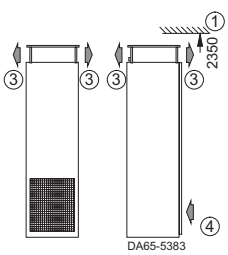


Fig. 67

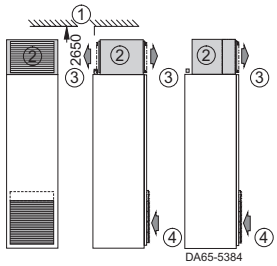
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	3318	3300	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	3302	3299	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

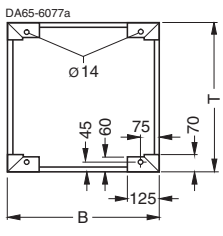


Degree of protection IP21

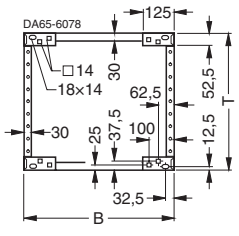


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

Cabinet units

Converter cabinet units, 1000 kW to 1500 kW, single-quadrant operation, 6 pulse

500 V to 600 V, 1000 kW to 1100 kW

660 V to 690 V, 1300 kW to 1500 kW

with interphase transformer chassis

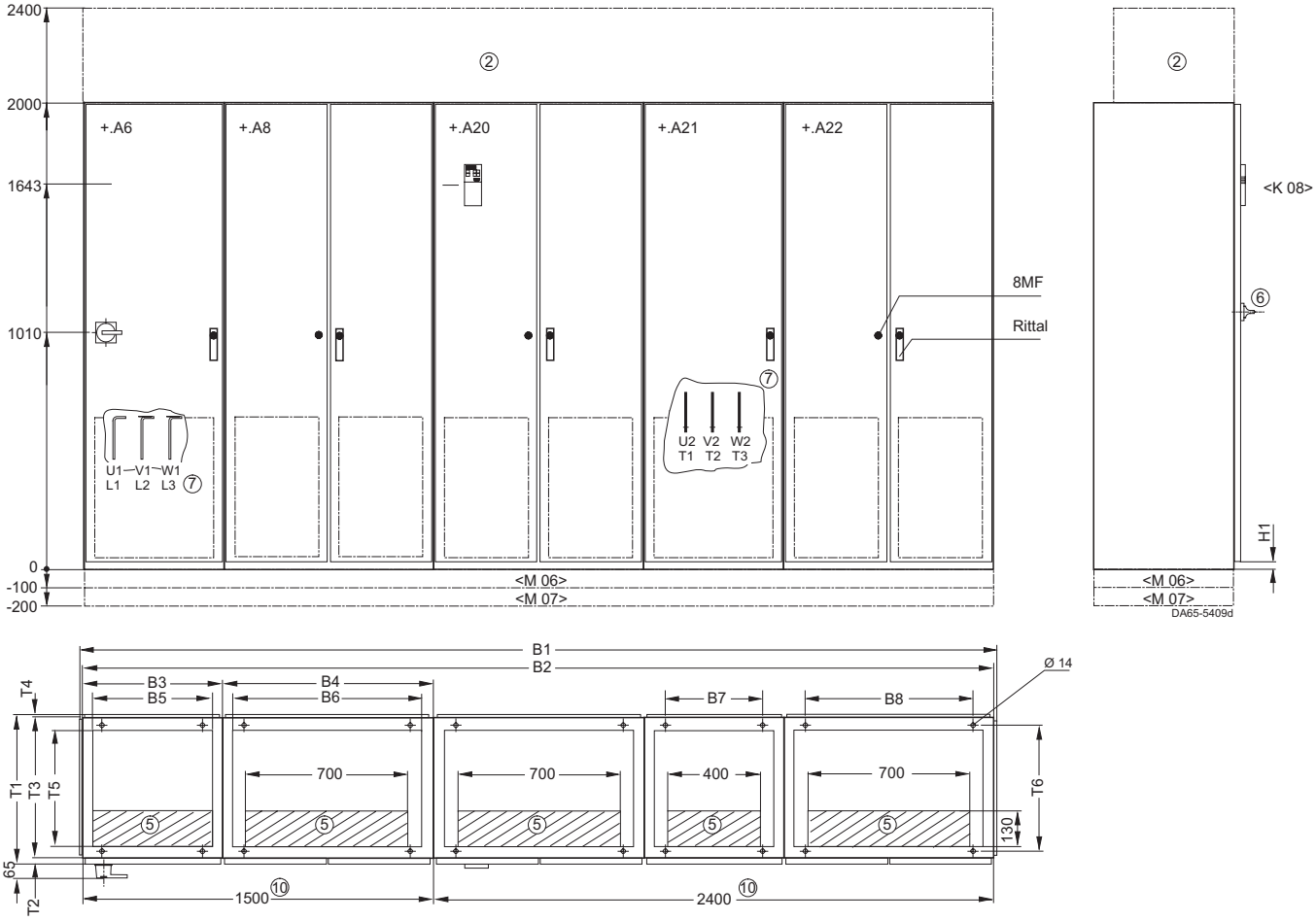
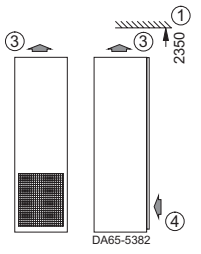
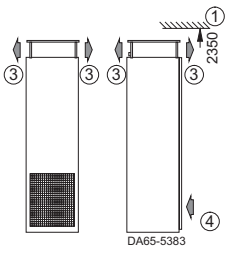


Fig. 68

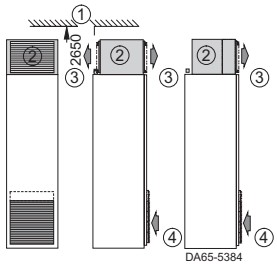
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	3918	3900	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	3902	3899	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

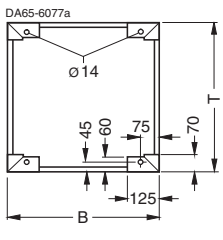


Degree of protection IP21

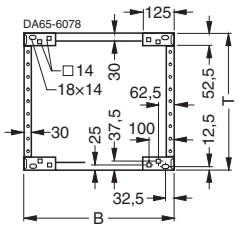


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

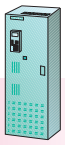
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

7

Dimension Drawings

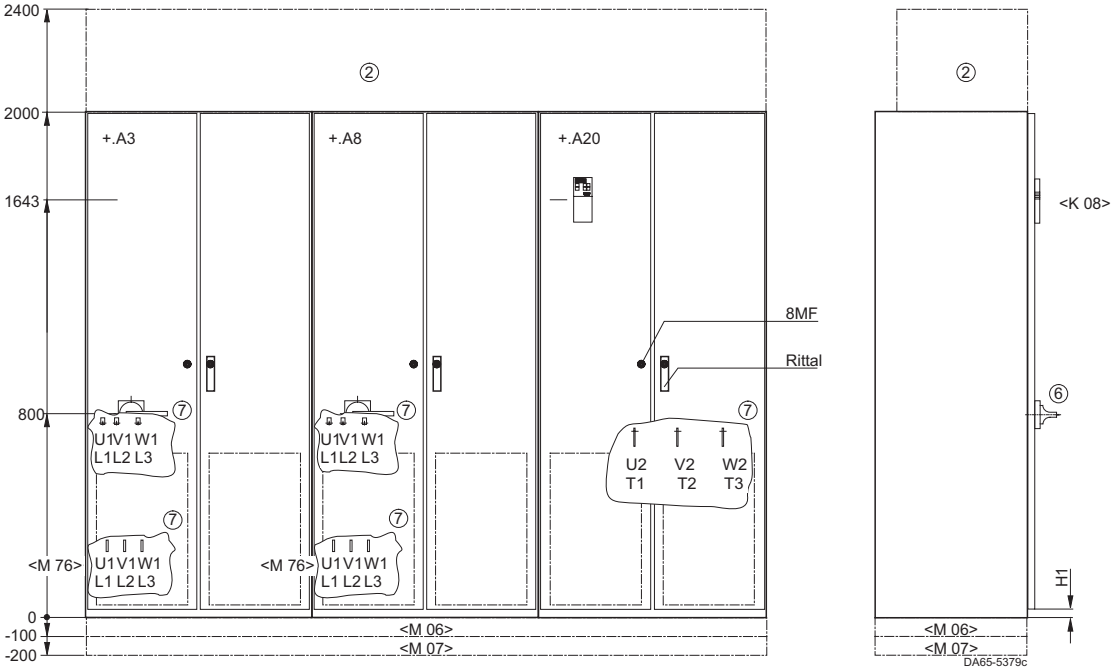
Converter cabinet units, 200 kW to 400 kW, single-quadrant operation, 12 pulse



380 V to 480 V (2 x), 250 kW to 400 kW

500 V to 600 V (2 x), 200 kW to 315 kW

660 V to 690 V (2 x), 250 kW to 400 kW



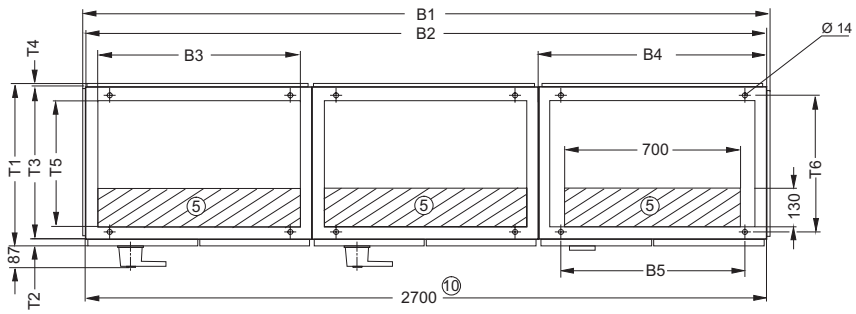
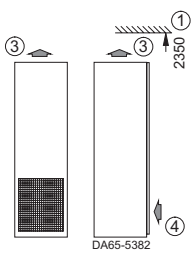
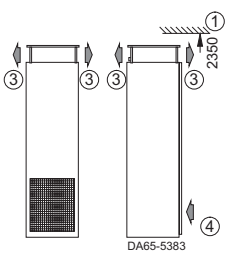


Fig. 69

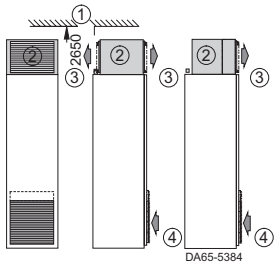
Cabinet Type	B1	B2	B3	B4	B5	T1	T2	T3	T4	T5	T6	H1
8MF	2718	2700	840	900	750	634	25	600	9	466	510	63
Rittal	2702	2699	812	899	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

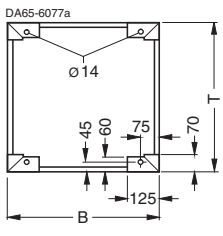


Degree of protection IP21

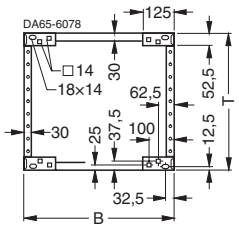


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

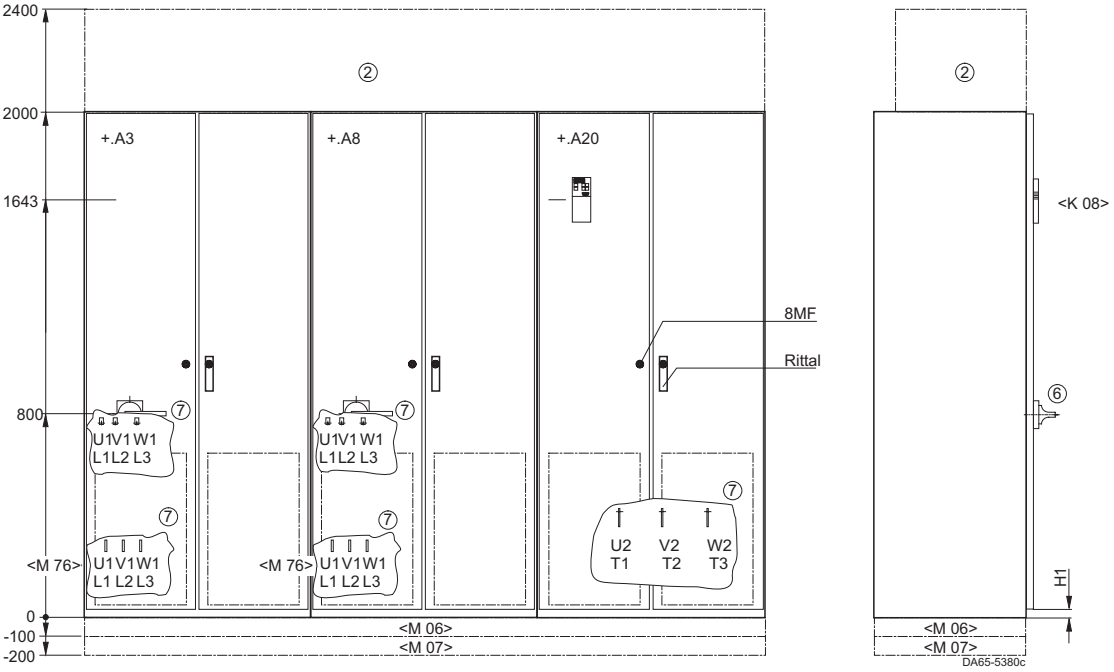
Cabinet units

Converter cabinet units, 400 kW to 800 kW, single-quadrant operation, 12 pulse

380 V to 480 V (2 x), 500 kW

500 V to 600 V (2 x), 400 kW to 630 kW

660 V to 690 V (2 x), 500 kW to 800 kW



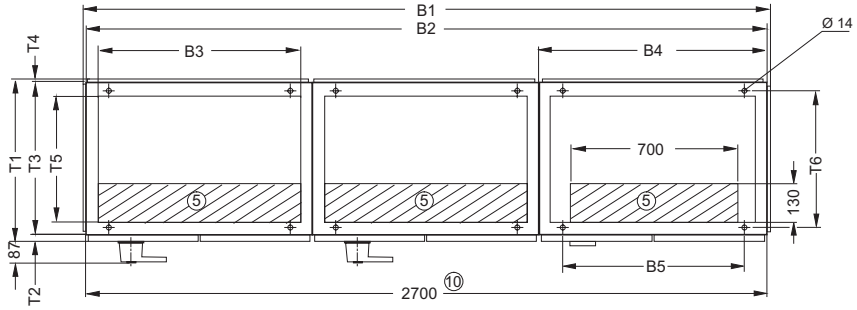
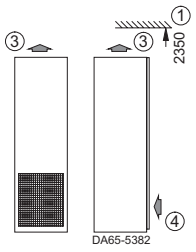
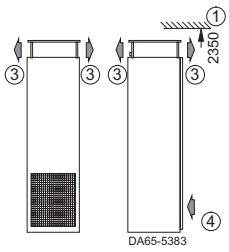


Fig. 70

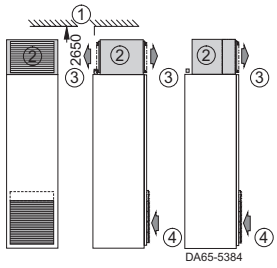
Cabinet Type	B1	B2	B3	B4	B5	T1	T2	T3	T4	T5	T6	H1
8MF	2718	2700	840	900	750	634	25	600	9	466	510	63
Rittal	2702	2699	812	899	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

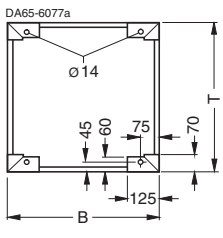


Degree of protection IP21

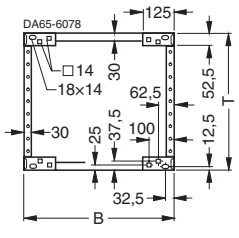


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

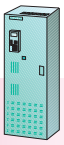
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

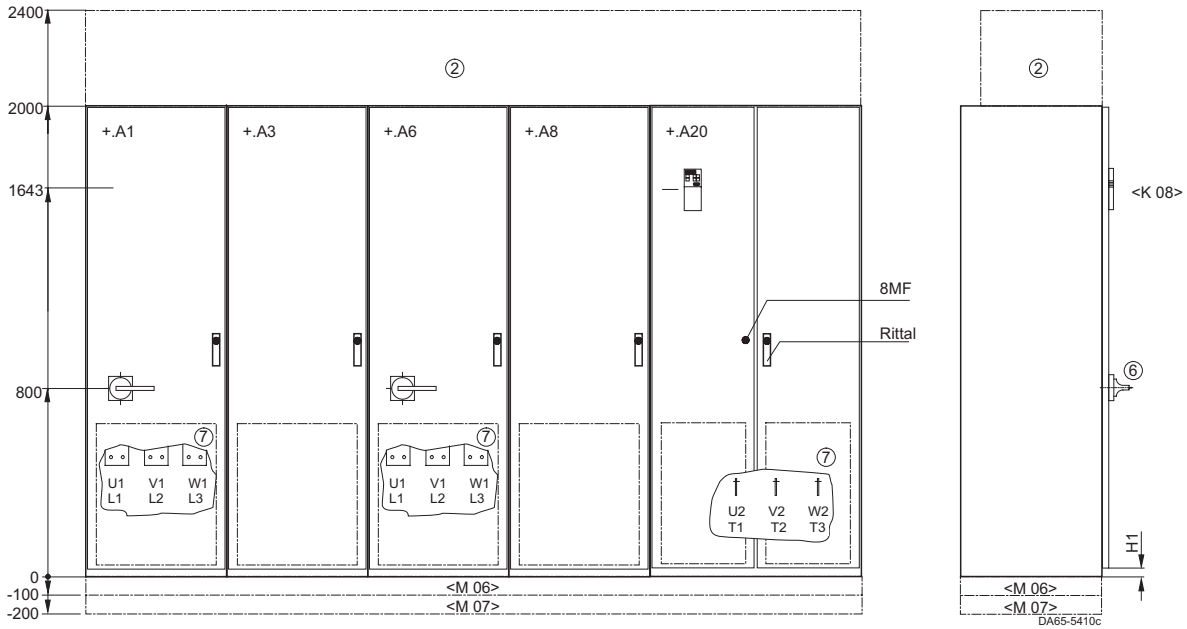
7

Dimension Drawings

Converter cabinet units, 630 kW, single-quadrant operation, 12 pulse



380 V to 480 V (2 x), 630 kW



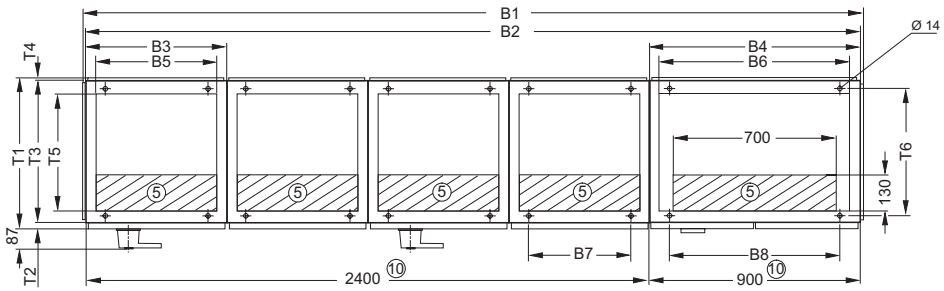
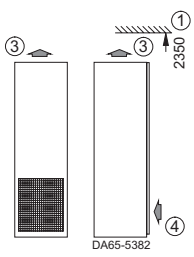
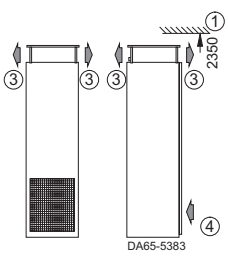


Fig. 71

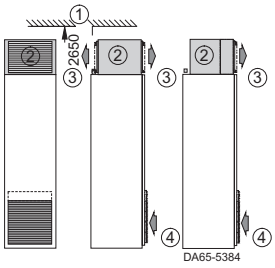
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	3318	3300	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	3302	3299	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

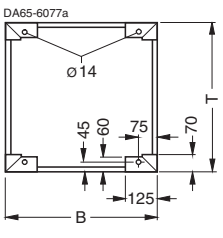


Degree of protection IP21

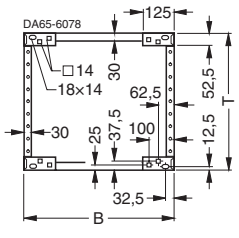


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

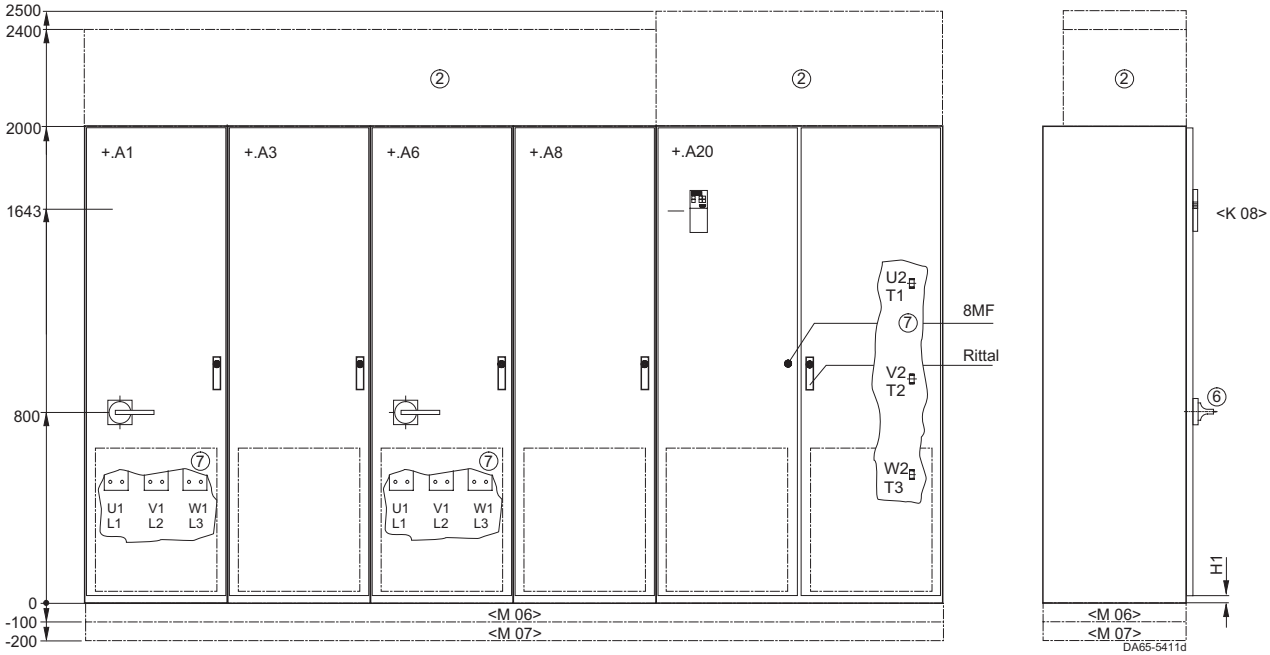
Cabinet units

Converter cabinet units, 710 kW to 1200 kW, single-quadrant operation, 12 pulse

380 V to 480 V (2 x), 710 kW

500 V to 600 V (2 x), 800 kW to 900 kW

660 V to 690 V (2 x), 1000 kW to 1200 kW



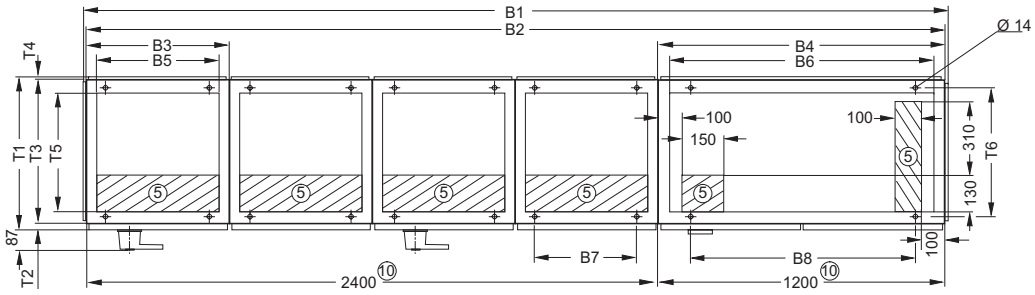
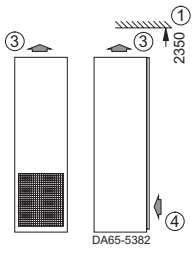
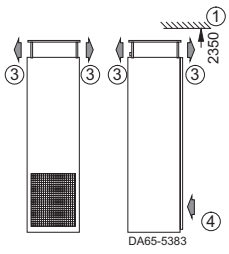


Fig. 72

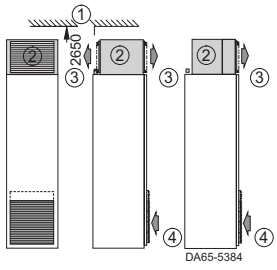
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	3618	3600	600	1200	540	1140	450	1050	634	25	600	9	466	510	63
Rittal	3602	3599	599	1199	512	1112	475	1075	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

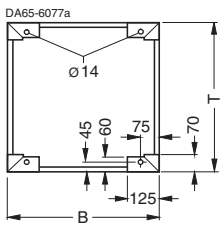


Degree of protection IP21

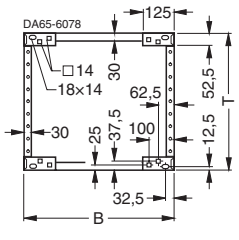


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

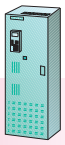
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

7

Dimension Drawings

Converter cabinet units, 1100 kW to 1500 kW, single-quadrant operation, 12 pulse



500 V to 600 V, 1100 kW

660 V to 690 V, 1500 kW

without interphase transformer chassis

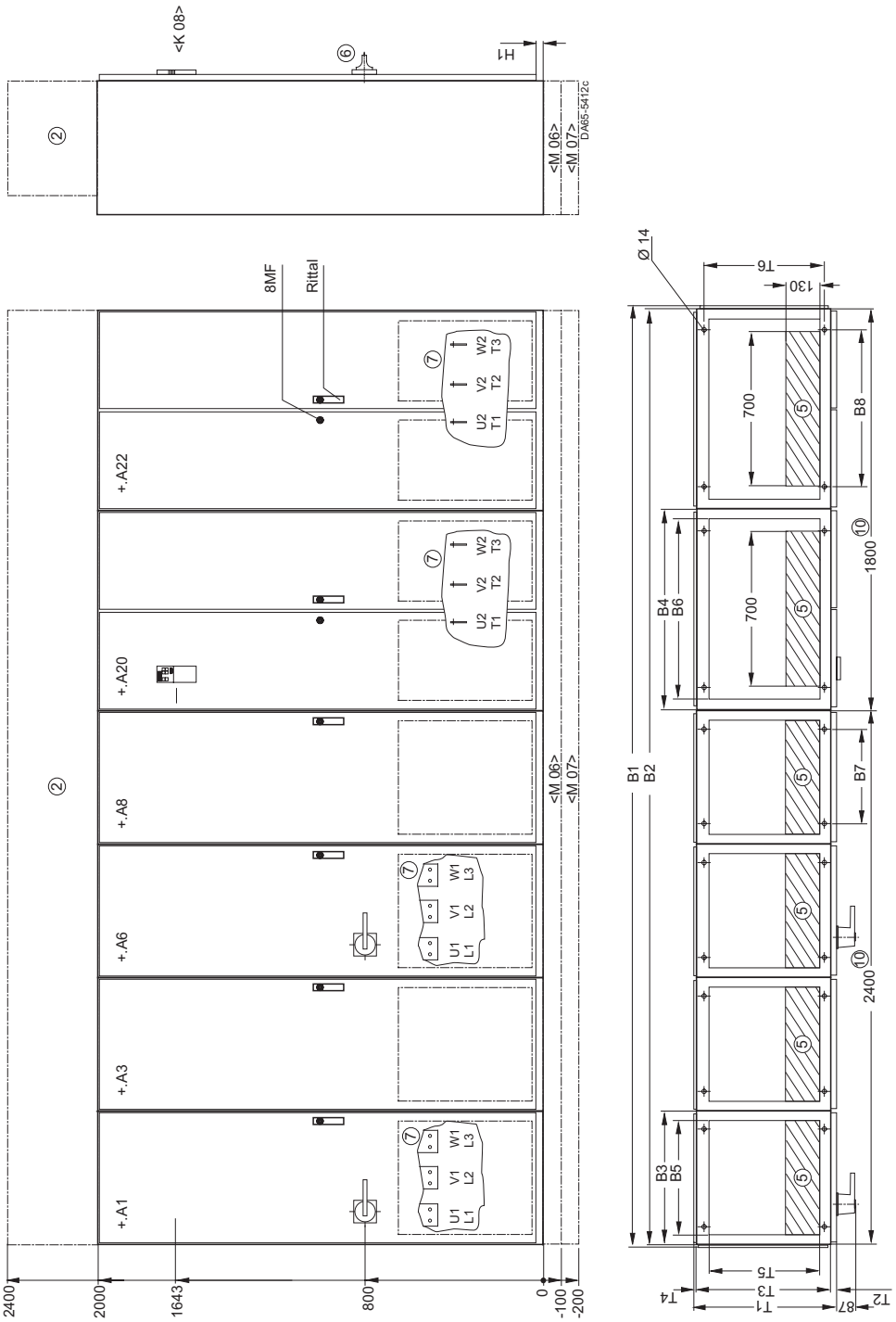
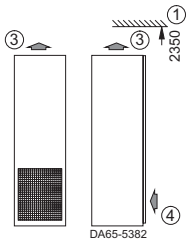
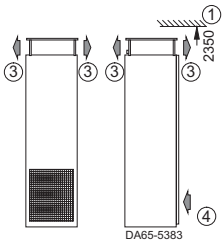


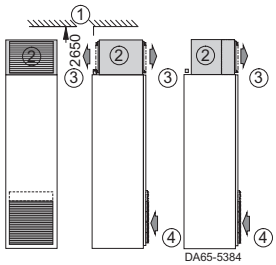
Fig. 73



Degree of protection IP20



Degree of protection IP21



Degree of protection IP23/IP43

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	4218	4200	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	4202	4199	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5

For pedestal dimensions, see page 7/35.

Cabinet units

Converter cabinet units, 1100 kW to 1500 kW, single-quadrant operation, 12 pulse

500 V to 600 V, 1100 kW

660 V to 690 V, 1500 kW

with interphase transformer chassis

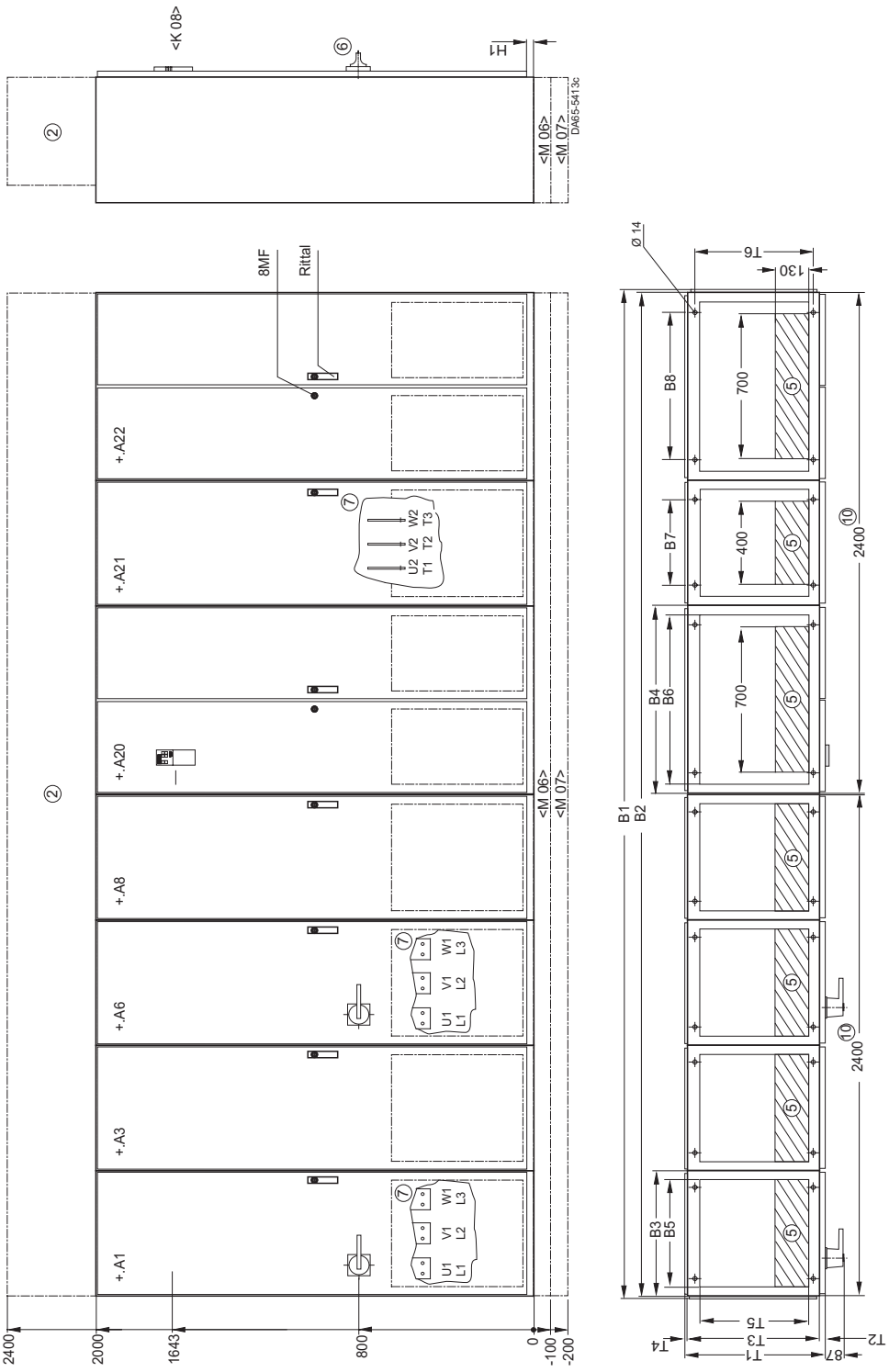
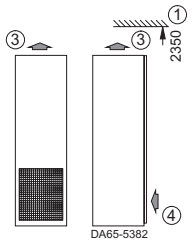
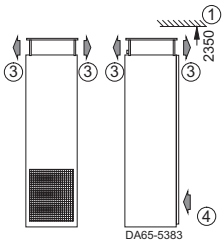


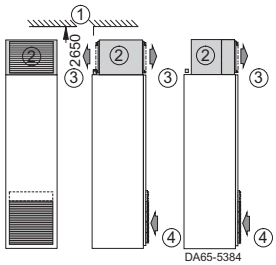
Fig. 74



Degree of protection IP20



Degree of protection IP21



Degree of protection IP23/IP43

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

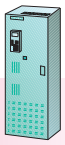
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	4818	4800	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	4802	4799	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5

For pedestal dimensions, see page 7/35.

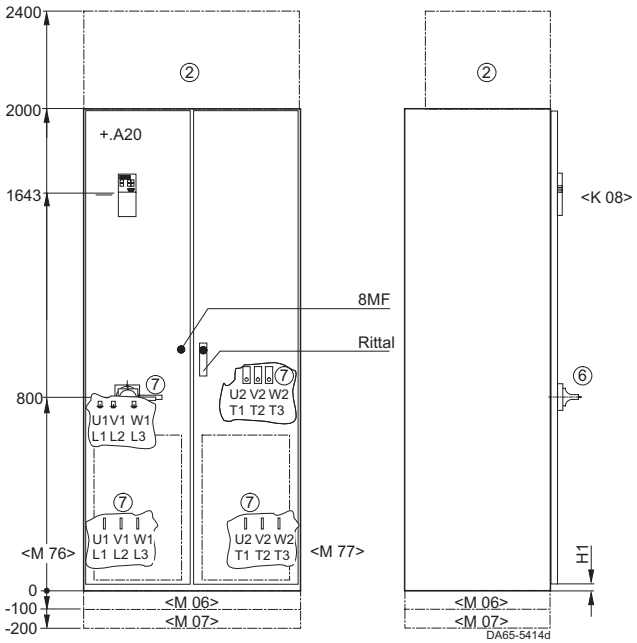
Dimension Drawings

Converter cabinet units, 37 kW to 45 kW, four-quadrant operation, 6 pulse



380 V to 480 V, 45 kW

500 V to 600 V, 37 kW to 45 kW



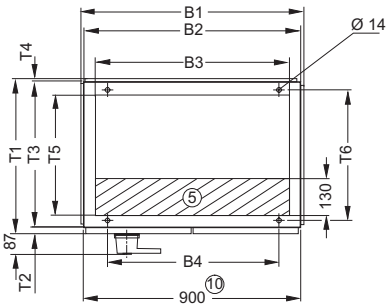
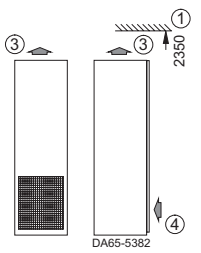
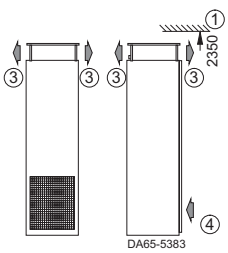


Fig. 75

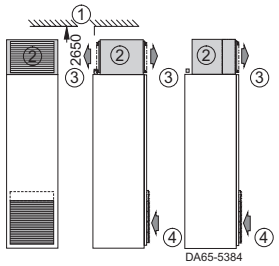
Cabinet Type	B1	B2	B3	B4	T1	T2	T3	T4	T5	T6	H1
8MF	918	900	840	750	634	25	600	9	466	510	63
Rittal	902	899	812	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

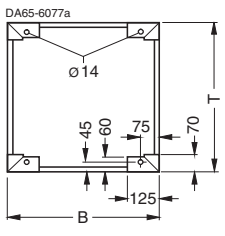


Degree of protection IP21

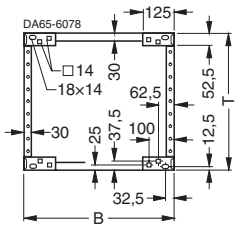


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

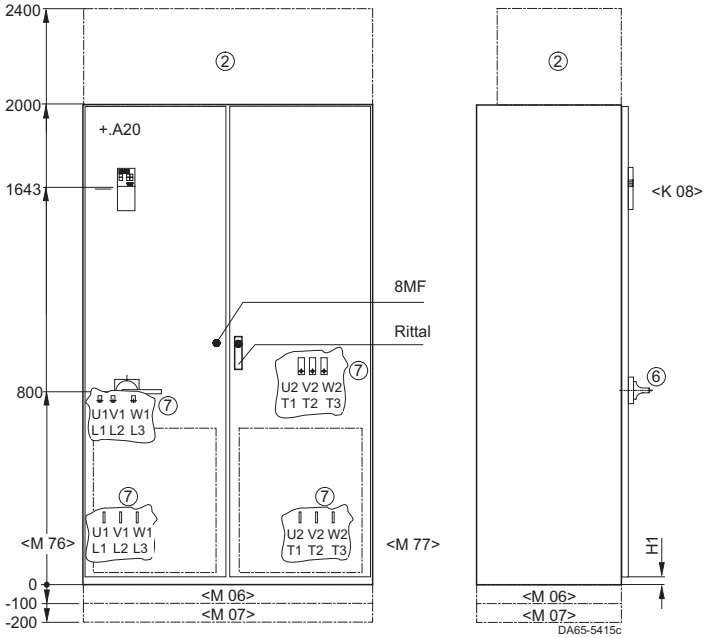
Cabinet units

Converter cabinet units, 55 kW to 90 kW, four-quadrant operation, 6 pulse

380 V to 480 V, 55 kW to 90 kW

500 V to 600 V, 55 kW to 75 kW

660 V to 690 V, 55 kW to 75 kW



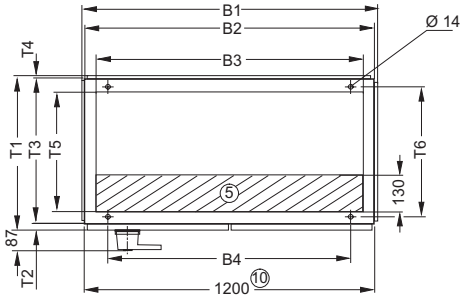
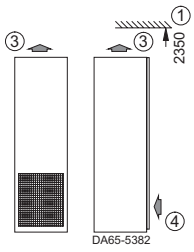
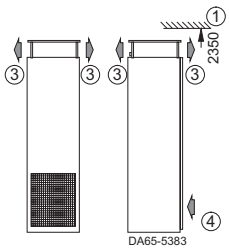


Fig. 76

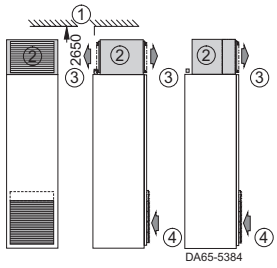
Cabinet Type	B1	B2	B3	B4	T1	T2	T3	T4	T5	T6	H1
8MF	1218	1200	1140	1050	634	25	600	9	466	510	63
Rittal	1202	1199	1112	1075	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

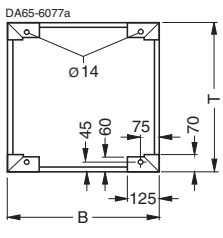


Degree of protection IP21

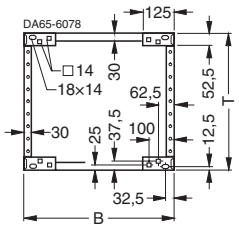


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

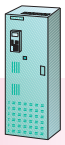
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

7

Dimension Drawings

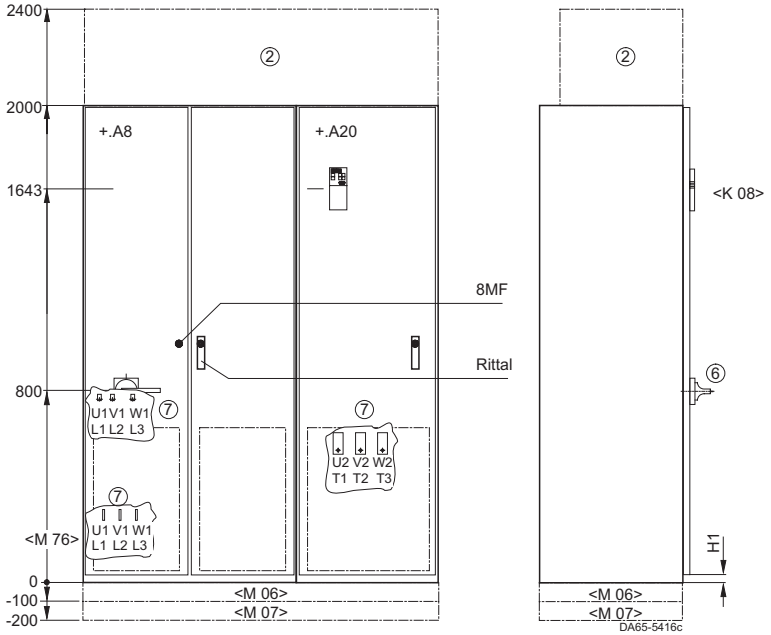
Converter cabinet units, 90 kW to 200 kW, four-quadrant operation, 6 pulse



380 V to 480 V, 110 kW to 200 kW

500 V to 600 V, 90 kW to 160 kW

660 V to 690 V, 90 kW to 200 kW



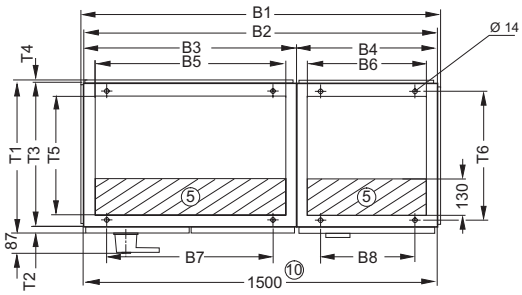
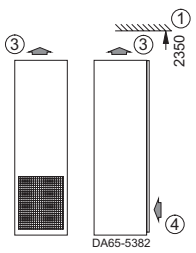
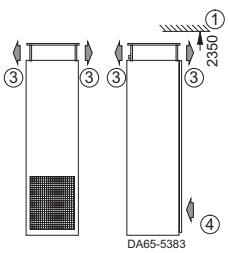


Fig. 77

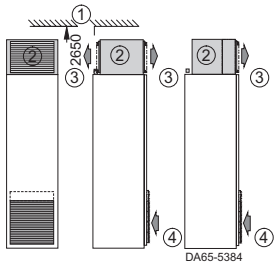
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	1518	1500	900	600	840	540	750	450	634	25	600	9	466	510	63
Rittal	1502	1499	899	599	812	512	775	475	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

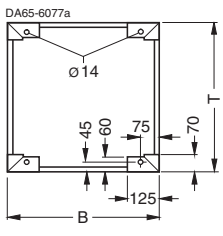


Degree of protection IP21

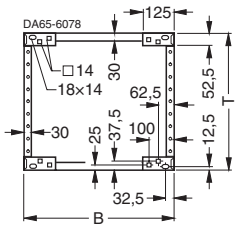


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



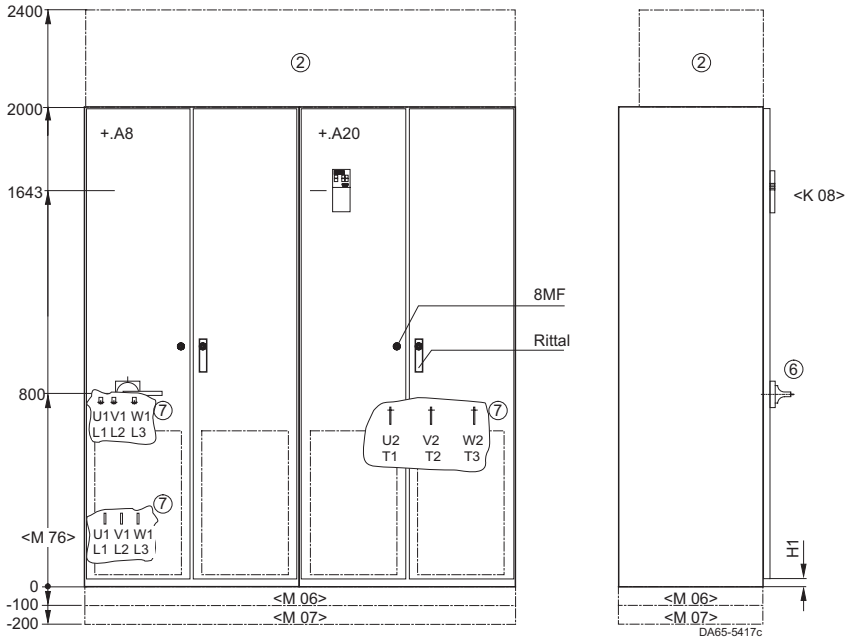
Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

500 V to 600 V, 200 kW to 250 kW



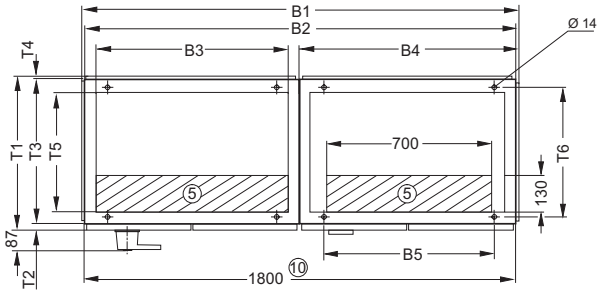
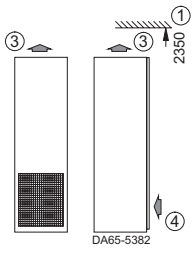
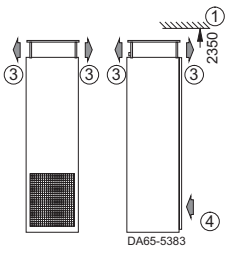


Fig. 78

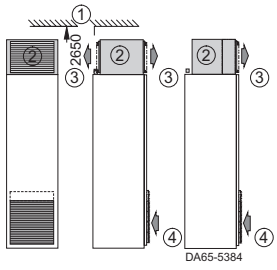
Cabinet Type	B1	B2	B3	B4	B5	T1	T2	T3	T4	T5	T6	H1
8MF	1818	1800	840	900	750	634	25	600	9	466	510	63
Rittal	1802	1799	812	899	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

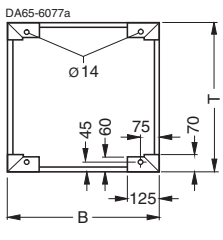


Degree of protection IP21

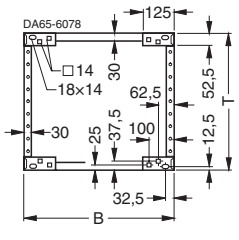


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

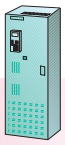
Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

Dimension Drawings

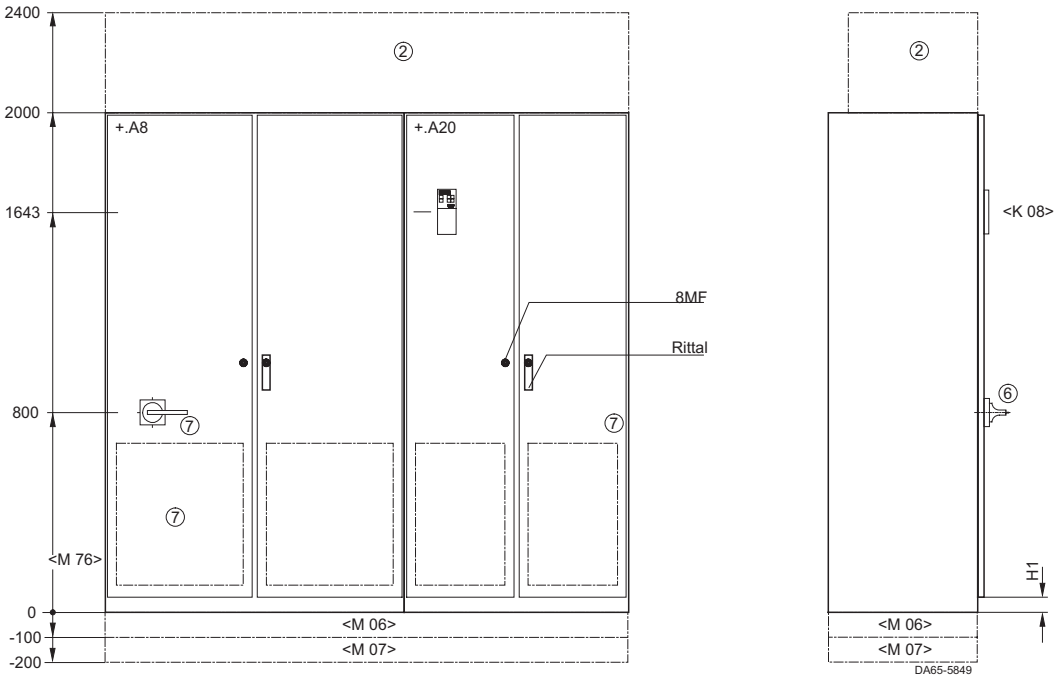
Converter cabinet units, 250 kW to 400 kW, four-quadrant operation, 6 pulse



380 V to 480 V, 250 kW

500 V to 600 V, 315 kW

660 V to 690 V, 250 kW to 400 kW



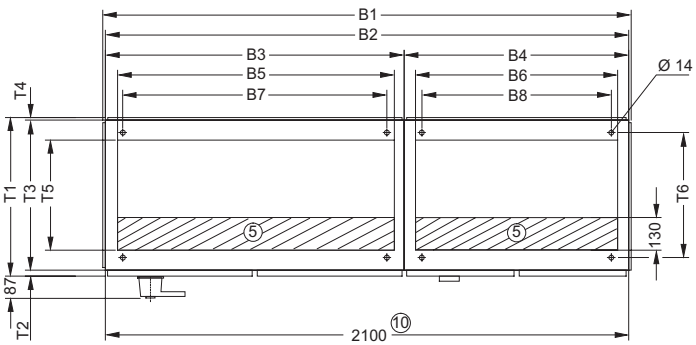
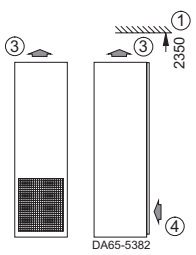
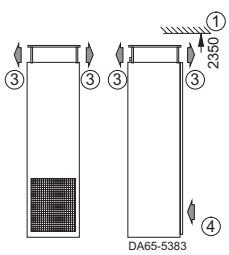


Fig. 79

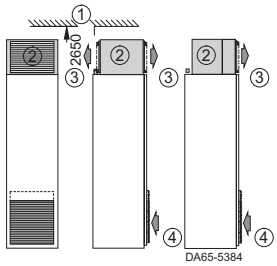
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	2118	2100	1200	900	1140	840	1050	750	634	25	600	9	466	510	63
Rittal	2102	2099	1199	899	1112	812	1075	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

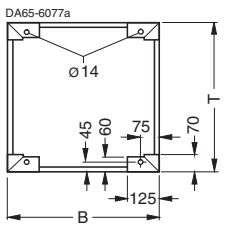


Degree of protection IP21

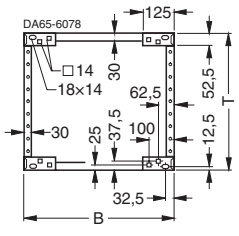


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

380 V to 480 V, 315 kW to 400 kW

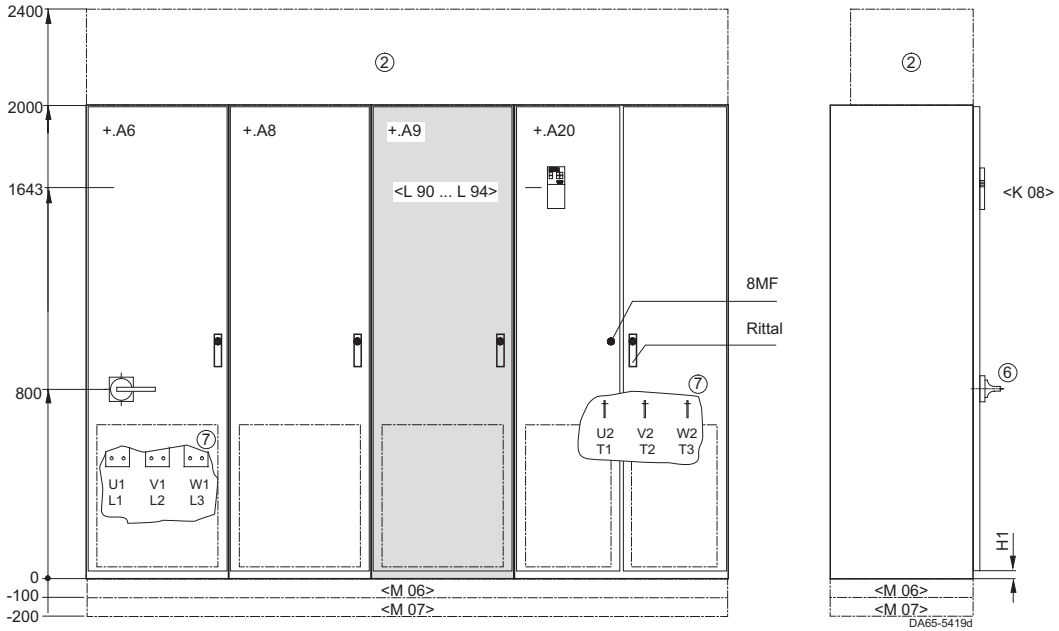
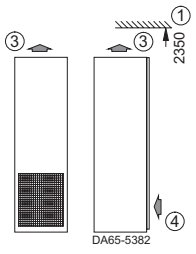
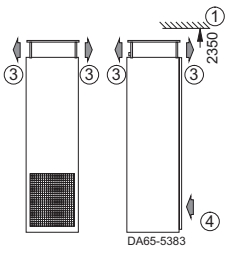


Fig. 80

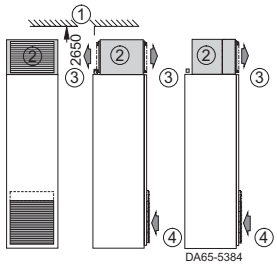
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	2718	2700	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	2702	2699	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

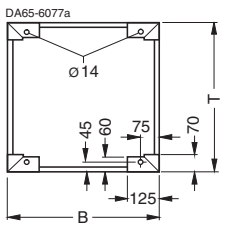


Degree of protection IP21

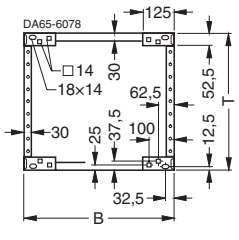


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

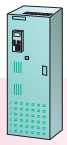
Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

Dimension Drawings

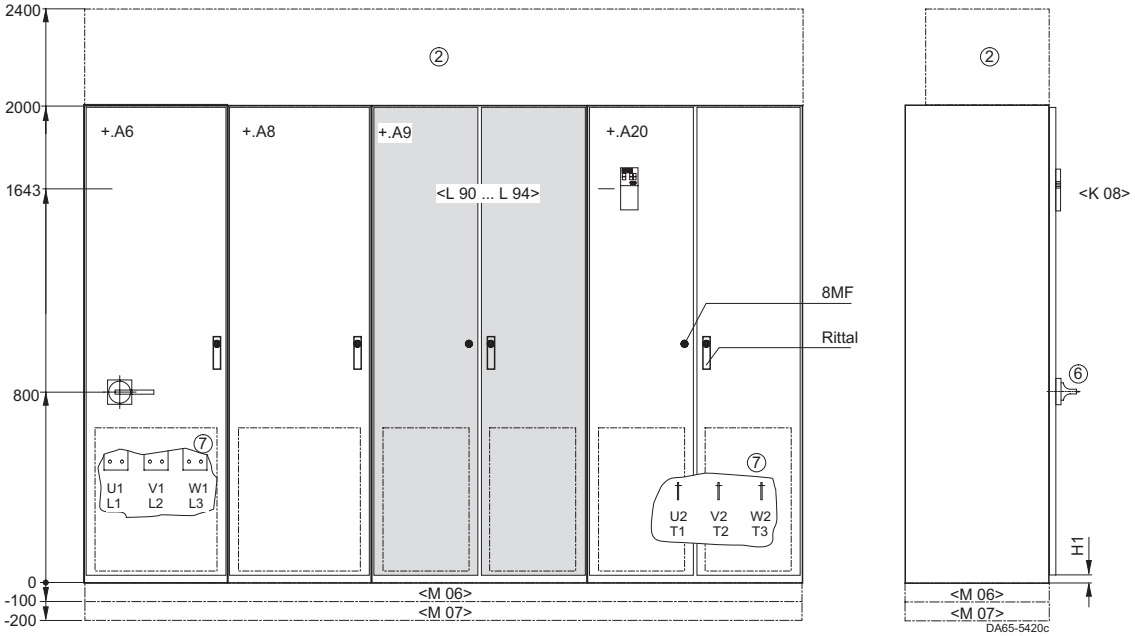
Converter cabinet units, 400 kW to 800 kW, four-quadrant operation, 6 pulse



380 V to 480 V, 500 kW

500 V to 600 V, 400 kW to 630 kW

660 V to 690 V, 500 kW to 800 kW



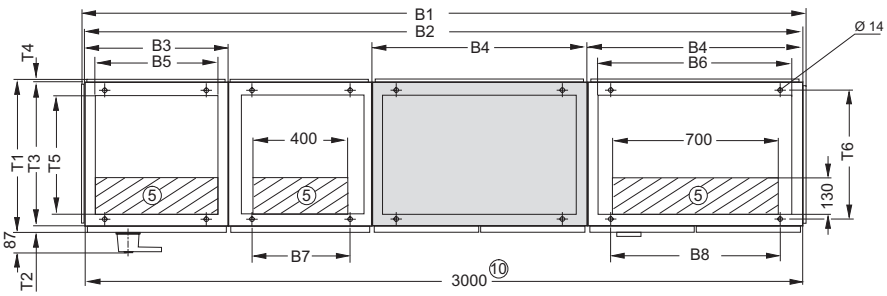
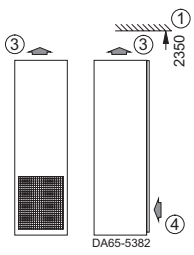
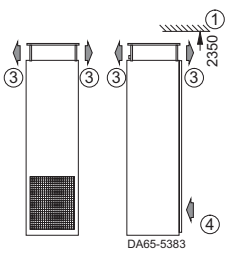


Fig. 81

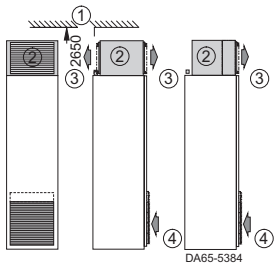
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	3018	3000	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	3002	2999	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

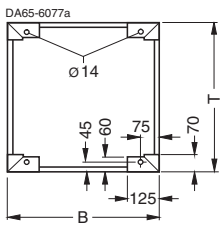


Degree of protection IP21

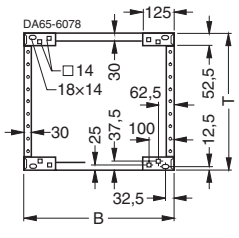


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



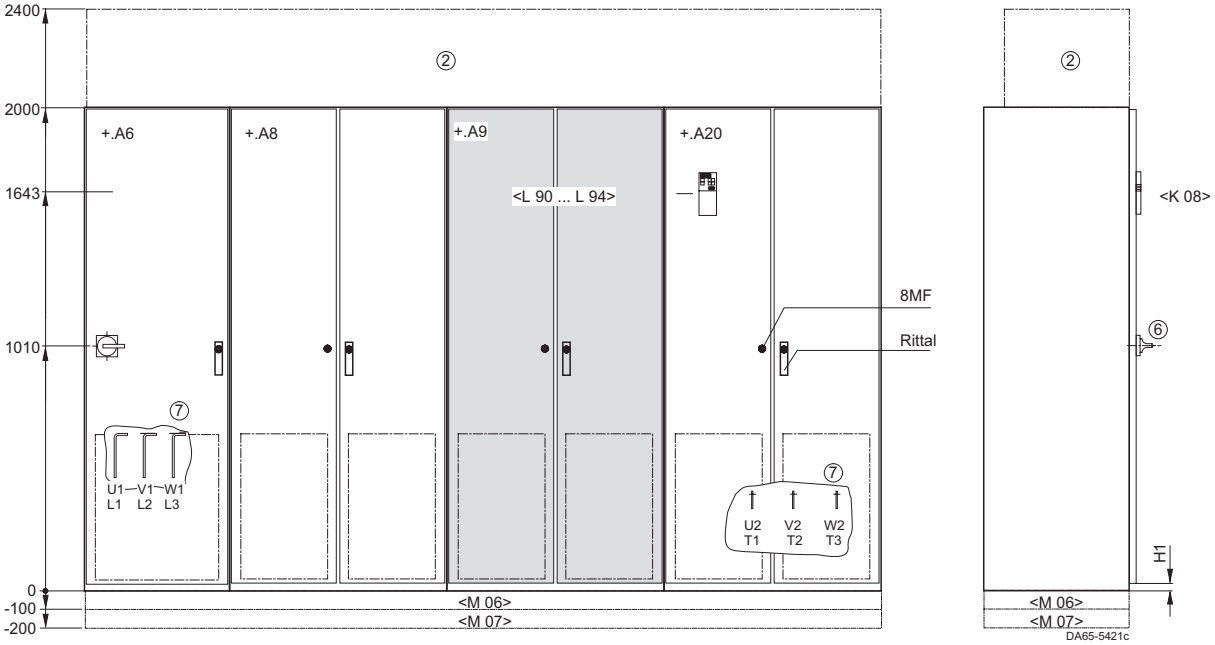
Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

380 V to 480 V, 630 kW



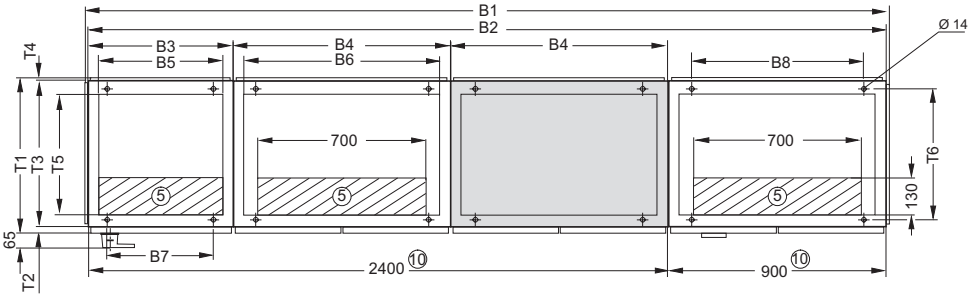
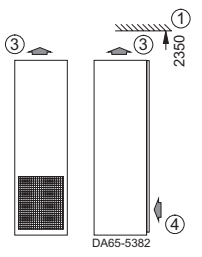
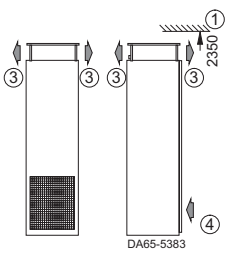


Fig. 82

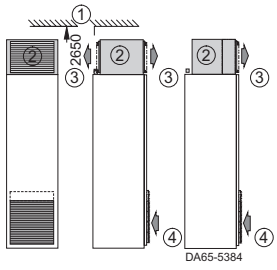
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	3318	3300	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	3302	3299	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

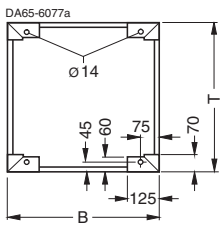


Degree of protection IP21

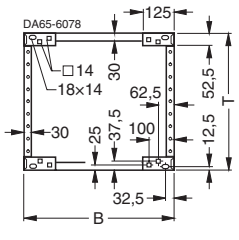


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

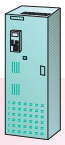
Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

Dimension Drawings

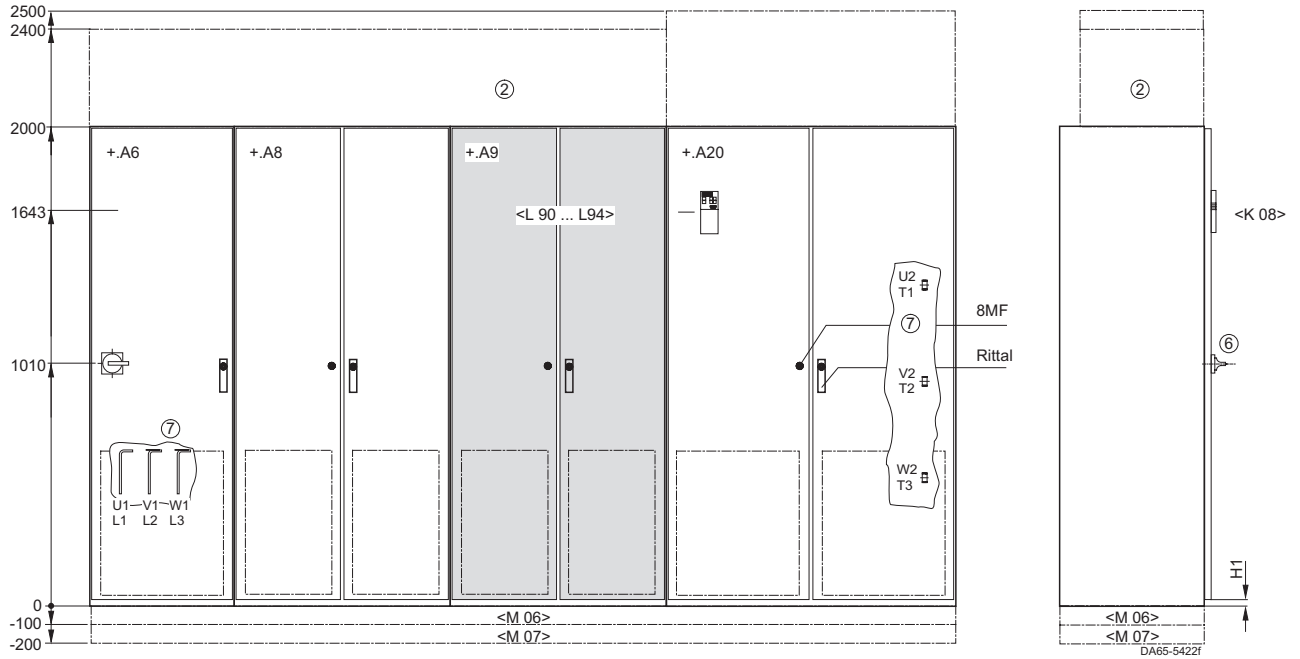
Converter cabinet units, 710 kW to 1200 kW, four-quadrant operation, 6 pulse



380 V to 480 V, 710 kW

500 V to 600 V, 800 kW to 900 kW

660 V to 690 V, 1000 kW to 1200 kW



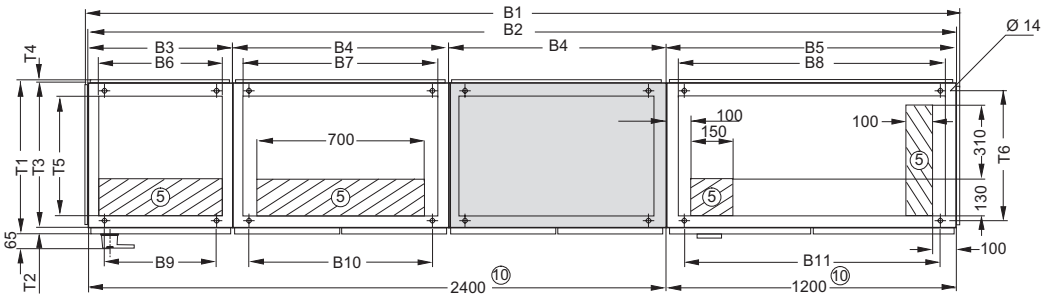
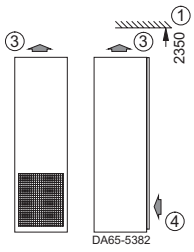
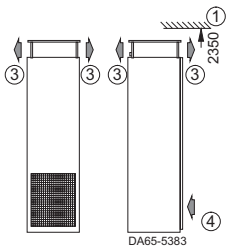


Fig. 83

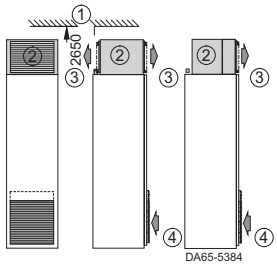
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	T1	T2	T3	T4	T5	T6	H1
8MF	3618	3600	600	900	1200	540	840	1140	450	750	1050	634	25	600	9	466	510	63
Rittal	3602	3599	599	899	1199	512	812	1112	475	775	1075	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

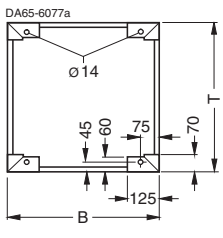


Degree of protection IP21

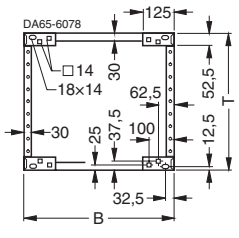


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

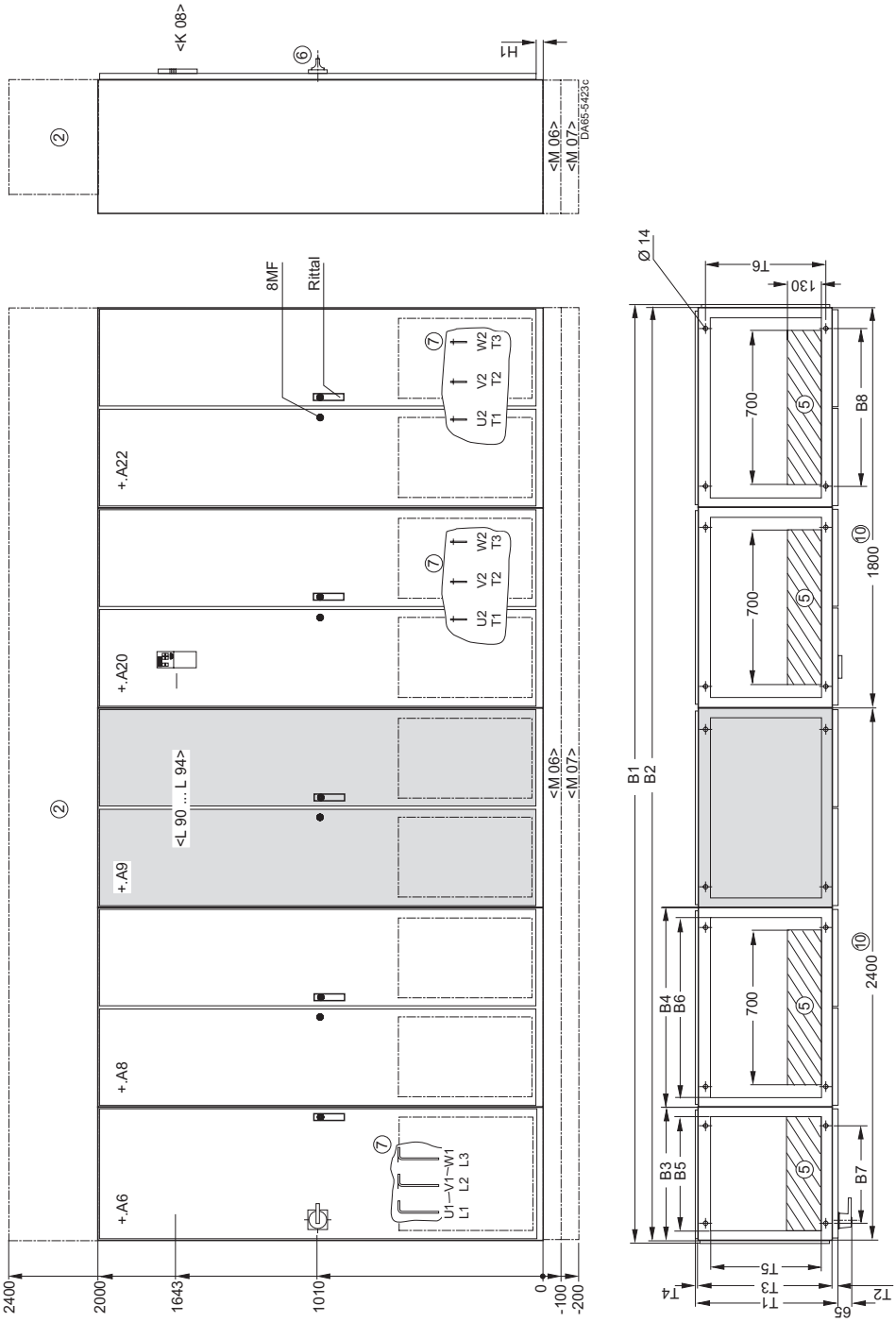
Cabinet units

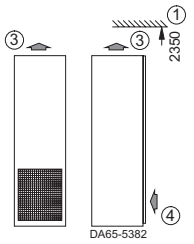
Converter cabinet units, 1000 kW to 1500 kW, four-quadrant operation, 6 pulse

500 V to 600 V, 1000 kW to 1100 kW

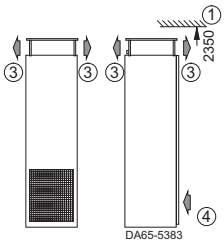
660 V to 690 V, 1300 kW to 1500 kW

without interphase transformer chassis

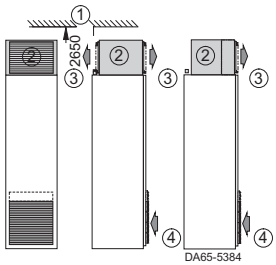




Degree of protection IP20



Degree of protection IP21



Degree of protection IP23/IP43

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

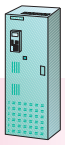
Fig. 84

Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	4218	4200	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	4202	4199	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5

For pedestal dimensions, see page 7/46.

Dimension Drawings

Converter cabinet units, 1000 kW to 1500 kW, four-quadrant operation, 6 pulse



500 V to 600 V, 1000 kW to 1100 kW
660 V to 690 V, 1300 kW to 1500 kW
with interphase transformer chassis

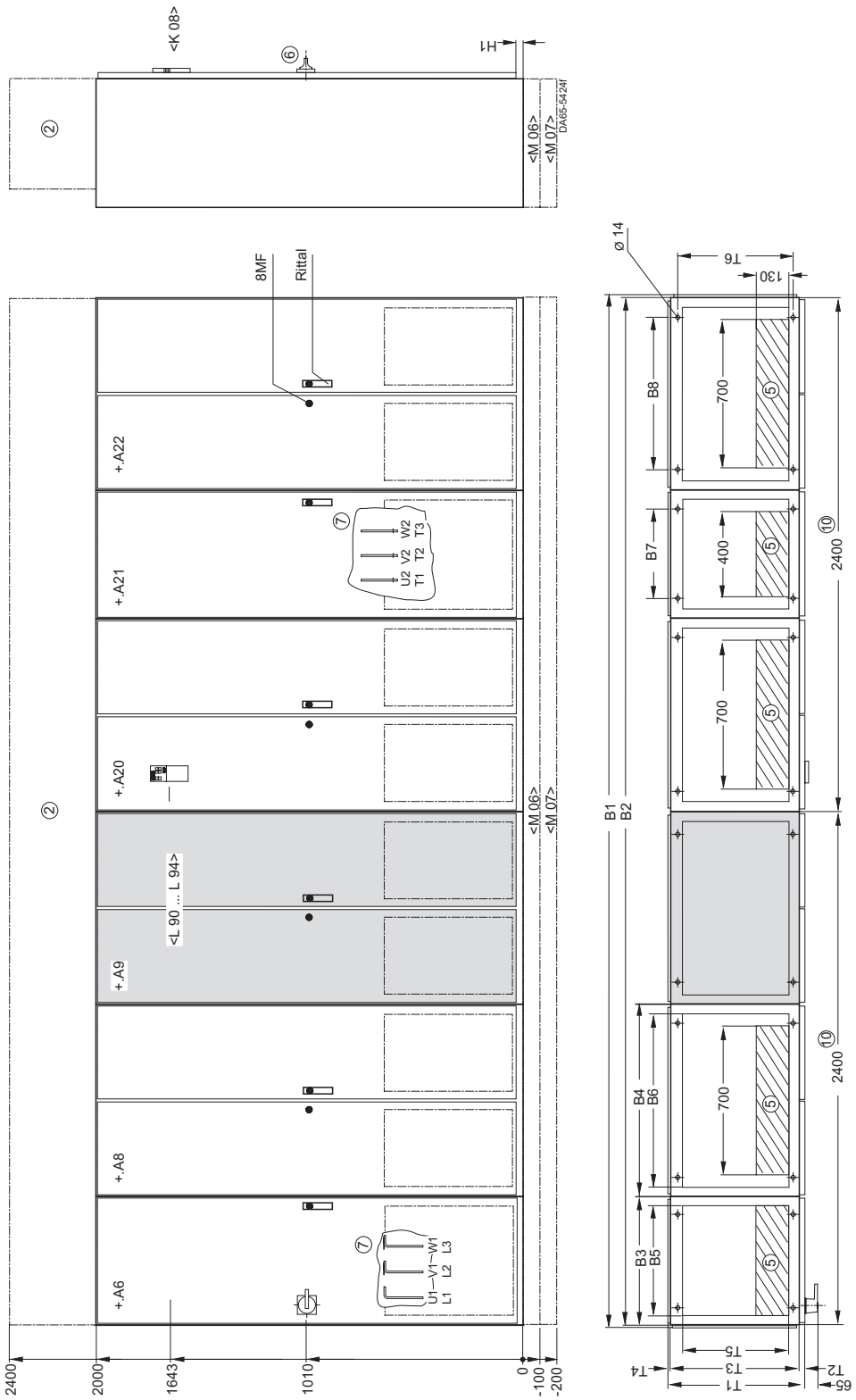
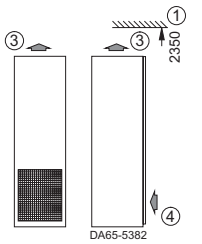
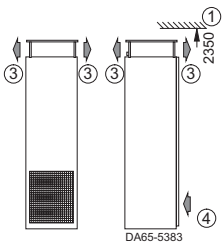


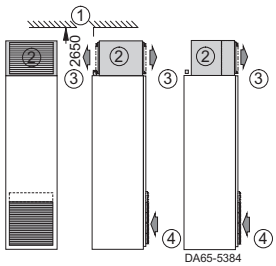
Fig. 85



Degree of protection IP20



Degree of protection IP21



Degree of protection IP23/IP43

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	4818	4800	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	4802	4799	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5

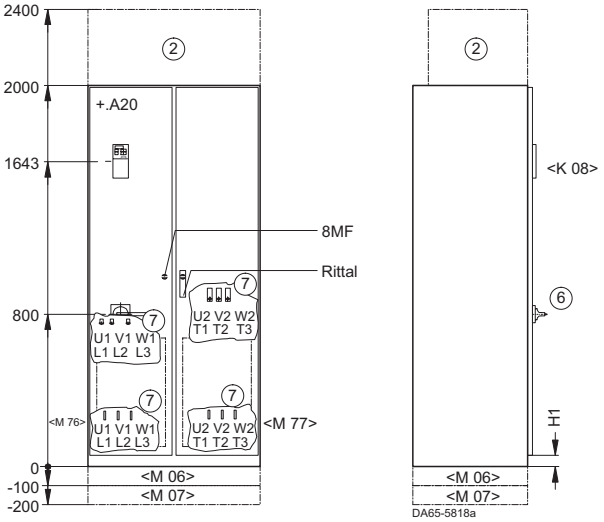
For pedestal dimensions, see page 7/49.

Cabinet units

Converter 37 kW to 45 kW, with self-commutated, pulsed rectifier/regenerative unit AFE

380 V to 460 V, 45 kW

480 V to 575 V, 37 kW to 45 kW



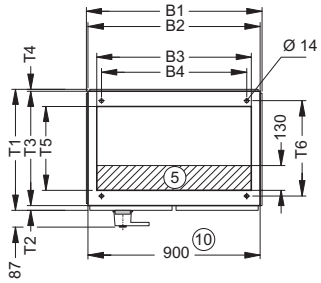
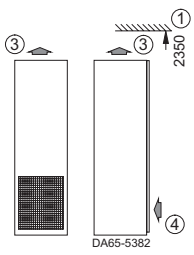
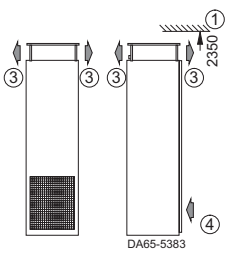


Fig. 86

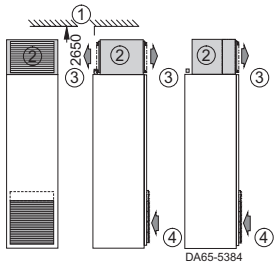
Cabinet Type	B1	B2	B3	B4	T1	T2	T3	T4	T5	T6	H1
8MF	918	900	840	750	634	25	600	9	466	510	63
Rittal	902	899	812	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

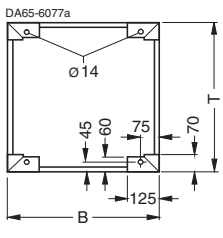


Degree of protection IP21

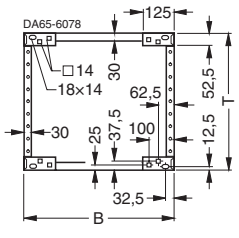


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

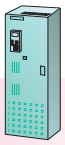
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

7

Dimension Drawings

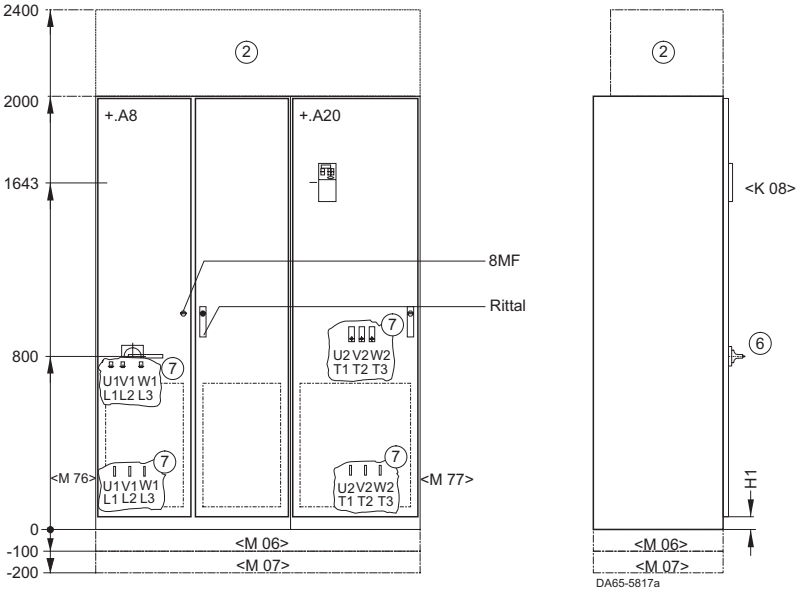
Converter 55 kW to 90 kW, with self-commutated, pulsed rectifier/regenerative unit AFE



380 V to 460 V, 55 kW to 90 kW

480 V to 575 V, 55 kW to 75 kW

660 V to 690 V, 55 kW to 75 kW



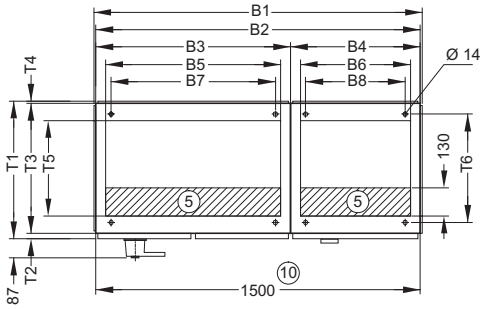
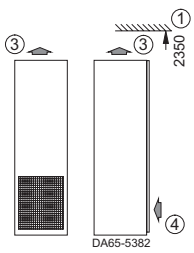
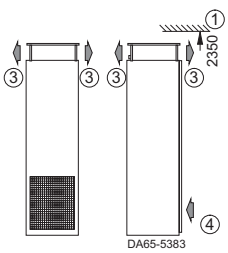


Fig. 87

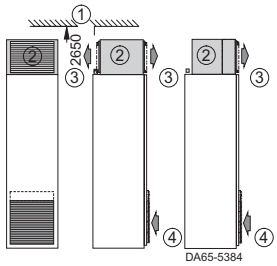
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	1518	1500	900	600	840	540	750	450	634	25	600	9	466	510	63
Rittal	1502	1499	899	599	812	512	775	475	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

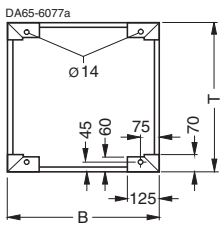


Degree of protection IP21

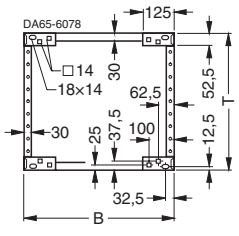


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

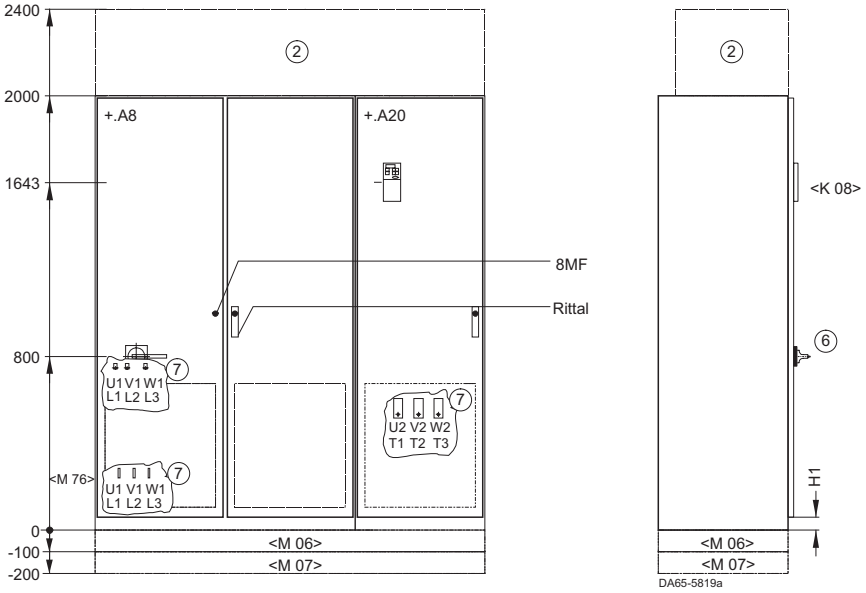
Cabinet units

Converter 90 kW to 200 kW, with self-commutated, pulsed rectifier/regenerative unit AFE

380 V to 460 V, 110 kW to 200 kW

480 V to 575 V, 90 kW to 160 kW

660 V to 690 V, 90 kW to 200 kW



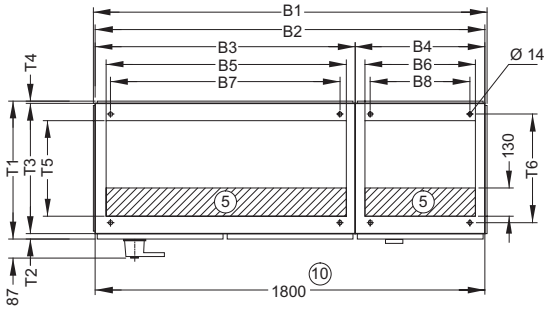
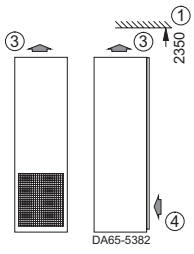
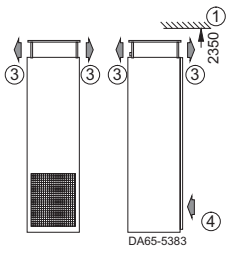


Fig. 88

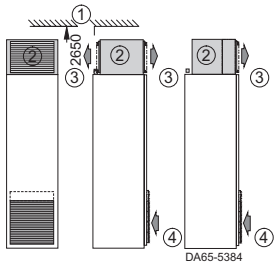
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	1818	1800	1200	600	1140	540	1050	450	634	25	600	9	466	510	63
Rittal	1802	1799	1199	599	1112	512	1075	475	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

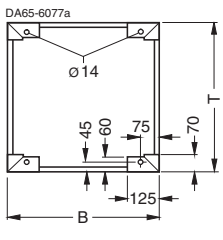


Degree of protection IP21

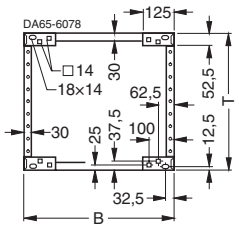


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

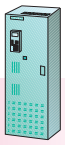
Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

Dimension Drawings

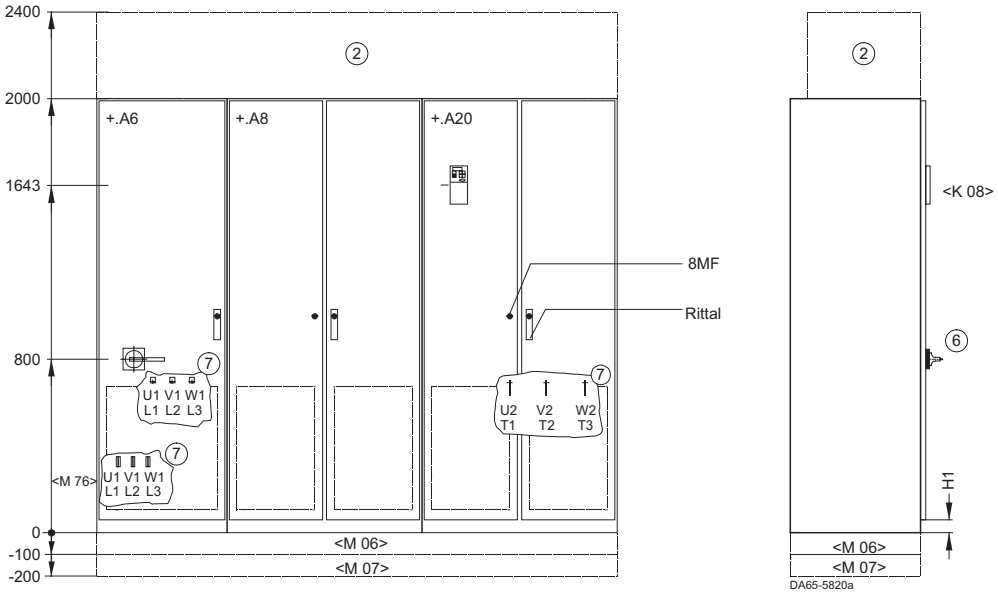
Converter 200 kW to 250 kW, with self-commutated, pulsed rectifier/regenerative unit AFE



380 V to 460 V, 250 kW

480 V to 575 V, 200 kW

660 V to 690 V, 250 kW



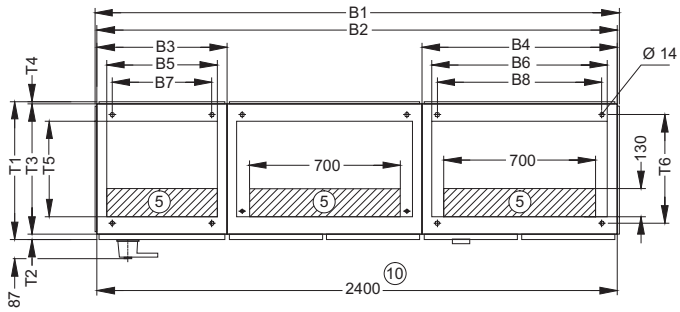
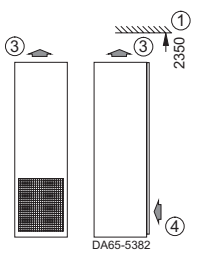
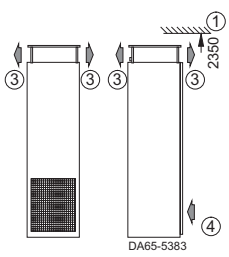


Fig. 89

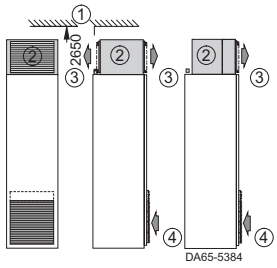
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	2418	2400	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	2402	2399	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

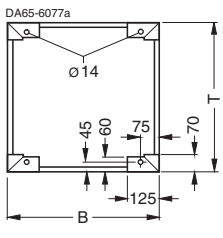


Degree of protection IP21

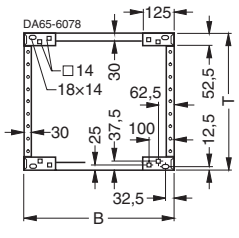


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

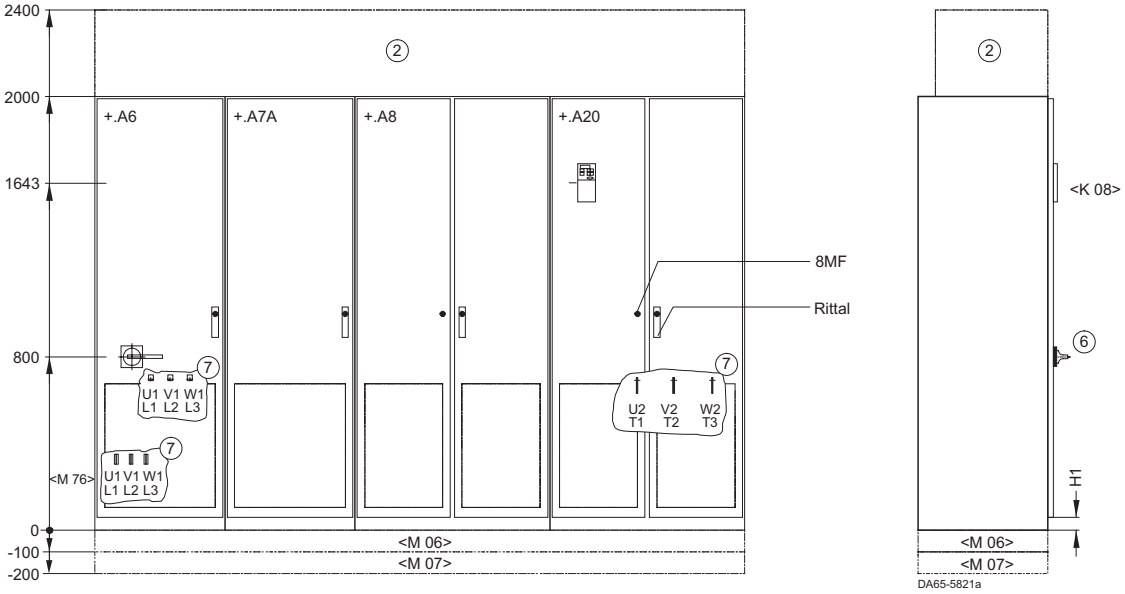
Cabinet units

Converter 250 kW to 400 kW, with self-commutated, pulsed rectifier/regenerative unit AFE

380 V to 460 V, 315 kW to 400 kW

480 V to 575 V, 250 kW to 315 kW

660 V to 690 V, 315 kW to 400 kW



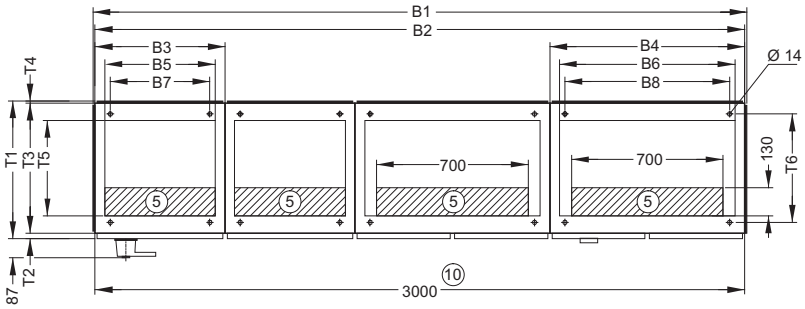
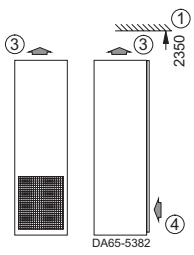
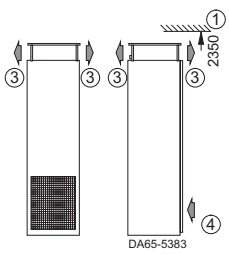


Fig. 90

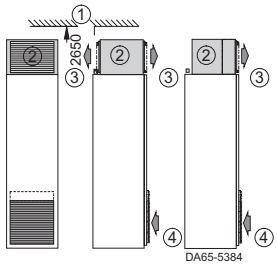
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	3018	3000	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	3002	2999	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

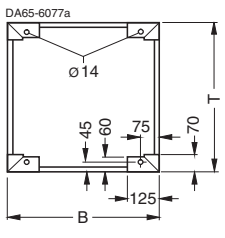


Degree of protection IP21

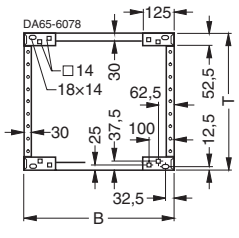


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

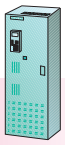
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

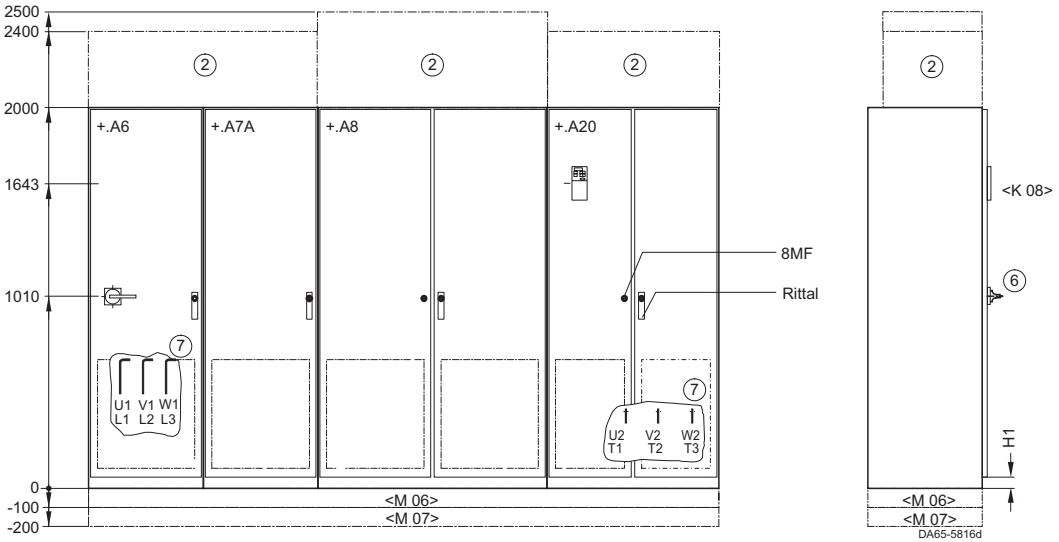
7

Dimension Drawings

Converter 630 kW, with self-commutated, pulsed rectifier/regenerative unit AFE



380 V to 460 V, 630 kW



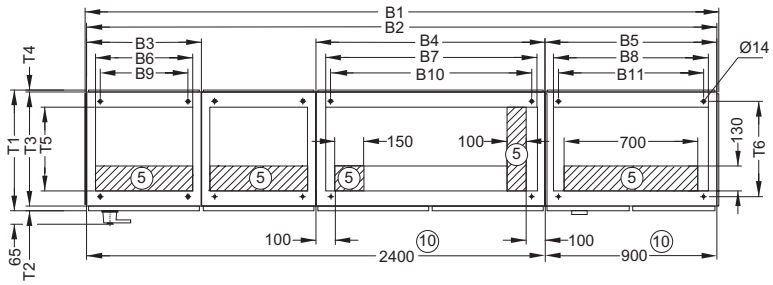
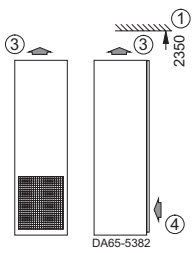
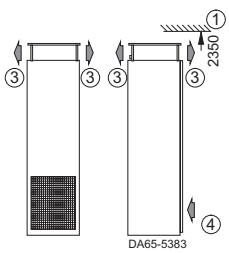


Fig. 91

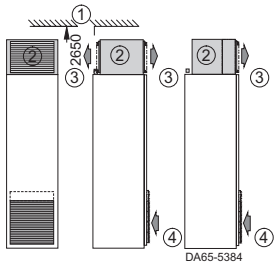
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	T1	T2	T3	T4	T5	T6	H1
8MF	3318	3300	600	1200	900	540	1140	840	450	1050	750	634	25	600	9	466	510	63
Rittal	3302	3299	599	1199	899	512	1112	812	475	1075	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

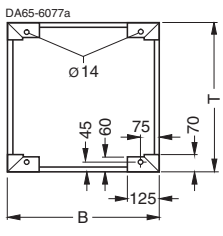


Degree of protection IP21

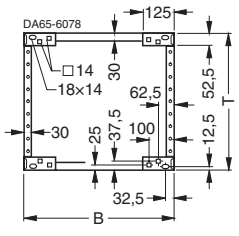


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

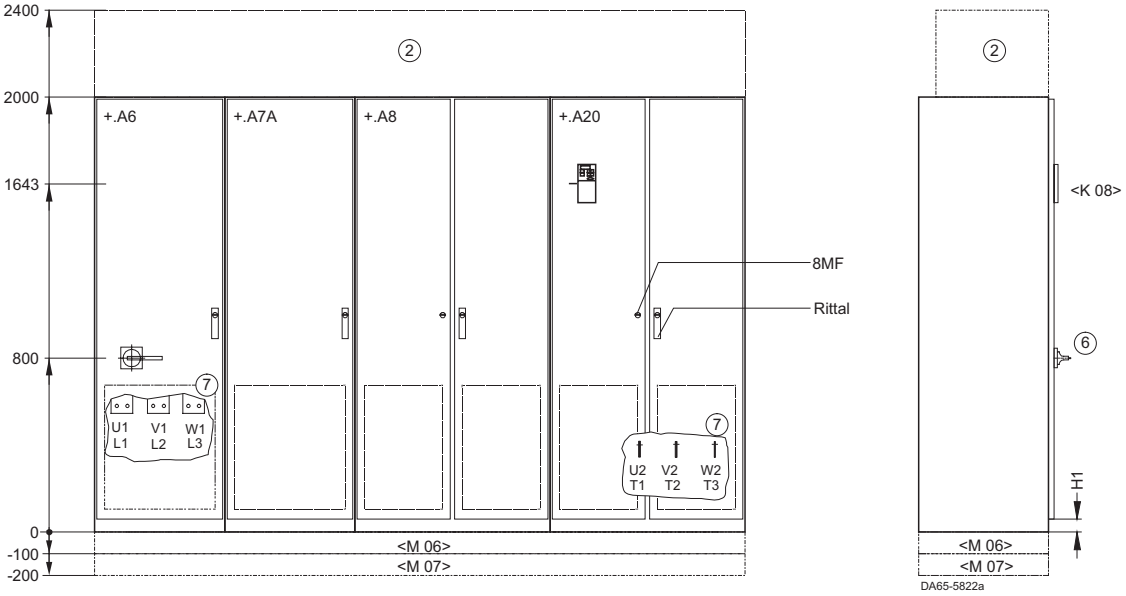
Cabinet units

Converter 400 kW to 800 kW, with self-commutated, pulsed rectifier/regenerative unit AFE

380 V to 460 V, 500 kW

480 V to 575 V, 400 kW to 630 kW

660 V to 690 V, 500 kW to 800 kW



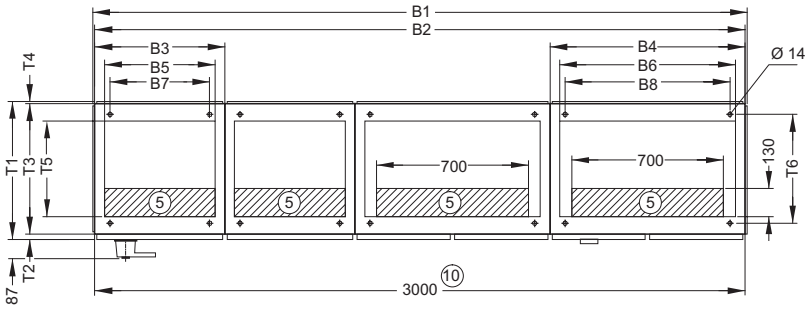
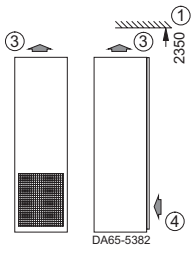
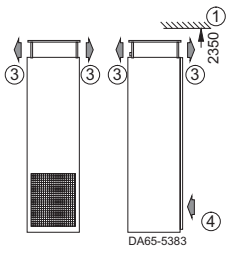


Fig. 92

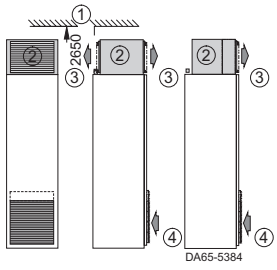
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	3018	3000	600	900	540	840	450	750	634	25	600	9	466	510	63
Rittal	3002	2999	599	899	512	812	475	775	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

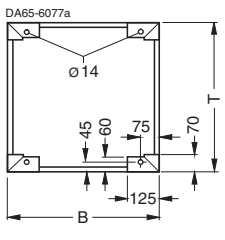


Degree of protection IP21

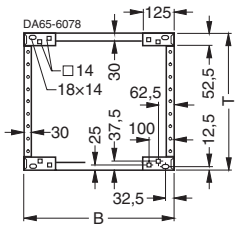


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

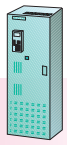
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

7

Dimension Drawings

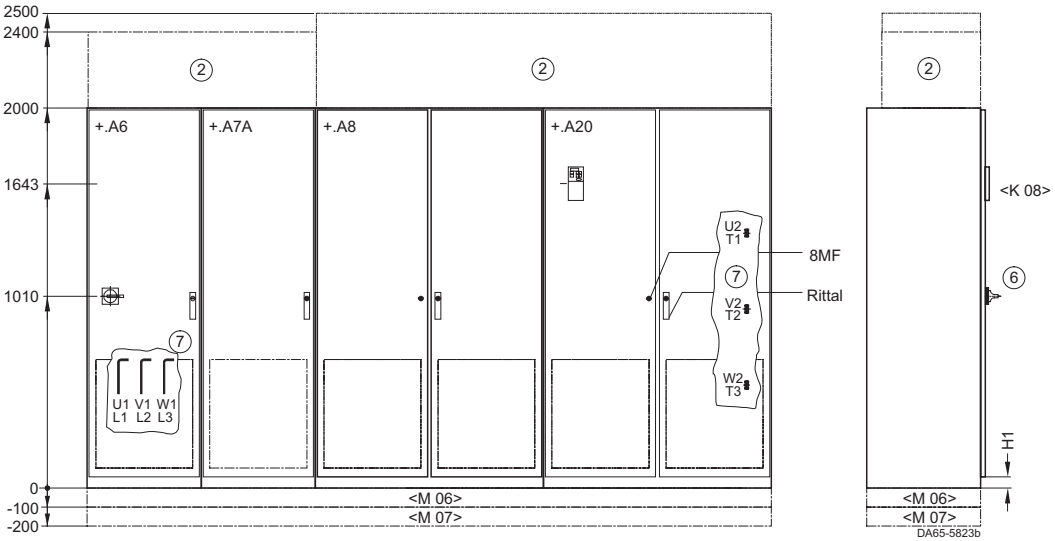
Converter 710 kW to 1200 kW, with self-commutated, pulsed rectifier/regenerative unit AFE



380 V to 460 V, 710 kW

480 V to 575 V, 800 kW to 900 kW

660 V to 690 V, 1000 kW to 1200 kW



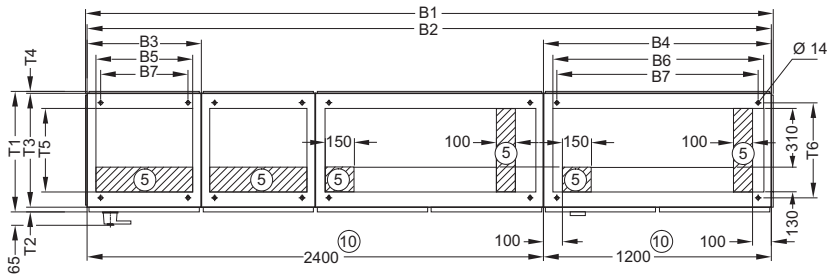
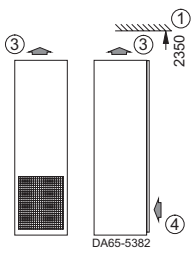
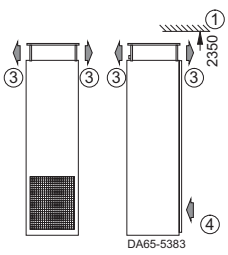


Fig. 93

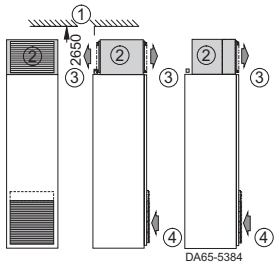
Cabinet Type	B1	B2	B3	B4	B5	B6	B7	B8	T1	T2	T3	T4	T5	T6	H1
8MF	3618	3600	600	1200	540	1140	450	1050	634	25	600	9	466	510	63
Rittal	3602	3599	599	1199	512	1112	475	1075	602	6.5	589	6.5	440	470	25.5



Degree of protection IP20

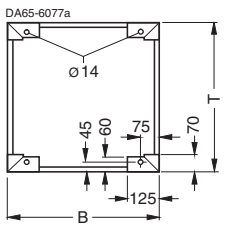


Degree of protection IP21

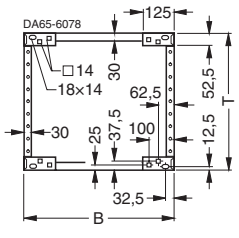


Degree of protection IP23/IP43

Pedestal dimensions



Pedestal 8MF



Pedestal Rittal

Degree of protection IP54 prepared for, air inlet on bottom, air outlet on top.
Degree of protection IP54 b on request.

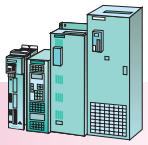
① Minimum ceiling height for wall mounting
② Cover optional
③ Air outlet
④ Air inlet
⑤ Cable entry possible from underneath within the gray area
⑥ Mains switch lockable with padlock
⑦ Power connection
⑩ Transport unit

Pedestal	Cabinet width W	Cabinet depth D
Rittal	600/900/1200	550
8MF	600/900/1200	600

Vector Control
Appendix

A

Appendix



Certificate for Environment, Resources and Recycling, Certificate ISO 9001

Compact PLUS/compact and chassis units · cabinet units

Siemens AG has committed itself to protecting the environment and conserving valuable natural resources. This applies to both manufacturing and the products we sell.

As early as the development phase, the possible impact of future products and systems on the environment is taken into consideration. Our aim is to prevent environmental pollution or, at least, reduce it to a minimum. In doing so, we look beyond existing regulations and legislation.

Below are some of the most important environment-related aspects which are taken into account in the design of SIMOVERT MASTERDRIVES.

The use of dangerous substances (such as arsenic, asbestos, beryllium, cadmium, CFCs, halogens and many more) is avoided as early as the development phase.

Connections have been designed so that they are easy to service and materials are selected carefully with preference being given to those which can be recycled or disposed of without causing problems.

Materials for manufacturing purposes are identified in accordance with their recyclability. This applies, in particular, to components which contain unavoidable, hazardous materials. These components are installed or mounted in such a way that they can be easily separated, thus facilitating disposal in an environmentally-friendly manner. Wherever possible, recycled components are used.

Environmentally-compatible packaging materials (pressed board and PE foils) are used for shipping and storage. We also try to keep the amount of packaging material used to a minimum.

If possible we pack our products in reusable packaging.

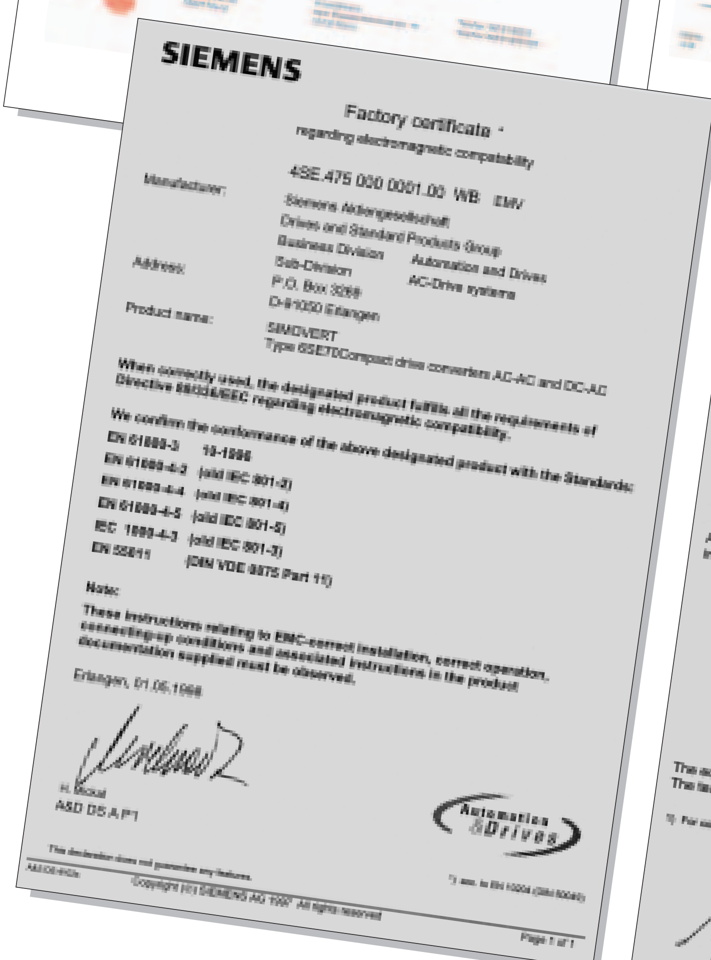
We have already made preparations to enable the converters to be disposed of after use in accordance with the regulations governing the disposal of electronic equipment (not yet in force).

This catalog is printed on chlorine-free bleached paper.

All divisions of A&D of Siemens AG are certified. As an example, the certificates of A&D MC are printed below.


IQNet
THE INTERNATIONAL CERTIFICATION NETWORK
CERTIFICATE
Siemens AG
Automation & Drives (A&D)
Environmental Management System,
ISO 14001 : 1996
Registration Number: DE-01348-01


IQNet
THE INTERNATIONAL CERTIFICATION NETWORK
IQNet Registration No. DE-1258-05
This is to state that
Siemens AG
Automation & Drives
holds the
Management System Certificate
for the scope specified thereon and for the standard(s)
ISO 9001
Signed for and on behalf of IQNet



SIEMENS

Factory certificate *
regarding electromagnetic compatibility

4SE.475 000 0001.00 WB EMV

Manufacturer: Siemens Aktiengesellschaft
Drives and Standard Products Group
Business Division Automation and Drives
Sub-Division AC-Drive systems

Address: P.O. Box 3269
D-91050 Erlangen

Product name: SIMOVERT
Type 6SE70Compact drive converters AC-AC and DC-AC

When correctly used, the designated product fulfils 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:
These instructions relating to EMC-correct installation, correct operation, connecting-up conditions and associated instructions in the product documentation supplied must be observed.

Erlangen, 01.05.1998

H. Mickal
A&D DS A P1

Automation & Drives

This declaration does not guarantee any features.

*) acc. to EN 10204 (DIN 50049)

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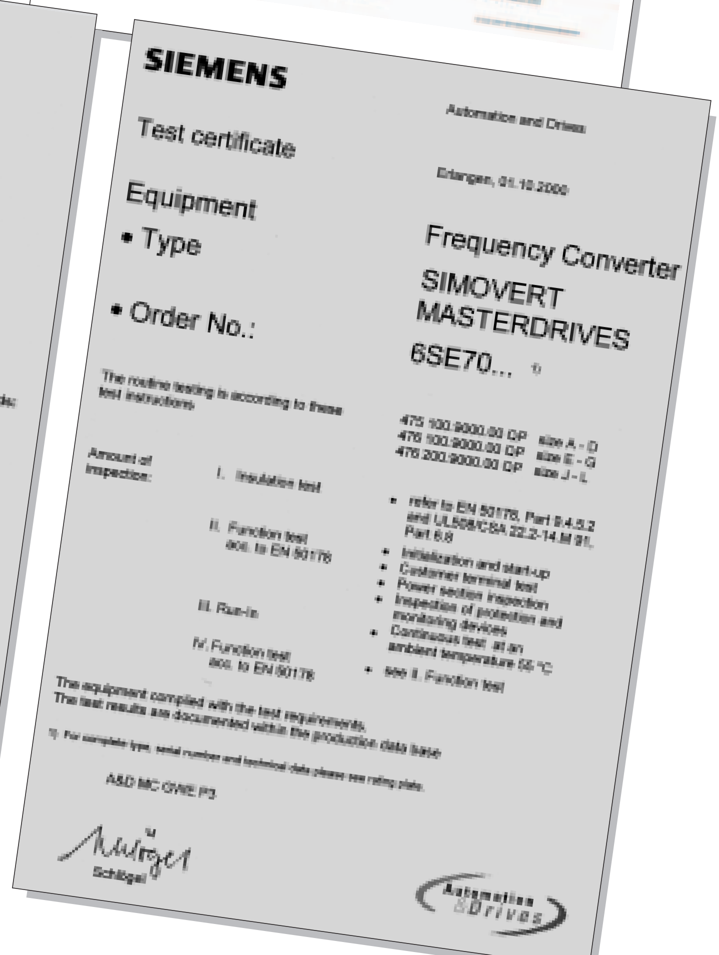


SIEMENS
Automation and Drives

Test certificate
Erlangen, 01.10.2000

Equipment: Frequency Converter
• Type: SIMOVERT MASTERDRIVES
• Order No.: 6SE70... 1)

The routine testing is according to these test instructions:
475 100.9000.00 QP size A - D
476 100.9000.00 QP size E - G
476 200.9000.00 QP size J - L

Amount of inspection:

I. Insulation test
• refer to EN 50178, Part 9.4.5.2 and UL508/CSA 22.2-14.M 91, Part 6.8

II. Function test acc. to EN 50178
• Initialization and start-up
• Customer terminal test
• Power section inspection
• Inspection of protection and monitoring devices

III. Run-in
• Continuous test at an ambient temperature 55 °C

IV. Function test acc. to EN 50178
• see II. Function test

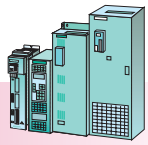
The equipment complied with the test requirements.
The test results are documented within the production data base.

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

A&D MC QWE P3

Schlögel

Automation & Drives



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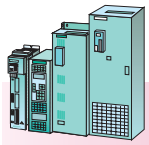

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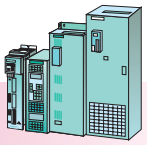

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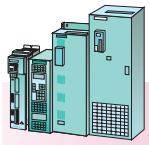

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You start by selecting a

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- Product or
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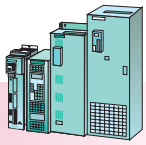
Under the fax no.
0 08 00-74 62 84 27
you will find further information.



A&D on the WWW

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The Siemens Automation and Drives Group (A&D) has therefore built up a comprehensive range of information on the World Wide Web, which offers quick and easy access to all data required.

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Automation and Drives, CA 01
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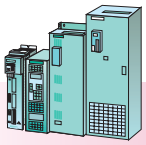

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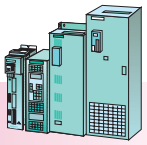

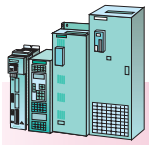

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Automation and Drives
Motion Control Systems and Large Drives
PO Box 31 80
D-91050 Erlangen
Germany

Order No.: **E86060–K5165–A101–A3–7600**
Printed in Germany
KG K 0803 17.0 E 328 En/P322007

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• AC Servomotors 1FT, 1FK	
• AC Linear motors 1FN	
• Converter System SIMODRIVE 611	
• Converter Systems SIMODRIVE POSMO A/CD/CA/SI	
Low-Voltage Three-Phase-Motors	
Project Manual	M 10
Squirrel-Cage Motors, Totally Enclosed, Fan-Cooled	M 11
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